UPDATED

In A Moment's Notice: Surge Capacity for Terrorist Bombings

Challenges and Proposed Solutions

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention

Updated In A Moment's Notice: Surge Capacity for Terrorist Bombings

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Executive Summary

Explosive devices and high-velocity firearms are the most common weapons used by terrorists. The morbidity and mortality inflicted in two European capitals, Madrid, Spain, and London, England, in 2004 and 2005 respectively, demonstrates the impact of detonating explosives in densely populated civilian areas. Explosions can produce instantaneous havoc, resulting in numerous casualties with complex, technically challenging injuries not commonly seen after natural disasters. Because many patients self-evacuate after a terrorist attack and prehospital care may be difficult to coordinate, hospitals near the scene can expect to receive a large influx, or surge, of victims after a terrorist strike. This rapid surge of victims typically occurs within minutes, exemplified by the Madrid bombings where the closest hospital received 272 patients in 2.5 hours. Such a surge differs dramatically from the gradual influx of patients after infectious disease outbreaks or environmental emergencies such as heat waves. In addition, injuries to workers involved in rescue and recovery can lead to a secondary wave of patients.

Health care and public health specialists should anticipate profound challenges in adequately caring for the surge of victims following a terrorist bombing. The health care system, especially emergency care, is already strained by routine daily volumes. Furthermore, emergency departments (EDs), inpatient units, and intensive care units (ICUs) of acute care hospitals are chronically overcrowded and resource constrained.

Without immediate federal assistance, many, if not most, communities would have difficulty caring for a surge of victims resulting from a terrorist bombing event.

To address the challenges posed by such an event, the Centers for Disease Control and Prevention (CDC)'s National Center for Injury Prevention and Control (NCIPC), Division of Injury Response (DIR) convened expert panels in October 2005, January 2006, and June 2009. These panels included experts in emergency medical services (EMS), emergency medicine, trauma surgery, burn surgery, pediatrics, otolaryngology, intensive care medicine, hospital medicine, radiology, pharmacology, nursing, hospital administration, bloodbanking, and public health. The panels were tasked with identifying creative strategies that could be adopted in a timely manner to address medical care surge issues from terrorism, and the panel experts focused on rapidly managing large numbers of

bombing casualties. They examined challenges that would confront not only the general emergency medical response and health care system, but also select medical disciplines. Although developed for addressing a surge of injuries from a terrorist bombing, the recommendations in this report may also improve the management of a surge from other mass casualty events, including biological, chemical, or nuclear attacks.

This document reflects the recommendations of the expert panels. It includes a description of system-wide and discipline-specific challenges as well as recommendations to address these issues. Solutions for the discipline-specific challenges have been incorporated into easy-to-use templates that can assist various disciplines in managing surge needs for injuries. The needs and resources of each community must be considered to effectively plan for a surge of patients into an already overburdened health care system.

CHAPTER ONE

Introduction

A BACKGROUND

Current patterns in terrorist activity increase the potential for civilian casualties from explosions. Recent events in Egypt, India, Iraq, Israel, Pakistan, Spain, and the United Kingdom indicate that bombings targeting civilian populations are a continuing danger. The U.S. Department of State reported 7,000 terrorist bombings worldwide between 1968 and 1999.[1] From 2001 through 2003, more than 500 international terrorist bombings caused 1,579 civilian deaths, excluding the attacks of September 11, 2001.[1–3]

The U.S. Federal Bureau of Investigation confirmed 324 incidents of terrorist bombings in the United States between 1980 and 2001[4]. More than 21,000 bombing incidents (actual, accidental, or attempted) occurred in the United States between 1988 and 1998.[5]

According to reports compiled from the Terrorist Attack Archives at the Terrorism Research Center, 758 terrorist events were staged in 45 countries in 2005, and more than half (N = 399) were bombings. These events resulted in 8,019 injured persons and 3,049 civilian deaths.[6]

Despite justifiable concerns about the dangers of chemical, biologic, or nuclear terrorist attacks, bombings with conventional explosives remain the most common method. Explosions, particularly in confined spaces, can inflict multisystem injuries on numerous patients and produce unique challenges to health care providers. Unlike the gradual influx of patients after events such as infectious disease outbreaks or heat waves, the surge of patients after an explosion typically occurs within minutes of the event and can quickly overwhelm nearby hospital resources.[7–8] The potential for many casualties and an immediate surge of patients may stress and limit the ability of EMS systems, hospitals, and other health care facilities to care for critically injured victims.[9–11]

The persistent threat of terrorist activities, combined with documented evidence of decreasing emergency care capacity, requires appropriate preparation.[12] Health care and public health systems, individual hospitals, and health care personnel must collaborate to ensure that strategies are in place to effectively receive, evaluate, and treat large numbers of injured patients. In addition, rapidly identifying and stabilizing the most critically injured patients should be the main focus. Collaborative efforts must also strategically plan for future incidents.

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B ROLE OF THE CDC'S INJURY CENTER

The mission of CDC's Injury Center is to increase the capacity to prevent injuries and their adverse health effects by working with partners to develop, evaluate, and promote evidence-based surveillance, prevention, and care practices.[13] One of CDC's strategic goals is to protect people from health consequences resulting from terrorist attacks. The Injury Center uses a systematic public health approach to define the injury problem, identify risk and protective factors, develop and test prevention interventions and strategies, and ensure widespread adoption of effective interventions and strategies.

Many agencies have addressed issues of surge capacity for events such as biological attacks, most notably, CDC's public health and laboratory programs and the Health Resources and Services Administration (HRSA)'s hospital preparedness program. After in-depth discussions with HRSA, the Department of Homeland Security, the Federal Emergency Management Agency, the National Highway Traffic Safety Administration, CDC undertook efforts to play a unique role in identifying surge capacity issues and proposing solutions related to terrorist bombings. Any solutions to enhance surge capacity in preparation for terrorist bombings could also apply to surge issues resulting from other man-made or natural disasters.

In October 2005 and January 2006, the CDC's Injury Center convened expert panels to identify problems and recommend feasible and affordable strategies for rapidly managing large numbers of bombing casualties. These recommendations, in the form of *surge action templates*, were designed for emergency medical services, hospital, and public health systems, with the recommendation that immediate steps be taken to ensure an effective response. The expert panels were also charged with

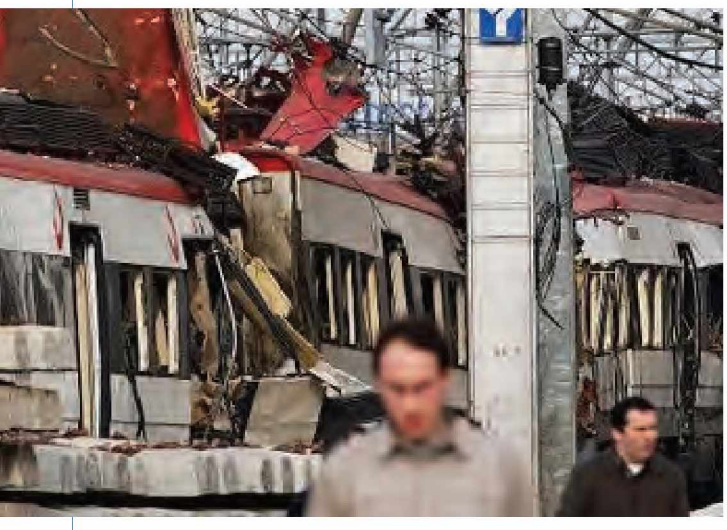
identifying creative strategies that could be adopted in a timely manner to address surge issues from terrorist bombings. To begin the process, the first panel had three objectives:

1. Increase collaboration between CDC and federal agencies, external partners, and other experts on issues of surge capacity for injuries from conventional terrorist bombings;
2. Identify factors that limit rapid assessment and treatment of injured patients in the field and at hospitals (including triage, availability of radiology, and access to operating rooms) and develop mechanisms to address these factors; and
3. Develop strategies and identify mechanisms to widely disseminate and implement findings from the expert panel (i.e., Internet, print publications, and training curricula).

In June 2009, CDC convened another expert panel to update and revise the surge action templates. Attendees involved in the expert panel meetings came from many countries and represented a broad spectrum of medical care and administrative disciplines required to care for bombing victims. Panel members included personnel from emergency medical services; physicians specializing in emergency medicine, trauma surgery, burn surgery, pediatrics, otolaryngology, intensive care medicine, hospital medicine, and radiology; experts in pharmacology, nursing, hospital administration, and bloodbanking; and experts in public health. The expert panel members are listed in the acknowledgments section of this report. At the June 2009 panel session, expert working groups reviewed each of the original templates and their suggested changes were presented to the plenary body for discussion. The templates provided later in this report represent the modifications recommended by this latest expert panel.

C LESSONS LEARNED FROM MADRID

To provide a framework for discussions at the first meeting, the panel was presented with the example of the March 11, 2004, Madrid bombings. The Madrid experience provides a real-life scenario of what U.S. health care providers and systems must be prepared to confront: a complex, coordinated attack with thousands of injured victims and a rapid surge of patients to surrounding hospitals. Between 7:37 a.m. and 7:42 a.m., 10 terrorist bombs were detonated on four crowded commuter trains, killing 177 people instantly and injuring more than 2,000 persons.[14] Gregario Maranon University General Hospital staff evaluated and treated 312 patients, with 272 of them arriving between 7:50 a.m. and 10:00 a.m. The Madrid response entailed multiple logistical and operational challenges, including field triage and transportation of injured persons; discharge of inpatients to free hospital beds; evacuation of EDs and ICUs; and multiple surgical procedures and diagnostic tests such as hundreds of radiographs, computerized tomography (CT) scans, and ultrasounds.



Panel members were asked to describe how members of their clinical discipline would respond to the Madrid example.

D TERRORIST BOMBINGS IN THE UNITED STATES: A "PREDICTABLE SURPRISE"

The persistent global reality of complex terrorist bombings, such as in Madrid, suggests that similar events in the United States could be described as a "predictable surprise." The expert panel reviewed the characteristics of "predictable surprises" outlined by Bazerman and Watkins[15] to provide background on common problems that could hinder effective surge response.

The following characteristics of "predictable surprises" outlined by Bazerman and Watkins apply to terrorist bombings and the United States:[15]

1. A shared trait of predictable surprises is that leaders knew a problem existed and that the problem would not solve itself.
2. Predictable surprises can be expected when organizational members recognize that a problem is getting worse over time.
3. Fixing the problem would incur significant costs in the present, while the benefits of action would be delayed and ambiguous.
4. Decision makers often fail to prepare for predictable surprises because the natural human tendency is to maintain the status quo.
5. A small vocal minority benefits from inaction and is motivated to subvert the actions of leaders for their personal benefit.
6. Leaders can expect little credit for the prevention of predictable surprises

CHAPTER TWO

Surge Capacity Challenges and Solutions: System-wide Challenges

Hospitals and emergency health care systems face enormous challenges. The threat of terrorism exists at a time when hospitals and emergency departments in the United States are struggling to manage the current volume of patients who present for care. Reductions in hospitals with emergency departments, regionalization of surgical care, increases in nonemergency patient visits to emergency departments, diversion of emergency medical services, and personnel shortages have led to unprecedented crowding in emergency departments.[16–20] These challenges are highlighted in three Institute of Medicine reports outlining the burdens of the American emergency care system.[21–23]

Ambulances are routinely diverted from one facility to another.[24] According to a 2003 report from the National Center for Health Statistics, 34% of U.S. emergency departments diverted ambulances from primary destinations.[24] Diversions occurred more frequently in metropolitan areas. Emergency departments also operate above capacity, forcing paramedics to wait for extended periods before patient care can be transferred to hospital staff. Patients are evaluated and treated in emergency department hallways and held for hours, or even days, awaiting placement in an inpatient bed due to high occupancy.[25] In 2003, 113.9 million visits were made to emergency departments in the United States, representing a 26% increase from 90.3 million visits in 1993. During this same period, the number of U.S. emergency departments decreased by 14%.[26] The problem intensified during the 1990s when the United States lost 103,000 staffed inpatient medical and surgical beds and 7,800 intensive care unit beds.[25]

Several issues affect the spectrum of injury care from prehospital through rehabilitation and also affect personnel, including fire chiefs, trauma surgeons, and nursing supervisors to emergency medical technicians (EMTs). Many problematic areas stand between the current reality of emergency care in the United States and the effective management of an event like the Madrid bombing. The following list describes these specific areas.

A ORGANIZATION AND LEADERSHIP

Effective preparedness and response demand an established, functional leadership structure with clear organizational responsibilities. In many instances, particularly at the local operational level, such preparation has not occurred. Consequently, confusion over specific roles and responsibilities during response efforts could occur.

A CDC publication reported that about three fourths of hospitals had disaster plans that addressed explosives, but few (one fifth) had actually conducted a drill involving simulated use of explosives.[27]

B ALTERATIONS IN STANDARDS OF CARE

As part of the response to a terrorist bombing, revisions to standard of care could be required, emphasizing the greatest good for the *community*. No universal methodology exists for altering standards of care, and the process is fraught with ethical, societal, medical, and legal issues. A protocol is needed to determine when and how to alter standards of care without the health care provider or facility experiencing repercussions. An altered protocol, simultaneously implemented by all hospitals within a system, would improve the ability to manage assessment, treatment, flow, and outcomes for the greatest number of patients. In August 2004, the Agency for Healthcare Research and Quality at the U.S. Department of Health and Human Services (HHS) convened a panel of experts to examine the complex issues surrounding alterations in clinical care. The panel's findings are published in the monograph *Altered Standards of Care in Mass Casualty Events.*[28]

C EDUCATION

Disaster preparedness and response education is not included in most medical or nursing school curricula. With the exception of emergency medicine, preparedness and response is also not required in most residency training programs. As standard curriculum, EMT paramedics are required to complete a module on medical incident command. Yet, EMT-Intermediates and EMT-Basics do not receive this essential training. Standardized training that addresses clinical care and systems issues should be given to all levels of providers.

D COMMUNICATIONS

Although effective and timely communications are essential to functional command and control, communication failure (prehospital, hospital, and public) is a recurrent theme during and immediately after a disaster.[29] Communication planning should include community education before, during, and after an event to promote public acceptance and understanding of the disaster response.

E TRANSPORTATION

Coordinated transportation service is vital. Hospitals must make timely and effective use of mutual aid transport units to transfer inpatients to tertiary or alternate care centers, (e.g., home, long-term care facilities) and free acute care beds. Effective plans to transport resources, personnel, supplies, and equipment by integrating private, public, and military transportation resources are required.

F INFRASTRUCTURE AND CAPACITY

Communities differ in their capabilities and infrastructure to handle disasters in terms of prehospital and hospital capacity. Regardless of a community's capabilities and the level of coordination between resources, those people injured from an explosion will rapidly seek care at the nearest hospital and may not present to facilities designated by existing response plan.[29, 30] Thus, all communities should develop plans that have been successfully and repeatedly tested with drills. In addition, facilities vary in capabilities and staffing. All facilities, including tertiary, community, rural, and alternate care, may face problems in the following areas.

1. Personnel

Shortages of qualified personnel, including nurses and specialized technicians, exist throughout the health care system. During a mass casualty event, these shortages could be further magnified. Some staff may not respond during a bombing or other disaster event for reasons that include fear for personal safety, family responsibilities, or injury. Conversely, the screening, managing, and credentialing of well-intentioned volunteers during a disaster can be challenging.

2. Equipment and supplies

Shortages of essential equipment and supplies often occur in the aftermath of a terrorist bombing or natural disaster. During response efforts, shortages may be exacerbated by the fact that most facilities in a given region use the same suppliers for back-up stock and equipment (e.g., pharmaceuticals, general medical supplies, ventilators).

3. Information technology (data management/data systems)

Often, software systems involving EMS, hospitals, and health departments are incompatible. To maximize patient outcomes and allow individuals to quickly locate family members, a data management system should be able to track patients from the scene and throughout their hospitalization and subsequent transfer to other facilities.

4. Cost

Preparation and incident mitigation requires a commitment of resources. Training prehospital providers, stockpiling key equipment, and reserving capacity will require considerable financial investment.

5. Interoperability

An effective medical response to a terrorist bombing requires that system components (personnel, organizations, and command structures) be interoperable. Currently, services, agencies, and systems are not integrated for maximum efficiency.

G POTENTIAL BOTTLENECKS

Response and capability of some clinical care areas may affect patients across the spectrum of care, causing potential bottlenecks. Consider the following list to maximize response capabilities.

1. Radiology

Given the nature of injuries related to terrorist bombings, many victims will undergo multiple radiology studies[14]. The numbers of patients requiring studies may lead to a bottleneck and hinder the institution's ability to streamline care. Although professional radiology societies have addressed detection and treatment of radiation emergencies, they have not focused on surge capacity for bombing victims.

2. Critical care

If a terrorist bombing increases the demand for critical care/ICU services that, in turn, exceeds reserve ICU capacity, hospitals would have limited ability to divert or transfer patients to other hospitals and will need a plan in place to provide emergency mass critical care.

3. Pharmacy

Ensuring an adequate supply of required pharmaceuticals throughout an institution and community is of great importance. Maintaining adequate drug stocks may be complicated because many facilities in a region use the same distributors.

4. Triage

Current planning and preparedness activities assume that prehospital providers will have a coordinated dispatch, arrive on the scene to triage patients, and transport them to the appropriate facilities. In many disasters, however, most victims self-transport or are transported by other laypersons, resulting in a patient surge at nearby facilities[31].

5. Legal issues

Examples of legal issues encountered during a terrorist bombing response include credentialing of providers; revising standards of care; altering standards for clinical documentation; and suspending provisions in the Emergency Medical Treatment and Active Labor Act, Health Insurance Portability and Accountability Act, or Clinical Laboratory Improvement Amendments.

CHAPTER THREE

Surge Capacity Challenges and Solutions: Discipline-specific Challenges

Although each of the system-wide challenges may affect the broad range of patient care, unique challenges also exist for many disciplines. The expert panel identified the following discipline-specific challenges and provided feasible and affordable strategies for effectively addressing surge capacity. The proposed solutions are provided in template format in the next section of this document.

A EMERGENCY MEDICAL SERVICES (EMS) RESPONSE

As initial responders, EMS providers and personnel must confront several of the following issues:

1. Personal protection

Currently, no unified approach exists to protect rescuers or stage a response. Specifically, a challenge in response planning is identifying circumstances in which appropriate concern for scene safety and the potential for secondary explosive devices may hinder the initial response.

2. Decontamination

Though treatment will be delayed, immediate decontamination may be imperative. Uniform policies and protocols for decontaminating personnel and patients need to be established for varying scenarios, including weather-related disasters and terrorist bombings.

3. Incident command

Interoperability between prehospital and hospital command structures is a challenge. A unified incident command structure must be incorporated into health care response, including designating EMS as part of the field response command structure.

4. Field triage

Although multiple triage systems are used across the United States, no agreed-upon methodology for field triage during a disaster exists.

5. Destination decisions

Determining the appropriate destination following an event may be difficult, especially if the initial scene assessment has not been thoroughly conducted.

6. Hospital evacuations

EMS transfer of patients from hospitals to free acute care beds often adversely affects routine hospital functions.

7. Sustainability of operations

Providing personnel with needed support (physical and emotional) and maintaining facilities, equipment, and supplies in the aftermath of an event is an ongoing challenge.

B EMERGENCY DEPARTMENT RESPONSE

The emergency department is the entry point to most hospitals and the site where initial information related to a disaster is communicated. The challenge is to determine the magnitude of the event and initiate the appropriate institutional response. This response must be in concert with the assessed magnitude, including decisions to declare an institutional disaster, initiate an institutional lockdown, and determine if recipient victim decontamination is needed. The quality and quantity of information from the field and between the regional emergency operations center and hospitals is critical to determining the extent of the response. Frequently, information challenges and communications are a source of failure.[29]

In a large-scale event, each hospital should have the capability to increase staffing, rapidly assess available bed status, and open occupied beds, especially in the ED, operating rooms, and intensive care units. During a mass casualty event, transfer of patients to an alternative care site may be delayed due to the time, personnel, and equipment needed to establish the site. However, development of an alternative location will, eventually, free noncritical care beds.

A list of key issues are highlighted below:

1. *Ascertaining the validity and scope of the event.* Notification is essential to activate and implement an appropriate response. Information updates must be consistent and frequent.
2. *Implementing incident command.* Incident command must be implemented within the ED, hospital, and community. Each hospital should be part of a regional unified command structure.
3. *Discharging patients from the ED.* To free resources, patients should be discharged or transferred to other areas for care.

C SURGICAL AND INTENSIVE CARE UNIT (ICU) RESPONSE

Multiple factors affect trauma surgery and its preparedness and response to a bombing event or natural disaster. These factors include:

1. Changes in surgical practice

The increased interest in disaster response capabilities is contrary to the general surgery community's decreased interest in managing emergency surgery. Thus, the knowledge base and skill set to manage a Madrid-type scenario is being concentrated at fewer hospitals. Many hospitals with the capacity to handle surge, as it relates to beds and staffing, have little technical capability.

2. Time of day

As in the Madrid bombings, the time of the event is critical for trauma centers and community hospitals. However, disaster planning often does not consider time of day. At 2:00 a.m., for example, a community hospital may not have operating room capability.

3. Limited ICU beds

Overcrowding may require decisions to delay nonemergent surgeries, identify beds in other areas of the hospital, or transfer patients to another facility.

4. Loss of excess capacity/capacity on a given day

The health care system has systematically and deliberately eliminated unused capacity to contain cost.

5. Education

More surgeons, especially those in trauma centers, require further education on the planning and response process. The U.S. military in Iraq has successfully demonstrated concepts in surgical surge capacity management that could be translated to civilian medicine. Furthermore, the U.S. military emergency surgery experience in Iraq has shown that more lives can be saved through temporizing damage-control surgery than if patients receive time-consuming definitive procedures.

In addition to these factors, after a terrorist attack, critical care services will be required to treat seriously ill or injured patients. The emergency mass critical care plan should address hemodynamic resuscitation and support using intravenous fluids and vasopressors, administration of antibiotics and other disease-specific countermeasures, prophylactic interventions to reduce adverse consequences of

critical illness, and basic modes of mechanical ventilation. Emergent critical care interventions should include those that

1. improve survival without which death is likely and
2. do not consume extensive staff or hospital resources.

Critical care areas should be equipped to measure, at a minimum, oxygen saturation, temperature, blood pressure, and urine output. When critical care units are full, hospitals can create additional capacity in non-ICU rooms concentrated on specific wards or floors. Patient care areas with critical care capability, such as endoscopy and surgical suites, are good alternatives. These improvised critical care areas will increase capacity only slightly and require cessation of services normally provided.

When a hospital cannot meet increased demand for ICU services by using existing critical care practitioners, a two-tiered staffing model comprising noncritical care physicians and nurses may be substituted. Members of the Working Group on Emergency Mass Critical Care (Center for Bioterrorism at the University of Pittsburgh) and the Society of Critical Care Medicine concluded that a critical care physician can supervise up to four noncritical care physicians who can each manage up to six critically ill patients.[31] Recommendations included a critical care nurse supervising up to three noncritical care nurses with each caring for two patients. In this model, a hospital's critical care staff is multiplied to where one critical care physician could oversee the care of up to 24 critically ill patients, and one critical care nurse could oversee the care of up to six critically ill patients.[31] In addition, many leading children's hospitals with large pediatric intensive care units (PICUs) in the United States operate at maximum capacity. If a mass casualty involving children and infants were to occur, the PICUs' response and ability to provide intensive care would be severely constrained.[32]

D RADIOLOGY RESPONSE

Whereas in many areas (ICU beds, operating rooms, ventilators, etc.) the United States has diminished capacity, our nation has a slight surplus of radiology,[33] which is beneficial in managing multiple bombing victims.

Hospitals have invested in imaging technologies, including CT, magnetic resonance imaging (MRI), and ultrasound. Still, relatively few U.S. hospital centers and health care systems have enough capacity and ability to maintain sufficient staffing levels to effectively use these modalities. Each hospital differs in its capabilities, equipment, and personnel (technicians and radiologists). Additional problems may include preserving radiology for the most appropriate critical patients, ensuring immediate access to backup components of critical equipment, and interacting with vendor technicians.

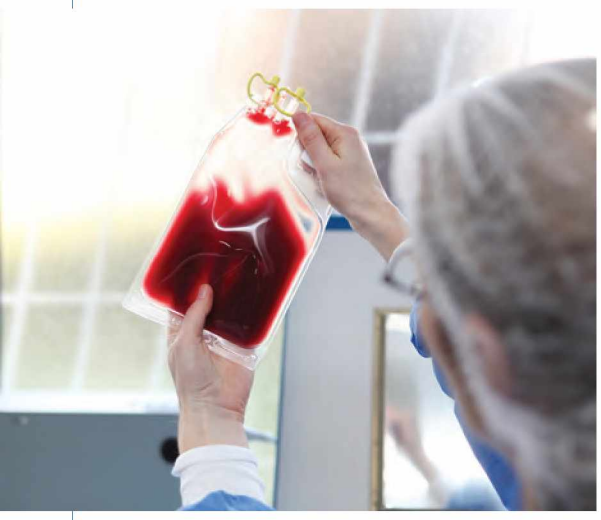
E BLOOD BANK RESPONSE

In the last 30 years, the United States has experienced only five disasters requiring more than 100 units of blood.[34] If a terrorist bombing occurs, large amounts of blood will be required only if many victims are seriously injured. The blood banking community has formed an interorganizational task force to address blood needs in the event of a disaster. The AABB (formerly the American Association of Blood Banks) Interorganizational Task Force on Domestic Disasters and Acts of Terrorism (AABB Interorganizational Task Force) unites virtually all national blood organizations (AABB, America's Blood Centers, and American Red Cross) and hospital and supplier associations. The task force also includes liaisons from the Department of Health and Human Services, Food and Drug Administration, CDC, and Armed Services Blood Program to coordinate preparing for and responding to disasters affecting the blood supply.

Potential issues with the U.S. blood supply are as follows:

1. Disruption of the blood supply system

Blood shortages are unlikely to occur in the event of a mass casualty event (MCE). However, interference of the blood supply system could complicate patient care. Blood collection, processing, and testing are highly regulated procedures in a technical system that requires trained staff. During times of disaster, including terrorist attacks, the general public will often want to provide assistance to relief efforts. Blood donors may potentially present to hospitals and blood centers and overburden the system. On September 11, 2001, New York and New Jersey used 224 units of blood, while Washington, DC, and Virginia used 34, totaling 258 units. These units were all in supply before the disaster occurred.[34] However, across the nation, more than a half million people donated blood. In the event of a disaster, the AABB Interorganizational Task Force will inform the public if blood donations are needed and provide instructions on how and where to donate. In most instances, the appropriate message will state that additional blood is not needed immediately after the disaster.



2. Transportation of blood

Even when blood products are not shelved at the surge capacity site, the products can be available within hours. Blood can be transported to a disaster location faster than donations can be processed. However, logistical issues are associated with the transportation of blood. For example, authorization may be required to transport blood around the state or country. In addition, blood centers may have difficulty obtaining fuel to power generators or operate vehicles that transport blood. Federal, state, and local emergency preparedness officials should prioritize the transportation of blood products.

3. Local organization

In a disaster, blood products should be strategically placed at hospitals serving the large influx of patients. In some metropolitan areas, hospitals may be served almost entirely by one blood center,

while in other cities, by several centers. Planned and coordinated efforts are needed during a disaster to know which blood centers will service hospitals at surge capacity. Within an hour of a disaster, the AABB Interorganizational Task Force will convene a conference call of national blood organizations, HHS, and local affected blood centers to determine local needs for blood and actions necessary to meet those needs. The task force will meet again hours or days later to evaluate subsequent blood-related efforts.

4. Staff who can administer blood

Most hospitals maintain a 72-hour supply of blood. If blood is not stored at the hospital, it can generally be readily accessed. During a mass casualty event, consumption of a 72-hour blood stock in a few hours is highly unlikely. Instead, the hospital may have too few trained staff to administer blood. Several documents are available to assist blood centers, hospital blood banks, and transfusion services to prepare for and respond to disasters and acts of terrorism.[35–37]

F HOSPITALISTS RESPONSE

Hospitals and outpatient primary care physicians are increasingly favoring the transfer of inpatient care to full-time hospitalists. The number of hospitalists in the United States has grown from a few hundred in 1996 to approximately 20,000 currently.[38] Although they may not be directly involved in the care of casualties from a terrorist event, hospitalists will be vital in rapidly discharging inpatients, accepting transfers from ICUs, and freeing bed space for victims.

G ADMINISTRATION RESPONSE

A surge of patients from a bombing event will likely contribute to administrative stresses on a hospital. Hospitals face formidable challenges in the post-September 11, 2001, era. Shrinking revenue margins put pressure on budgets and complicate investment decisions to purchase items for contingency operations. The current U.S. health care industry must support its contingency investment needs by pooling a mix of private funding with local, state, and federal resources. As a result, every hospital has some capacity, but specific clinical and administrative capabilities vary widely between facilities.

The United States has 5,010 community hospitals, of which 274 are major teaching hospitals.[39] The major teaching hospitals, components of most academic medical centers, often include a Level 1 trauma center, and may coordinate local EMS transport. These hospitals are the focal points of graduate medical education and tertiary services. During a response, these hospitals will serve the local community, through either direct clinical care or system coordination. Maintaining these hospitals in the face of falling revenue margins strains the ability of any organization to support infrastructure for response capability.

Nonteaching hospitals face a similar situation. The total number of staffed beds in the United States has dropped to 951,045.[39] Outsourcing outpatient services and procedures to nonhospital settings has further reduced revenue. Reduction in revenue has furthered a decline in investment to strengthen hospital infrastructure. A gradual erosion of sophisticated diagnostic services offered by hospitals has

complicated the U.S. health care industry's ability to respond to traditional challenges and further weakened the potential to respond to extraordinary circumstances.

Within each community, leadership from the health care industry is key in an effective response. Hospitals must be linked to provide mutual aid and assist patient transfers. Businesses function on increasingly narrow inventory levels, and hospitals in the same community usually rely on the same suppliers. In a crisis, suppliers will resort to rationing inventory. Regional and multistate mutual aid plans should be developed. In catastrophic events, help from outside the affected zone may take days to arrive, underscoring the need to identify resources to support 3 days of operations before reordering supplies.

Hospital responses to mass casualty events are often chaotic due to lack of training and experience. The disorganized response is compounded by the lack of an appropriate command structure such as the Hospital Incident Command System (HICS). Although using an appropriate incident command system does not guarantee a successful response, absence of one will increase the likelihood of failure. Hospital personnel must understand the concept of regional unified command and be willing participants during a disaster.

When a situation demands swift action, hospital administrators have to focus on many areas simultaneously. By using a stepwise approach, administrators can limit disorganization and improve response times, thereby saving lives. Administrators should focus on the critical areas in the following areas:

1. Control of the external environment

The external environment will change rapidly during a large event. Maintaining control of hospital grounds (facility security and traffic) is essential. Clearing beds to accommodate incoming casualties, redirecting nonemergency patients to other areas, and managing overall movement of staff will require effective management of the external environment, including media, family members of injured patients, and curious bystanders.

2. Implementation of the HICS

HICS is a widely used emergency management system known for providing a chain of command that can rapidly mobilize.[40] The system also enables accountability of position functions, flexible responses to emergencies, and improved documentation of facility actions. HICS provides a common language to facilitate outside assistance and allows for the development of prioritized response checklists for senior leadership. In large-scale disasters such as the Madrid bombings, prior identification of the appropriate decision makers is crucial.

3. Personnel issues

Balance must be struck between the needs of staff and the larger organization to ensure adequate coverage for short- and long-term medical responses. Early decisions should include when staff can leave duties to check on family members and contingencies for staff members leaving during a response. A method to request additional staff on short notice coupled with defining an individual institution's surge capacity can assist in finding the right mix of clinical and nonclinical support to handle the increased workload.

4. Memorandums of understanding or agreement

Formal agreements to share supplies, personnel, or equipment should be written and drilled to support local, regional, and state partners following an event.

5. Logistics and supplies

Coordinating with key suppliers and maintaining inventories throughout the health system will ease escalation of response efforts. During particular events, some clinical areas (i.e., obstetrics, outpatient surgery, and various clinics) may not be directly affected and could provide supplies. Effective logistics management would also include transporting patients to and from appropriate care settings. Although the housing of evacuees is a municipal function, knowing the locations of designated Red Cross shelters throughout the vicinity and transportation resources for low-acuity patients will hasten discharge planning and improve patient flow in the emergency department.

6. Alternate care sites

Triage systems are typically used to prioritize patients so low-priority patients can be directed from the main hospital, thus allowing ambulances and hospital staff to focus on high-priority patients. Alternate sites may allow large health systems to facilitate triage and direct patients and families to appropriate sources of care.

7. Credentialing

The Joint Commission on the Accreditation of Healthcare Organizations (JCAHO)'s emergency credentialing system must be tested within a facility before implementation. State Emergency Systems for Advance Registration of Volunteer Health Professionals reflect JCAHO requirements and provide a standardized set of verified credentials for volunteers who may be called to assist hospitals during emergency situations.[41] Many aspects of staff credentialing can be streamlined, but formal enrollment cannot be avoided. In most hospitals, formal enrollment provides access to delivering routine care, including entering orders and prescriptions, ordering laboratory tests, and documenting care by using automated systems. Whether credentialing is handled by human resources or a professional staffing office, the design of the system should support the use of volunteers in nonclinical activities.

8. Patient tracking

Tracking patient movement is critical during mass casualty events. Successful tracking begins when a patient enters the health care system. The ability to track patients, identify supply consumption, and monitor bed use enables senior management to proactively meet the needs of health care. Patient tracking systems should be designed to allow automated tracking for exercises and real disasters.

This list is exhaustive for all facilities. The staff of any health care organization should periodically evaluate areas such as plant and materials management, social work resources, safety, biomedical equipment and repair, service procurement, and patient admission to help prepare for mass casualty events. Often, disaster preparedness is solely focused on the transfer of care between provider and patient and is not focused on infrastructure.

CHAPTER FOUR

Addressing Discipline-Specific Challenges: Surge Action Templates

This section contains 10 templates developed by the June 2009 expert panel to help various disciplines address issues of surge capacity. Most, but not all, of these disciplines (e.g., drugs and pharmaceutical supplies and nursing care) have been discussed in the preceding sections. However, the issues the disciplines face are of significant concern to systems planners, and, therefore, the expert panel recommended that these easy-to-use templates be included as solutions to help ease discipline-specific challenges to surge capacity.

The templates are ordered in the general flow through the health care system.

1. Emergency Medical Services System Response
2. Emergency Department Response
3. Surgical Department Response
4. Intensive Care Unit Response
5. Radiology Response
6. Blood Bank Response
7. Hospitalist Response
8. Administration Response
9. Drugs and Pharmaceutical Supplies
10. Nursing Care

Along with general information (i.e., purpose, background, goals), each template provides basic and, in most cases, low-cost strategies that can be rapidly implemented to better manage surge capacity. The templates emphasize the importance of practicing and evaluating plans.

The templates are intended as guides because specific preferences, needs, and capabilities vary among communities. Furthermore, the templates propose solutions that assume that communities are currently engaged in disaster planning and preparedness activities. Therefore, a significant portion of the personnel and resource costs is expected to be absorbed by these ongoing activities. Exact costs should be determined by local communities and institutions.

Emergency Medical Services System Response

Emergency Medical Services System Response

Emergency Department Response

Surgical Department Response

Intensive Care Unit Response

Radiology Response

Blood Bank Response

Hospitalist Response

Administration Response

Drugs and Pharmaceutical Supplies

Nursing Care

PURPOSE

To provide guidance for local emergency medical services (EMS) response and to mobilize additional EMS-related resources needed in a community within 4 hours of an explosion. These resources are intended to treat at least 300 injured patients.

BACKGROUND

The Madrid, Spain, terrorist bombings were used as a model to help develop solutions for managing rapid surge problems during a mass casualty event.

On March 11, 2004, 10 explosions occurred almost simultaneously on commuter trains in Madrid, killing 177 people instantly and injuring more than 2,000. On that day, 966 patients were taken to 15 public community hospitals. More than 270 patients arrived at the closest facility between 8:00 a.m. and 10:30 a.m.

Federal resources should not be expected to arrive sooner than 72 hours from the time of the explosion. Resources can be delayed by the time taken to deploy them and by emergency personnel responding to multiple communities.

GOAL

To mobilize the appropriate number and type of EMS resources to adequately evaluate injuries, initiate triage, begin transporting at least 300 injured patients, and establish ongoing EMS operations for up to 72 hours.

REQUIRED RESOURCES

- Personnel must:
  1. Be appropriately trained, equipped, and knowledgeable about chemical, biological, radiological, nuclear, and explosives (CBRNE) detection, personal protection, and decontamination;
  2. Be educated in the care of blast-related injuries for adult and pediatric patients;
  3. Be prepared to institute triage;
  4. Have the necessary resources and be capable of rapidly detecting CBRNE agents to assist with decontamination plan; and
  5. Be prepared to institute and participate in unified incident command.

- An incident management process to address 72-hour operations.
- A communications system that is interoperable with the public safety disciplines (fire, law enforcement, EMS, and emergency management) and with receiving hospitals, other health care facilities, and local public health officials.
- Rapid access to a medical cache(s) sufficient to treat the volume of critically injured patients.
- Ambulance resources to transport critically injured patients.
- Alternative resources (i.e., buses) to transport noncritically injured persons.
- Decontamination equipment for ambulatory and non-ambulatory patients. Equipment should be rapidly deployable to the explosion site, a secondary treatment site, or a hospital.
- Secondary triage and treatment sites that can be determined/implemented within the community.
- A demobilization plan that includes access to mental health professionals.

▶ ***This document is a resource guide. Local needs, preferences, and capabilities of the affected communities may vary.***

ASSUMPTIONS

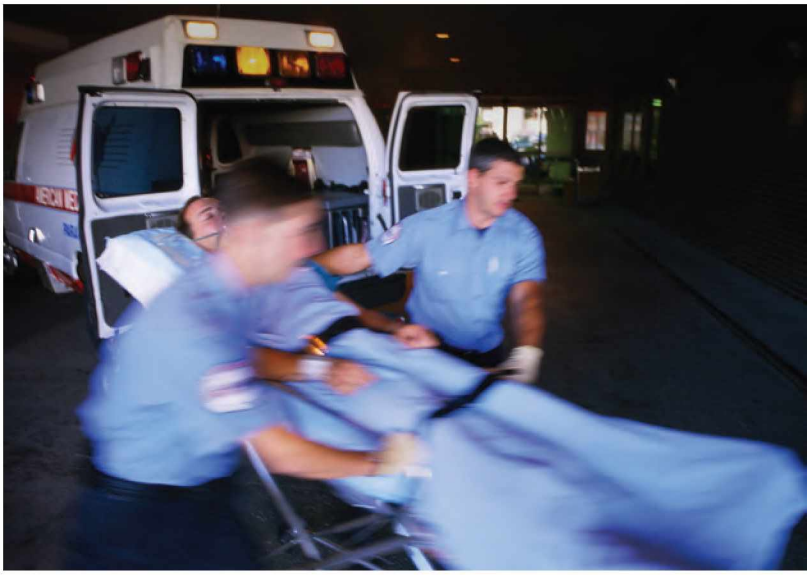
- EMS systems in the United States are highly variable, with a wide range of available resources, experience, and financing.
- A functional EMS system is a critical component for the prehospital management of injured bombing victims and the rapid redistribution of patients from any initial hospital that is overwhelmed with casualties.

ACTION STEPS

The following outlines the appropriate steps for managing surge capacity:

1. Education.

- Train EMS dispatch personnel about appropriate strategies to organize EMS response to bombing incidents.
- Train responding EMS personnel about how to treat primary, secondary, tertiary, and quaternary blast-related injuries. For guidance, go to www.bt.cdc.gov/masstrauma/explosions.asp.
- Train EMS personnel about National Incident Management System (NIMS) compliance and the incident command system (ICS). The importance of command, staging, triage, and treatment of initial casualties (regardless of rank of the provider) should be emphasized.



Develop a plan that includes expectations for initially arriving personnel, including scene assessment, consideration of secondary devices, and attention to safety.

- Train EMS personnel about the use of personal protective equipment (PPE) and the potential risks of transporting contaminated patients. Train EMS officials in advanced ICS (ICS-700 or equivalent).
- Train responding personnel to be aware of the need to preserve forensic evidence.

2. Local policy and planning.

- Facilitate fire, EMS, law enforcement, 911 centers, emergency management, hospitals, other health care facilities, and public health collaborating to develop written plans, as listed in the bullets below. The recommended time for completing these plans is 6 to 12 months. The planning process should include business and community partners. Within 6 months of the plans' completion, other agencies listed in these plans (including mutual aid agencies, etc.) must be included in ongoing planning and evaluation.
- Plan for mobilizing the appropriate number of ambulances within 10 minutes following the blast. At least 75% of these resources should arrive at staging areas in the first hour, with all arriving in the first 90 minutes. This mobilization should be accomplished by using 911 EMS resources, mutual aid agreements with other EMS providers, or mutual aid agreements with nonemergency transport providers.
- Develop a plan that includes expectations for initially arriving personnel, including scene assessment, consideration of secondary devices, and attention to safety.
- Describe in a plan each agency's role in the command structure. Plan should include how critical functions of command, safety, staging, and triage will be accomplished in the first 10 minutes of a response; how treatment, transport, and additional ICS elements will be filled over the first hour; and how the ICS structure will be formally filled by officials trained in advanced ICS (ICS-700 or equivalent) by the end of the first hour.
- Describe in a plan how alternative transport for 200 ambulatory patients will be initiated in the first 10 minutes after an explosion.
- Plan for personnel accountability and patient tracking.
- Describe in a plan the details of interdisciplinary communications (primary and alternatives). Representatives from fire, EMS, law enforcement, emergency management, hospitals, and public health must be included in this plan. The planning process should also involve business and community partners.
- Plan for decontamination and protection of personnel. This plan should address the following:
  1. agency responsible for scene assessment and determining what (if any) decontamination measures are required;
  2. realistic assessment of the time required to deploy decontamination resources for ambulatory and non-ambulatory patients; and
  3. deployment of decontamination resources to event site, secondary triage sites, or receiving hospitals.

- Determine the extent of decontamination required before transport (e.g., none, gross, and/or technical).
- Ensure that a plan is in place to enable the rapid redistribution of casualties, if required, from a hospital overwhelmed with a surge.
- Plan to establish secondary triage points for ambulatory patients (ideally, within the first hour after the explosion).

This plan should address the following:

1. how sites can be activated and staffed with sufficient medical personnel, law enforcement personnel for security, and support staff to record arrivals,
2. how such patients will be reassessed,
3. how immediate needs for medical care will be met until transfer to definitive care occurs (e.g., allocation of medical supplies and personnel), and
4. how to establish criteria for determining death at the scene, particularly in a mass casualty situation, and for appropriately managing the deceased.

EVALUATION

- Plan and conduct exercises (tabletop, functional, and full scale).
- Generate an after-action report that assesses overall objectives.
- Refine plan.

For more information, visit **http://emergency.cdc.gov/masscasualties**.

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Managing Surge Needs for Injuries:
Emergency Department Response

PURPOSE

To activate additional emergency department (ED) resources needed within 4 hours of an explosion. These resources are intended to rapidly treat and disposition 300 injured patients for 12 to 24 hours.

BACKGROUND

The terrorist bombings in Madrid, Spain, were used as a model to help develop solutions for managing rapid surge problems during a mass casualty event.

On March 11, 2004, 10 explosions occurred almost simultaneously on commuter trains in Madrid, killing 177 people instantly and injuring more than 2,000. On that day, 966 patients were taken to 15 public community hospitals. More than 270 patients arrived at the closest facility between 8:00 a.m. and 10:30 a.m.

Federal resources should not be expected to arrive sooner than 72 hours from the time of the explosion. Resources can be delayed by the time taken to deploy them and by emergency personnel responding to multiple communities.

GOAL

To establish policies, procedures, didactic training, and drills to improve institutional preparedness for rapidly treating and managing 300 injured patients for 12 to 24 hours.

REQUIRED RESOURCES

- Staff: adequate medical, nursing, and support staff available to provide initial triage, evaluation, and stabilization for 300 persons. This ability includes:
  1. Visually identifying the patients (such as with digital photography),
  2. Tracking patients during their care, and
  3. Maintaining chain of evidence.

▶ ***This document is a resource guide. Local needs, preferences, and capabilities of the affected communities may vary.***

ASSUMPTIONS

- The emergency department will have established the following:
  1. Disaster medical record packets;
  2. Procedures for obtaining additional equipment, supplies, and beds;
  3. Plan for notifying and activating backup personnel;
  4. Procedures for triage, emergency identification of patients, discharge of patients, and quick documentation; and
  5. Temporary disaster log to document basic information.

- Patients will be regularly reassessed for change of status and priority.
- Patients may require decontamination.
- Initial evaluation and triage of self-referred patients should be rapidly facilitated.
- Emergency medical services unit's turnaround and return to service should not be impeded by patient reassessment and ED bed assignment process.
- All patients potentially requiring operative intervention should be prioritized in consultation with the appropriate member of the surgical staff.
- The ED and hospitals closest to the event may be overwhelmed with casualties, and the response may require rapid triage and redistribution of patients to additional hospitals and health care facilities.
- ED staff will be familiar with the hospital disaster plan, their individual roles and responsibilities, and the roles and responsibilities of all essential departments.

ACTION STEPS

1. Conduct drills.

Implement and drill a hospital emergency incident management system (such as the Hospital Incident Command System (HICS)). Clinical care providers should be included in the training and drills.

If hospital personnel (e.g., practitioners, administrators, nurses) have not trained or drilled in a hospital emergency incident management system, learned about the National Incident Management System (NIMS), or understood the function of a hospital incident command center, this information should be included in training sessions.

2. Educate clinical staff.

Instruct clinical staff, especially surgeons and emergency physicians, about the unique aspects of blast-related injuries and care following an attack with a radiation dispersal device (RDD).

3. Establish an institutional lockdown process.

Establish an institutional lockdown process and drill regularly; include radiation detection and decontamination of arriving patients.

4. Update the institutional call-down list and perform a functional call-down exercise.

5. Identify surge staff.

Identify potential institutional surge staffing from employees with clinical training but not currently tasked with clinical jobs.

6. Identify patient supplies.

Identify patient care supplies that would be needed in a surge situation, such as additional intravenous (IV) equipment, bandages/dressings, gowns, gloves, masks, etc.

7. Develop a regional unified command structure.

Develop a regional unified command structure that includes local emergency management and area hospitals. Local emergency managers should guide and lead this development.

8. Identify nonpatient care areas.

Identify nonpatient care areas in the institution that could be converted to patient care to expand surge bed capacity.

9. Conduct drills for early patient discharge.

Establish and drill a procedure for early patient discharge to increase bed capacity in the ED and in critical patient care areas. Drills and procedures should be coordinated with intensive care unit (ICU) staff to appropriately plan for potential early discharge, movement of patients to non-ICU beds, and transfer to alternative care sites.

EVALUATION

- When appropriate, evaluation drills have been incorporated into the action steps listed above. The institutional disaster preparedness plan should be updated based on each drill experience.

For more information, visit **http://emergency.cdc.gov/masscasualties**.

Surgical Department Response

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PURPOSE

To mobilize and assign operating rooms and related assets to provide life- and limb-saving surgical care to those who could most benefit of 300 patients injured from explosions (care extends to patients from the community with acute surgical illness) for up to 72 hours after a bombing.

BACKGROUND

The Madrid, Spain, terrorist bombings were used as a model to help develop solutions for managing rapid surge problems during a mass casualty event.

On March 11, 2004, 10 explosions occurred almost simultaneously on commuter trains in Madrid, killing 177 people instantly and injuring more than 2,000. On that day, 966 patients were taken to 15 public community hospitals. More than 270 patients arrived at the closest facility between 8:00 a.m. and 10:30 a.m.

Federal resources should not be expected to arrive sooner than 72 hours from the time of the explosion. Resources can be delayed by the time taken to deploy them and by emergency personnel responding to multiple communities.

GOAL

Within 2 hours of a blast event, establish a person with decision-making capability who is responsible for operating rooms and surgical support areas for up to 72 hours from the time of the event. This person will be trained, have an appropriate knowledge base for triaging patients to the proper place, and occupy a position in the hospital's incident management system.

REQUIRED RESOURCES

- Operating room equipment: sufficient stocks of operating room supplies to conduct emergent surgical procedures for up to 72 hours.
- Staff: Arrangements should include a contingency schedule to staff operating rooms concurrently or in succession for up to 72 hours. Staff should include surgeons, nurses, operating room technicians, anesthesiologists, administrative and clerical staff, and support personnel.
- Medications: sufficient quantities of required anesthetic agents and other medication for surgical procedures.

ASSUMPTIONS

- The event in the surgical department will extend beyond the emergency department (ED) event and may last for days.
- Operating room (OR) assets are a critical component of surge capacity after an explosion and must be mobilized quickly.
- The OR capacity of any institution or community (i.e., number of operating rooms) is fixed because of structural requirements.
- One or more surgeons, anesthesiologists, and critical care specialists will be in the hospital or be available immediately after an event occurs.
- Other surgeons, anesthesiologists, and critical care specialists can be available within 2 hours of an event to provide direct patient care in the operating rooms and related areas.
- The ORs, post-anesthesia care units (PACUs), and intensive care units (ICUs) will already be in use.
- Casualties of the blast and patients already in the hospital system, or in other treatment centers in the community, will require one or more of these three areas—OR, PACU, or ICU—within 72 hours.
- If these areas are not made available in a timely manner, patients will be detrimentally affected.
- Federal resources cannot be expected to arrive sooner than 72 hours from the time of an explosion.
- Surgical staff will be familiar with the hospital disaster plan, their individual roles and responsibilities, and the roles and responsibilities of all essential departments.

ACTION STEPS

1. Identify medical leadership.

Identify medical leadership within surgery and anesthesiology departments who will actively participate in disaster planning. These individuals should collaborate in designing, implementing, and refining an incident command system for OR capacity. In addition, OR disaster planning should be conducted in conjunction with representatives of critical care, emergency medicine, administration, and others involved with the institution's proposed incident command system. These discussions should be facilitated by the hospital disaster committee.

2. Establish a flexible or adaptable response.

Establish a flexible or adaptable response so that unused operating space could be readily converted for critical care use.

3. Select individuals for incident command role and define processes and responsibilities. Create job action sheets for each position.

- Specify the authority, process, and responsibilities of the OR incident command and a call schedule identifying individuals available to fill their roles 24 hours a day, beginning within 2 hours of the event, and extending for 72 hours.

- Although individuals from several disciplines and departments may assist the incident command, final decision-making authority should rest with one person. This person has the authority to cancel scheduled OR cases, rearrange OR schedules, identify patients that could be transferred, call in and deploy OR teams, and prioritize patients for beds in the OR, PACU, and ICU. This person should directly communicate with incident command through a counterpart who is knowledgeable about OR and ICU utilization.
- Candidates for this decision-making role should be able to assess medical needs of various patients requiring OR services. An individual serving in this role should not have primary patient care responsibility at the same time (i.e., be part of a surgical team).
- Communication systems linking surgery, nursing, anesthesiology, critical care, ED, and hospital administration should be specified if not already specified by the hospital incident command system.
- Methods for data collecting, testing, and monitoring and improving the system should be specified.

Ensure that individuals who assume leadership roles within the incident management system are trained and knowledgeable about working within the chosen system, operations of other hospital components, and community disaster response.

4. Train incident management leaders.

Ensure that individuals who assume leadership roles within the incident management system are trained and knowledgeable about working within the chosen system, operations of other hospital components, and community disaster response. Training requirements should be specified in writing.

5. Establish lines of communication.

Identify lines of communication and interactions, including training and exercises with other components of the community-wide disaster plan and regional trauma system.

6. Develop plans to move patients to different care sites if needed.

EVALUATION

- Participate in community-wide drills and evaluate performance of OR incident command.
- Determine when individuals should be on-site. Review triage decisions and quality, quantity, and appropriateness of information obtained from and given to others, including hospital incident command, emergency medicine, and other community assets.
- Refine and conduct further planning based on drill experience.

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Managing Surge Needs for Injuries:
Intensive Care Unit Response

PURPOSE

To mobilize and assign intensive care unit (ICU) beds and related assets to provide life- and limb-saving care to those who could benefit most out of 300 patients injured from explosions (care extends to patients from the community with acute illness) for up to 72 hours after a bombing.

BACKGROUND

The Madrid, Spain, terrorist bombings were used as a model to help develop solutions for managing rapid surge problems during a mass casualty event.

On March 11, 2004, 10 explosions occurred almost simultaneously on commuter trains in Madrid, killing 177 people instantly and injuring more than 2,000. On that day, 966 patients were taken to 15 public community hospitals. More than 270 patients arrived at the closest facility between 8:00 a.m. and 10:30 a.m.

Federal resources should not be expected to arrive sooner than 72 hours from the time of the explosion. Resources can be delayed by the time taken to deploy them and by emergency personnel responding to multiple communities.

GOAL

Within 2 hours of a blast event, mobilize the resources of the intensive care units and related support areas and sustain response for up to 72 hours from the time of the event.

REQUIRED RESOURCES

- Resources needed for communicating within the organization and with the community (e.g., satellite phone and other portable communication devices).
- Transportation resources for the patients who may have severe burns. After initial resuscitation, some of these patients may require transfer to a burn center.
- Additional ventilators may be needed. Most, if not all, ICUs and ventilators and other usual ICU resources will be in use at the time of the incident.

▶ ***This document is a resource guide. Local needs, preferences, and capabilities of affected communities may vary.***

ASSUMPTIONS

- Patient care in the ICU will extend beyond the emergency department surge and may last for days or weeks.
- ICU assets are a critical component of surge capacity after an explosion and must be mobilized quickly.
- The ICU capacity of any institution or community (i.e., number of beds) is fixed because of structural requirements.
- Some critical care physicians, nurses, respiratory care practitioners, and pharmacists will be in the hospital or be available within 2 hours after an event occurs.
- The majority of critical care patients will require mechanical ventilation.
- The institution will be capable of caring for burns and open fractures for a minimum of 24 hours.
- Occult injuries may become apparent in the ICU or outside the ICU and, therefore, need additional resources.
- Other critical care specialists can be available within 2 hours of an event to provide direct patient care in the operating rooms and related areas.
- If operating rooms and related areas are not made available in a timely manner, patients could suffer adverse consequences.
- Some patients could be moved to different care sites.
- Federal resources cannot be expected to arrive sooner than 72 hours from the time of an explosion.
- ICU staff will be familiar with the hospital disaster plan, their individual roles and responsibilities, and the roles and responsibilities of all essential departments.

ACTION STEPS

1. Involve leadership.

Critical care leadership should be involved in all components of hospital disaster planning.

2. Designate medical and nursing leadership.

The hospital should designate medical and nursing leadership to coordinate critical care resources and report through the incident management system.

3. Plan for patient overflow.

Hospitals will identify ICU overflow sites for patients who cannot be admitted to an existing ICU and ensure that adequate staff support and monitoring can be provided.

4. Plan for secondary triage.

ICU referral may differ in a mass casualty event. Expertise is required in secondary triage and in ongoing care for decisions regarding application of resources.

5. Develop a plan to ventilate patients.

Hospitals will have a plan to obtain additional ventilators and/or personnel if needed. The plan should include a protocol for managing patients when ventilators are not available.

6. Educate incident command leaders.

Ensure that individuals who will assume a role in the critical care component of the incident command role are knowledgeable about incident command, operations of other hospital components, and community disaster response.

7. Identify lines of communication.

Identify lines of communication and interactions with other components of the community-wide disaster plan and regional trauma system.

8. Establish admission protocols.

Ensure that protocols for admission to the ICU during a disaster are in place.

9. Ensure that supply of critical and necessary medications is available.

EVALUATION

- Participate in community-wide drills and evaluate performance of ICU incident management.
- Determine when individuals should be on-site. Review triage decisions and quality, quantity, and appropriateness of information obtained from and given to others, including hospital incident command, emergency medicine, and other community assets.
- Refine and conduct further planning based on drill experience.

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Managing Surge Needs for Injuries: Radiology Response

PURPOSE

Within 2 hours of an explosion, operationalize radiology support for the initial treatment of 300 injured patients and for ongoing care up to 72 hours.

BACKGROUND

The Madrid, Spain, terrorist bombings were used as a model to help develop solutions for managing rapid surge problems during a mass casualty event.

On March 11, 2004, 10 explosions occurred almost simultaneously on commuter trains in Madrid, killing 177 people instantly and injuring more than 2,000. On that day, 966 patients were taken to 15 public community hospitals. More than 270 patients arrived at the closest facility between 8:00 a.m. and 10:30 a.m.

Federal resources should not be expected to arrive sooner than 72 hours from the time of the explosion. Resources can be delayed by the time taken to deploy them and by emergency personnel responding to multiple communities.

GOAL

To establish policies, procedures, and drills to improve radiology department preparedness for treating 300 patients injured from an explosion for up to 72 hours.

REQUIRED RESOURCES

Enough radiology personnel (radiologists, technicians, and support staff), equipment, and supplies to care for 300 injured patients.

▶ ***This document is a resource guide. Local needs, preferences, and capabilities of the affected communities may vary.***

ASSUMPTIONS

- Radiology services will be a critical component of the hospital response to a bombing.
- Many patients requiring radiology over a relatively short time period may lead to bottlenecks.
- At least one x-ray technician will be on-site, and additional technicians will need to be mobilized.

- Radiologist interpretation of images may not be available immediately, and the radiologist may not be available on-site.
- Most hospitals will be able to provide plain radiographic imaging but will not be fully equipped to address all radiological needs that will arise in an event of this magnitude (ability to do special imaging or ultrasound may be limited).
- A majority of the patients involved in a bombing will require some form of radiological evaluation.
- Radiology staff will be familiar with the hospital disaster plan, their individual roles and responsibilities, and the roles and responsibilities of all essential departments.

ACTION STEPS

1. Develop a radiology management plan.

Develop a management plan and call list for the radiology department to use during a mass casualty event. Enhanced radiology patient throughput will be essential in the initial evaluation and treatment of blast-injured patients. Each radiology department must develop a plan to ensure rapid turnaround of patient studies and interpretations.

2. Conduct drills.

Drills should call for radiologists to provide immediate (wet) readings of plain films and special studies. These readings will assist in rapidly evaluating and treating patients. The plan should also optimize and streamline radiology study protocols for use during a mass casualty event.

3. Put support in place to conduct ultrasounds.

When disaster patients arrive, an ultrasound technician will be available in the emergency department to perform an immediate focused abdominal sonography for trauma (FAST) exam. If an ultrasound technician is unavailable, then emergency physicians and trauma surgeons should be trained to conduct this exam.

4. Conduct an imaging equipment survey.

Evaluate the status of the equipment for multiple trauma patients and ensure adequate numbers of portable equipment. Radiology equipment is expensive and usually requires planning in advance for acquisition and installation. However, by evaluating how available equipment could be put to maximum use during a mass casualty event, a facility can improve patient throughput.

5. Include radiology systems in incident command system plan.

All aspects of patient throughput in the radiology department should be addressed in the hospital incident command system plan.

Computerized tomography (CT) should be available, including radiologist interpretation, within 1 hour of the event.

6. Create radioactive contamination screening protocol.

The hospital should have a protocol and capability for screening and decontamination of radioactive contamination. This protocol needs to be coordinated with the overall hospital response.

7. Ensure timely availability of equipment and readings.

Computerized tomography (CT) should be available, including radiologist interpretation, within 1 hour of the event. The hospital should plan to have ultrasound available for bedside evaluation.

8. Plan for specialized studies and interventions.

Additional specialized studies and interventions may be required (arteriogram, interventional procedures, magnetic resonance imaging (MRI)/magnetic resonance angiography (MRA), etc.) and may not be available on-site. Plans must be in place to obtain these studies at another institution or to transfer patients if necessary.

9. Create plan to read films.

Create a plan to ensure that each film is formally read and discrepancies with any initial readings are reported in a timely fashion.

EVALUATION

- Where appropriate, the action steps listed above have been incorporated into evaluation drills. The institutional disaster preparedness plan should be updated based on each drill experience.

For more information, visit **http://emergency.cdc.gov/masscasualties**.

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Managing Surge Needs for Injuries:
Blood Bank Response

PURPOSE

Within 4 hours of an event, respond in an organized manner to provide blood products for up to 300 injured patients and sustain support for up to 72 hours.

BACKGROUND

The Madrid, Spain, terrorist bombings were used as a model to help develop solutions for managing rapid surge problems during a mass casualty event.

On March 11, 2004, 10 explosions occurred almost simultaneously on commuter trains in Madrid, killing 177 people instantly and injuring more than 2,000. On that day, 966 patients were taken to 15 public community hospitals. More than 270 patients arrived at the closest facility between 8:00 a.m. and 10:30 a.m.

Federal resources should not be expected to arrive sooner than 72 hours from the time of the explosion. Resources can be delayed by the time taken to deploy them and by emergency personnel responding to multiple communities.

GOAL

During the first 4 hours of a disaster, ensure that appropriate blood products can be located, processed, and administered in a timely manner to admitted patients requiring treatment. Identify additional needs so that blood products can be collected, processed, and administered for up to 72 hours.

REQUIRED RESOURCES

- American Association of Blood Banks (AABB) documents (including the *Disaster Operations Handbook: Coordinating the Nation's Blood Supply During Disasters and Biological Events*[32] and the *Disaster Operations Handbook—Hospital Supplement: Coordinating the Nation's Blood Supply During Disasters and Biological Events*[33]).

- Disaster response plans for hospital and blood collection centers.
- Laboratory personnel to collect, process, and distribute products.
- Transportation resources, diesel and unleaded fuel, and storage equipment (e.g., dry ice).
- Transfusion supplies.
- Massive transfusion protocol to include patient identification methods. Appropriate use of O negative blood only for women of childbearing age that satisfies blood bank requirements to move to type-specific blood.
- "Medical Needs Assessment for Blood" form.
- Quick reference card to be developed/updated for supplementing available resources.
- Transportation plan to include alternative transportation modes.
- Critical services restoration plan for blood collector to ensure it is on local priority restoration lists.
- Key contacts list maintained for all suppliers of blood products, including whole blood providers, to include multiple methods of communications.
- Emergency communications plan for blood provider and transfusion services that includes amateur radio and/or satellite phone.
- Disaster response plans for hospital transfusion services.
- Assessment of blood needs from all patient care disciplines provided to the incident management commander, transfusion service, and blood provider.

▶ ***This document is a resource guide. Local needs, preferences, and capabilities of the affected communities may vary.***

ASSUMPTIONS

- Blood bank staff will be familiar with the hospital disaster plan, their individual roles and responsibilities, and the roles and responsibilities of all essential departments.
- Overall blood product inventory management within the United States should include a regional approach to communication among blood collection facilities and hospital transfusion services to ensure that federal regulations regarding blood product collection, testing, transport, and administration are followed during a disaster.
- The most difficult problems involve disruption or interference of the blood supply system. The following list describes these difficulties:
  1. Historically, blood supply needs during disaster response have been met with the quantity of blood products available at that time.
  2. Facilities currently maintain about a 3-day supply of blood products, which may need to be expanded to a 7-day supply.
  3. Typically, fewer casualties require blood products than the total number of victims.
  4. Local communities have limited sources of blood products.
  5. If faced with a surge increase in demand, communities will need to have blood products transported from blood centers outside the local area.

- After a disaster, the public usually responds by volunteering to donate larger quantities of blood products than are needed:
  1. An influx of blood donors could strain the ability of the blood supply system to collect and process those products.
  2. When resources (personnel, equipment, and supplies) are unnecessarily applied to collecting and processing unneeded products, these resources cannot process and distribute available and urgently needed products.
- The media must continuously provide the community with reliable information about need and supply of blood products.
- Limited personnel have the training, education, and skills to process and administer blood products within treating facilities. The following should then be considered:
  1. Additional qualified laboratory personnel may be needed to process requests for blood products.
  2. Additional nursing personnel may be needed to administer blood products.
- Methods of transporting or transferring blood products from supplier to destination may be limited during a disaster.
- Commercial transport services (air and ground) may be limited because of the disaster.
- Federal, state, and local governments consider blood needs to be a critical element of the public health infrastructure in emergencies.
- The AABB Interorganizational Task Force on Domestic Disasters and Acts of Terrorism, formed in January 2002, has developed a process to educate the community about donations and to facilitate collection, processing, and movement of blood products during a disaster:
  1. This multi-organizational task force includes federal and national organizations.
  2. Published references include a disaster operations handbook[32] and a hospital supplement[33] that specifically address these issues. These references include a flowchart outlining the process for involving AABB and appropriate national and federal organizations in response efforts to provide blood products during a disaster.

ACTION STEPS

The following is an overview of the hospital transfusion service disaster response:

1. Hospital emergency incident management commander

- Delegates coordination of medical needs assessment for blood. The quantity of disaster-related hospital admissions is communicated to the hospital transfusion service.
- Ensures that the hospital security staff has approved blood provider access to the hospital for blood product deliveries.
- Determines if an alternate delivery point is required for blood deliveries as a result of the disaster. Once determined, this information is provided to the transfusion service and blood supplier.
- Determines if routine phone service will be interrupted during this disaster. If alternate communication methods are necessary, the incident management commander should inform the transfusion service of the alternative communications pathways that are available.

2. Hospital blood bank

- Hospital blood bank completes "Hospital Disaster Response Medical Needs Assessment for Blood."
- Incident management commander provides information necessary to complete expected hospital admissions, security approval, alternate delivery points, and phone service status.
- To determine current available inventory of type O blood (both positive and negative) for nondisaster-related patients, planners may follow this list of steps:
  1. Determine one day's worth of red blood cell inventory based upon historical usage.
  2. Determine total O red blood cell inventory (both positive and negative).
  3. Determine how many days of inventory are available by dividing the total O red blood cell inventory by one day's worth of inventory.
- Completed "Hospital Disaster Response Medical Needs Assessment for Blood" is provided to the primary blood supplier for the transfusion service. Only send the blood assessment to the primary blood supplier to prevent duplication of inventory data.
- Blood products reserved for nonemergent needs can be released for emergency utilization.
- Critical supplies are identified.
- Critical staff are identified.
- Core critical staff should have capabilities in order to be augmented.
- Critical staff should be provided appropriate clearance for restricted access.

3. Hospital disaster plan

- The hospital/transfusion service disaster plan should include patient identification processes for mass casualties.
- The hospital/transfusion service disaster plan should include triggers for implementing massive transfusion protocols.
- The hospital's disaster response plan should address the responsibility of determining if the hospital should cease routine transfusions until the disaster patient surge has passed.
- The emergency communications plan should include routine, emergency, and several backup lines of communication with the area blood provider.

If the hospital transfusion service is also a blood collector, the requirements of the blood provider included below should be addressed in the transfusion service's disaster response plan.

4. Blood provider response and responsibilities

- Evaluate scope of disaster based upon information provided from emergency medical services for affected area(s) and from emergency management agencies (EMAs) at the local, state, and federal agencies that are involved with disaster management.
- If the immediate hospital area is considered a restricted area, determine if hospital security has approved blood deliveries.
- Determine the location of the central staging area or if an alternate delivery point is needed.
- Determine if the hospital's phone service is affected by the disaster.

For immediate disaster-related casualty's blood product transfusion support, determine the type O red blood cells estimated for all disaster-affected hospitals.

- From the emergency communications plan, identify the alternative communication options.
- Determine liquid and frozen blood product storage capacity at area transfusion services.
- Summarize blood assessment needs from the hospital transfusion services within the affected area.
- For immediate disaster-related casualty's blood product transfusion support, determine the type O red blood cells estimated for all disaster-affected hospitals.
- Determine if local blood product inventories will support the transfusion needs of the casualties for
  1. the first 24 hours,
  2. days 1–10, and
  3. days 10–30.
- If the blood provider has the advantage of forewarning (e.g., hurricane warnings), blood products will be pushed into the patient care areas based upon their storage capacity. If local blood product inventories are estimated to be insufficient, the closest blood providers are contacted for blood product transport.
- If these transfers are insufficient to support the transfusion needs in the affected areas, the blood collector(s) establishes which outside blood collector(s) to contact for coordination of blood product transfers into the disaster-affected area.
- AABB's Interorganizational Task Force on Domestic Disasters and Acts of Terrorism is contacted if the disaster has national impact potential. The task force works to provide a consistent message to the blood community, blood donors, and the public.
- The blood provider can also contact the task force to coordinate the movement of blood if the normal means of product exchange is insufficient.
- Determine if area inventories are contaminated or potentially contaminated by the effects of the disaster.
- Determine if radiological agents are involved with the disaster.
- Alert staff related to collecting, processing, or storing bone marrow and stem cells of the potential for patient support.
- Determine if blood product inventories need to be transferred to hospitals that will be treating the disaster casualties.
- Determine if the transfusion service's blood product storage is jeopardized.
- Arrange for blood product transport containers if needed within the affected hospitals.
- Determine the effects of the disaster on the donor base.

5. Media relations

- To prevent an unnecessary response of persons wishing to donate blood, all blood-related media releases should be handled by the local blood provider. Consistent, accurate messages to the public regarding the need for blood donations is crucial for an adequate supply of blood during and in the days following a disaster.
- The AABB Interorganizational Task Force on Domestic Disasters and Acts of Terrorism has developed a process to educate the community about donations and how to collect, process, and move blood products during a disaster. This multi-organizational task force includes federal and national organizations.

EVALUATION

- Request that hospitals and collection organizations participate in a local or regional exercise requiring administration of blood products within 4 hours of an event and up to 72 hours.

For more information, visit **http://emergency.cdc.gov/masscasualties**.

Managing Surge Needs for Injuries: Hospitalist Response*

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PURPOSE

Within 4 hours, leverage the knowledge and skills of hospitalists to treat 300 patients injured from explosions and to sustain care for 72 hours.

BACKGROUND

The Madrid, Spain, terrorist bombings were used as a model to help develop solutions for managing rapid surge problems during a mass casualty event.

On March 11, 2004, 10 explosions occurred almost simultaneously on commuter trains in Madrid, killing 177 people instantly and injuring more than 2,000. On that day, 966 patients were taken to 15 public community hospitals. More than 270 patients arrived at the closest facility between 8:00 a.m. and 10:30 a.m.

Federal resources should not be expected to arrive sooner than 72 hours from the time of the explosion. Resources can be delayed by the time taken to deploy them and by emergency personnel responding to multiple communities.

GOAL

Within 4 hours, surge staff, resources, and space will be available to treat at least 300 patients injured in an explosion that require acute inpatient and intensive care for 72 hours.

REQUIRED RESOURCES

- Supplies, equipment and staffing (physicians, nurses, technicians, and support staff) to support surge response efforts.
- Mechanism to implement disaster care protocols. Mechanism should include methods to rapidly step down suitable patients (for example, from intensive care unit to floor and from floor to elsewhere).
- Mechanism within individual hospitals for placing hospitalists into real-time roles, enabling them to allocate and ration resources, serve as advisors, and function as outreach arms of incident command.

*Although the term *hospitalist* is used in this template, this category may include other attending physicians of multiple specialties as well as resident physicians and physician extenders/mid-level providers who are supervised by an attending physician.

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ASSUMPTIONS

- Effective clinical response to a bombing event with a surge of patients will require coordination and cooperation among multiple medical specialties.
- Hospitalists will be an integral component of identifying available hospital beds, discharging patients, caring for patients, and providing additional support during the response.
- Hospitalist staff will be familiar with the hospital disaster plan, their individual roles and responsibilities, and the roles and responsibilities of all essential departments.

ACTION STEPS

1. Educate and train hospitalists regarding responsibilities for rapid discharge of patients.

2. Educate and train hospitalists on other potential responsibilities during a surge event.

3. Develop a system for using just-in-time training protocols for hospitalists during a surge event.

4. Develop protocol to implement tiered staffing for hospitalists.

5. Establish a responsibility with leadership positions. Incorporate ongoing responsibility into operations chief and medical branch director job descriptions to ensure uniform use of resources given the varied skills and knowledge of the hospitalists.

6. Consider using a rapid response team model to access additional support and information.

EVALUATION

- Conduct an exercise that tests the action steps.
- Critique the exercise against the response plan.
- Revise policies and procedures based on the outcomes of the exercises.

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Managing Surge Needs for Injuries:
Administration Response

PURPOSE

Within 4 hours, mobilize additional administrative-related resources needed to treat 300 patients injured from an explosion and sustain care for 72 hours.

BACKGROUND

The Madrid, Spain, terrorist bombings were used as a model to help develop solutions for managing rapid surge problems during a mass casualty event.

On March 11, 2004, 10 explosions occurred almost simultaneously on commuter trains in Madrid, killing 177 people instantly and injuring more than 2,000. On that day, 966 patients were taken to 15 public community hospitals. More than 270 patients arrived at the closest facility between 8:00 a.m. and 10:30 a.m.

Federal resources should not be expected to arrive sooner than 72 hours from the time of the explosion. Resources can be delayed by the time taken to deploy them and by emergency personnel responding to multiple communities.

GOAL

To organize and support response to influx of 300 patients injured from an explosion for a 72-hour period.

REQUIRED RESOURCES

- Staff: To support the needs of patients, staff, and the general public, administrators will need to manage communications, acquire political support, interact with the media, address public inquiries, and manage internal systems and departments.
- Disaster response plans for the hospital should outline a disaster call schedule for administrators to ensure that appropriate numbers of administrative staff can be accessed.
- Transportation arrangements should be addressed as part of the disaster response plan to ensure that administrative staff can arrive at the hospital.

- Emergency communications plan for administrators should include amateur radio and/or satellite phone.

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ASSUMPTIONS

- Hospitals have a Hospital Incident Command System (HICS)-based emergency operations plan with appropriate staff training and resources.
- A medical response to a mass casualty event is comprehensive, community based, and coordinated.
- Legal and regulatory issues will be included in the hospital emergency preparedness plan: Emergency Medical Treatment and Active Labor Act (EMTALA), Health Insurance Portability and Accountability Act (HIPAA), Federal Volunteer Protection Act, Good Samaritan Laws, labor laws, Occupational Safety and Health Administration (OSHA) regulations, and facility codes.
- Activation of the community emergency operations center (EOC and incident command system), including the hospital's command center, is critical to success.
- Communication among hospitals, health systems, emergency medical services (EMS), EOC, and public health cannot be lost or interrupted.
- Hospitals, long-term care facilities, offices, and clinics have memoranda of understanding (MOU) to share resources.
- The community's EOC includes health care representatives.
- Patients who do not need acute care services should be treated at alternate care facilities.
- The hospital's preparedness plan will include mechanisms for modifying admission, discharge, and procedure schedules.
- Admissions that are not emergent will be deferred (develop criteria and put into policy).
- Operating room manager will be notified to defer or cancel inpatient and outpatient nonemergency surgeries.
- Intensive care specialist, hospitalist, or chief of staff's designee will be incorporated into plan for discharging patients during emergency operations. (See template on Hospitalist Response.) Set up MOUs with receiving hospitals.
- Administrative staff will be familiar with the hospital disaster plan, their individual roles and responsibilities, and the roles and responsibilities of all essential departments.

Additional staffing issues that should be considered:

- Have staff available to address the mental health of victims, families, and staff (i.e., psychiatrists, psychologists, licensed mental health practitioners, and volunteers).
- Employ workers trained by the American Red Cross, especially those who can provide mental health services.

- Provide child care services so that staff are free to attend to patients.
- Compile a list of qualified translators for the disaster.

ACTION STEPS

1. When an incident management system such as HICS is used, certain issues need careful consideration:

- Identification of all appropriate key stakeholders,
- Communication and coordination with local government,
- Mental health needs of the staff,
- Special needs population, and
- Security.

2. Control of the environment

- Consider the following about the external environment:
  1. The external environment will change rapidly during a large-scale mass casualty event. The hospital must be secured, and campus traffic must be controlled. Controlling the external environment includes clearing beds to accommodate incoming casualties, redirecting nonemergency patients to other resources, and managing the comings and goings of staff. The facility should have pre-identified locations for all emergency functions with appropriate signage.
  2. Managing media relations can be challenging when trying to provide safe and effective care. The institution's security and public affairs offices must work together and be in place before the media arrive.
- Consider the following regarding the internal environment:
  1. Develop a plan that identifies all physical beds available for care, including those in storage and those that can be rented on short notice.
  2. Ensure placement of cots in rooms or hallways as required.
  3. Make sure each department has a procedure for mass casualty care. The procedures need to be reviewed and accessible in the hospital command center.
  4. Departments need to determine procedures for what will be done immediately (0 to 120 minutes), intermediately (2 to 4 hours), and long term (4 to 24 hours).
  5. Every department should have a current call list that identifies staff by their proximity to the hospital.
  6. Make staff aware of where to park, where to report, how to respond, etc.
  7. Ensure that plans apply staff to tasks with which they are most familiar and perform daily; do not change routine procedures.
  8. Policies should be approved by a centralized committee that oversees the emergency operations and plans.

3. Activation of an incident management system

HICS, a widely used incident management system for health care facilities, is known for providing a chain of command with the ability to effectively manage an incident, provide accountability of position functions, allow for a flexible response to specific emergencies, improve documentation of facility actions, provide a common language to facilitate outside assistance, and develop prioritized response checklists for senior leadership. Identifying the appropriate people to make decisions is pivotal in a fast-paced disaster like the bombings in Madrid. Little time is available for meetings and discussion about the appropriate use of support functions and personnel. Staff should be trained and drilled regularly to ingrain the difference between incident structure and normal operations.

4. Logistics and supplies

Coordinating with key suppliers and maintaining current inventories throughout the health system will make ramping up the level of effort easier. When resources are limited, providers must be prepared to respond to care needs with the resources at hand.

Logistics include but are not limited to patient transportation. For example, housing of evacuees and the walking wounded and their families is a function of the local emergency management program. Knowing the locations of designated shelters throughout the vicinity and transportation resources for low-acuity patients and their family members will hasten discharge planning and patient flow in acute care facilities.

5. Alternate care sites

A hospital's ability to mobilize emergency care units and extend care to the community's walking wounded enhances effectiveness. Triage systems are used to prioritize patients so that low-priority patients can be directed from the main hospital, allowing ambulances and hospital staff to focus on high-priority trauma patients in need of medical assistance. Alternate sites, like the ones used during Hurricanes Katrina and Rita, allow large health systems to facilitate triage and direct patients to appropriate sources of care.

6. Credentialing and privileges

The Joint Commission [TJC] emergency credentialing system must be tested within an organization before it is really needed. State Emergency Systems for Advance Registration of Volunteer Health Professionals (ESAR–VHP) reflect TJC requirements and provide a standardized set of verified credentials for volunteers who may be called to assist hospitals during emergency situations.

Coordinating with key suppliers and maintaining current inventories throughout the health system will make ramping up the level of effort easier.

7. Patient tracking

Successful patient tracking begins at the point a patient enters the health care system. When more time is spent identifying and tracking patients, the prospect of reimbursement for related costs is better. The ability to track patients, identify their supply consumption, and monitor bed use enables senior management to proactively meet the needs of health care providers on the front line. Patient tracking systems must be flexible enough to track patients through the health care system.

8. Identification of gaps

- Ensure coordination between on-scene management and available community resources so that specific facilities are not overloaded.
- Communication among facilities at clinical and administrative levels is essential.

9. Identification of additional sources of community support

Additional sources of support can include local shelters, locally developed stockpiles, community pharmacies, drug wholesalers/warehouses, public health authorities, etc. Access to these resources will be important if the event displaces a large number of residents due to contamination, property damage, utility failure, etc.

10. Establishment of communication and relationships

- Develop communications with local emergency management.
- Establish communications with local, regional, and state hospitals.
- Establish regular schedules to drill every aspect of a response to ensure that all staff understand their roles.
- Evaluate the drills, and modify plans based on after-action reports.
- Drill the new plan.

14. An ethics panel should be convened as necessary to develop disaster policies, especially regarding alterations to standards of care in disasters.

EVALUATION

- Plan, conduct, and evaluate facility-wide drills. The evaluation should identify stressors on clinical and administrative activities.
- Plan, conduct, and evaluate community-wide drills. The evaluation should identify stressors on clinical and administrative activities.

For more information, visit **http://emergency.cdc.gov/masscasualties**.

Drugs and Pharmaceutical Supplies

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PURPOSE

Within 4 hours of an explosion, acquire the additional drugs and pharmaceutical supplies needed to treat 300 injured patients for up to 72 hours.

BACKGROUND

The Madrid, Spain, terrorist bombings were used as a model to help develop solutions for managing rapid surge problems during a mass casualty event.

On March 11, 2004, 10 explosions occurred almost simultaneously on commuter trains in Madrid, killing 177 people instantly and injuring more than 2,000. On that day, 966 patients were taken to 15 public community hospitals. More than 270 patients arrived at the closest facility between 8:00 a.m. and 10:30 a.m.

Federal resources should not be expected to arrive sooner than 72 hours from the time of the explosion. Resources can be delayed by the time taken to deploy them and by emergency personnel responding to multiple communities.

GOAL

Within 4 hours of an explosion, mobilize appropriate and adequate drugs and pharmaceutical supplies to treat 300 injured patients for up to 72 hours.

REQUIRED RESOURCES

- Readily available pediatric dosing charts, including color-coded tapes.
- Quick reference card to be developed/updated for supplementing available resources.
- The list below includes therapeutic categories, route of administration, and recommended drugs or pharmaceutical supplies. For simplicity, purchase and stockpile a single or limited number of drugs from each therapeutic category. Limiting the types of medications available should better enable prescription and dosing by care providers with little or no prior experience with the drug.
  1. Analgesics:
     by mouth (PO): hydrocodone/acetaminophen (one strength—5/500);
     intravenous (IV): morphine;

2. Anxiolytics:
   PO and IV: lorazepam;
3. Antipsychotics:
   PO and IV: haloperidol;
4. Antibiotics, broad spectrum with low allergy risk:
   PO and IV: ciprofloxacin;
5. Intravenous fluids:
   normal saline and dextrose 5% water (D5W); alternative methods for intravenous access such as interosseous;
6. Drugs for intubation:
   IV: etomidate, succinylcholine, and vecuronium;
7. Burn care agents:
   topical: silver sulfadiazine, bacitracin;
8. Ears, nose, and throat (ENT) meds for tympanic membrane perforation:
   neomycin, polymyxin B, and hydrocortisone otic suspension,
9. Ocular meds:
   proparacaine ophthalmic ointment, erythromycin ophthalmic ointment;
10. Tetanus toxoid vaccine; and
11. Other medications:
    penicillin, cephalosporin, vancomycin, metronidazole, clindamycin, anti-emetics (e.g., ondansetron hydrochloride [HCl]), albuterol.

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ASSUMPTIONS

- A demand for certain pharmaceuticals may follow a bombing event with multiple casualties.
- Pharmaceutical staff will be familiar with the hospital disaster plan, their individual roles and responsibilities, and the roles and responsibilities of all essential departments.

ACTION STEPS

1. Establish community medical leaders.

Identify community medical leadership and a committee to address near-term solutions. Discussions and subsequent decisions should include emergency medical services (EMS), emergency medicine, trauma surgery, hospital pharmacy (PharmD), blood bank, hospital leadership, hospital nursing, emergency management, public health, and law enforcement (regarding transport of pharmaceuticals).

2. Create an inventory of drugs.

Create an inventory of drugs and quantities available at points of care (prehospital and hospital). Assuming at least 4 hospitals and 10 ambulances will be involved in the response, the committee should delegate a point person to contact hospital pharmacists and EMS leadership and inquire about inventory.

3. Identify gaps.

Identify gaps between drugs in stock and the goal (within 4 hours of an event, acquire appropriate and adequate drugs to treat 300 patients for up to 72 hours).

4. Locate drug sources.

Identify potential sources of drugs in the community other than current prehospital and hospital supplies (e.g., locally developed stockpiles, community pharmacies, drug wholesalers/warehouses, private physician offices). Identification of additional sources should consider daily and routine needs of the community.

5. Develop relationships outside the community.

Develop relationships with leadership outside of the immediate community. Discussion with this leadership could include requests for a snapshot inventory of drugs and establishment of mutual aid agreements to rapidly acquire drugs.

6. Assess drugs available in the community.

Calculate total drug supplies available in the community by adding prehospital + hospital + community pharmacies + drug wholesalers/warehouses + physicians' offices (through medical society).

7. If the drug supply is deemed insufficient to care for 300 patients for up to 72 hours, develop a plan for intercommunity mutual aid or rationing.

8. Create plan for rapidly obtaining drugs.

Develop a plan to rapidly acquire drugs from additional sources and deliver products to points of care. This plan should include communications between point(s) of care and additional sources, mutual aid agreements with additional community sources, transport of drugs, and documentation for reimbursement.

9. Develop a detailed pharmaceutical list and recommended inventory based on hospital surge capability.

EVALUATION

- Plan, conduct, and evaluate a community-wide drill. The evaluation should include measurements of quantity and names of drugs and pharmaceutical supplies acquired, distributed, and administered; time when drill started; time drugs were acquired from distribution points; duration of transport; time of distribution to points of care; and time of administration to patients.
- Refine plan based on drill experience.

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Managing Surge Needs for Injuries: Nursing Care

PURPOSE

To accommodate the additional nursing resources required in a community following a terrorist bomb explosion and to treat 300 injured patients for up to 72 hours.

BACKGROUND

The Madrid, Spain, terrorist bombings were used as a model to help develop solutions for managing rapid surge problems during a mass casualty event.

On March 11, 2004, 10 explosions occurred almost simultaneously on commuter trains in Madrid, killing 177 people instantly and injuring more than 2,000. On that day, 966 patients were taken to 15 public community hospitals. More than 270 patients arrived at the closest facility between 8:00 a.m. and 10:30 a.m.

Federal resources should not be expected to arrive sooner than 72 hours from the time of the explosion. Resources can be delayed by the time taken to deploy them and by emergency personnel responding to multiple communities.

GOAL

Mobilize the appropriate number of facilities and beds, nursing staff, and resources required to treat 300 injured patients for up to 72 hours.

REQUIRED RESOURCES

Staff: A disaster plan should be devised, and staff should be trained and drilled to ensure that appropriate nursing staff levels will be available during an event. The plan should include a call-back schedule (ensuring that staff with appropriate experience in emergency medicine, surgery, and intensive care are available) and a mechanism for notifying staff and activating the plan, credentialing volunteers, and ensuring the safety and welfare of staff responding.

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ASSUMPTIONS

- Nursing personnel are essential to ensure an effective response to a bombing, including patient care, patient tracking and information management, and logistical support.
- Most nurses are not familiar with treating the injuries resulting from bomb blasts.
- Nurses will be expected to take care of patient populations, including pediatric patients, whom they are not familiar with treating.
- Nursing staff will be familiar with the hospital disaster plan, their individual roles and responsibilities, and the roles and responsibilities of all essential departments.

ACTION STEPS

1. Develop a plan for rapid expansion of nursing staff.

2. Have protocols in place for tiered staffing.

3. Implement just-in-time nursing training materials about bomb blast injuries.

4. Implement just-in-time training materials about pediatric trauma and bombing injuries.

5. Develop mechanisms for rapid deployment of nurses with pediatrics expertise.

6. Train nurses to accommodate and treat a rapid influx of patients.

7. Implement rapid patient discharge for patients who can go home or be quickly transferred to long-term care.

8. Maintain notification list of staff. Every department should have a current list that identifies staff by their proximity to the hospital.

9. Maintain a centralized database with staff competency skills, such as Advanced Cardiac Life Support® (ACLS), Trauma Nurse Core Course (TNCC), Emergency Nurse Pediatric Course (ENPC), and Pediatric Advanced Life Support (PALS). Identify who is competent to care for critically ill patients.

10. Consider utilizing a rapid response team model to access additional nursing support.

EVALUATION

- Hospitals/health systems should plan and execute a drill with emergency medical services (EMS) at least once a year. The drill should include objectives to accommodate 300 patients with beds, staffing, and resources.
- Critique the completed drill, write a summary report, and share findings with participants. Hospital administrators should incorporate findings of the summary report in disaster plan revisions. Any deficiencies should be tested in subsequent drills.
- Planning and conducting a drill will require considerable financial commitment. Exercises must be done in conjunction with state or county/city emergency management agency staff having the resources to conduct drills.

For more information, visit **http://emergency.cdc.gov/masscasualties**.

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