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# The Medical Management Of Bomb-Blast Scenes In The Emergency Department

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## Abstract

Bombings and other blast-related events place severe demands on pre-hospital and in-hospital systems. The resulting surge of victims can overwhelm the resources of any facility not prepared for such an event. The recent terrorist attacks underscore the urgency of our need for preparedness. The challenges become even more daunting when there is possible hazmat exposure as well; this means that adequate and rapid disposition of victims is even more critical in order to avoid contamination of hospitals systems or whole communities.

## INTRODUCTION

Disasters and incidents with hundreds, thousands, or tens of thousands of casualties are not generally addressed in hospital disaster plans. Nevertheless, they may occur, and recent terrorist actions around the globe suggest that it would be prudent for hospitals to improve their preparedness for a mass casualty incident. Mass casualties following disasters are characterized by such numbers, severity, and diversity of injuries that can overwhelm the ability of local medical resources to deliver comprehensive and definitive medical care to all victims. Injuries can result from accidental explosions in factories or fuel depots, or from intentional bombings such as those related to terrorism. Large blasts often produce such massive numbers of victims that medical systems can be totally overloaded and incapacitated unless they are prepared to handle the medical consequences of such events.

Bombs are attractive to terrorists because, compared to other weapons of mass destruction, they are relatively easy to design, assemble, and deliver, and because they are sudden and violent in nature. Large explosions attract media coverage and produce large numbers of casualties, both of which further the terrorist goal of disrupting society.

The introduction of victims contaminated with hazardous materials into care systems unprepared for such conditions inevitably leads to contamination of pre-hospital and in-hospital care providers, other patients, visitors, and families. The potential morbidity and mortality that follows such

contamination is at least theoretically avoidable by having in place special preparations, protocols, and paradigms to deal with possible blast events producing mass casualties, exposure to hazardous materials, or both.

## EMERGENCY DEPARTMENT DISASTER PLAN

The medical and surgical treatment of the traumatic injuries suffered by victims of blasts is well described elsewhere. When victims are relatively few in number, management follows established pre-hospital and in-hospital plans for multi-casualty events.

Explosions from intentional bombings and other blasts are among the few instantaneous traumatic events that can produce massive numbers of casualties requiring immediate medical attention. The possible presence of hazardous materials in terrorist-related blast events and certain industrial accidents make the problem of multiple severe injuries even more dangerous. Biohazards may not be detected or recognized at first, so all blast-related events suspected or known to be intentional should be handled as though they involved biohazardous agents.

Decontamination of victims can be accomplished at the triage site, thus reducing the in-hospital spread of biohazards. Triage, decontamination, and management capabilities at an out-of-hospital site allow for appropriate triage and timely delivery of decontaminated patients to in-hospital systems in a sequence based on severity of injuries. Critically injured ("red-tag") patients can be sent first,

followed by patients with intermediate needs (“yellow-tag”), and then by those with minor injuries (“green-tag”).

Depending on the resources of the community, it is possible to send patients with green-tag injuries to pre-designated alternative destinations such as area hospitals or clinics that can manage decontaminated green-tag patients but not patients who are critically injured.<sup>(1)</sup>

After initial on-scene interventions, some green-tag victims might require no further immediate medical attention. Hospitals must determine the maximum number of care providers, trained and outfitted for hazmat work, which could rapidly be available during such an event, and then develop plans for managing the large numbers of patients expected. As already noted, this is best done by preplanning with local incident response systems for initial out-of-hospital management of victims and determining what other area resources are available to handle victims of such events.

Education and training are especially important in:

- Disaster planning and rehearsal.
- Communications and security
- Integration of local, regional, and national resources into a disaster system.
- Critical incident stress management.
- Published research and experience in disaster management.
- Media relations.
- Protection of health care delivery personnel and facilities.
- Detection and decontamination of biological, chemical, and radiation exposure.
- Triage principles and implementation.
- Logistics of medical evaluation, stabilization, disposition, and reporting.

In the first 12 hours periods, half of the all victims want to take Emergency Department (ED) treatment. Emergency Department utilization rates affect the demand for ED capacity during mass-casualty incidents (MCIs) and disasters. Especially green tag patients come to ED for taking treatment. Only 10-15% of patients come to ED by ambulance services.<sup>(2)</sup> But green tag patients consumption

all medical materials, so red and yellow patients who are come by ambulances might not receive efficiently ED treatment. Emergency Department utilization rates in mass-casualty, terrorist bombings are likely to be influenced by the rate of immediately surviving injured, the number of immediately surviving injured, and the availability of EDs. In general, ED utilization rates in mass-casualty; terrorist bombings are complementary to immediate mortality rates. Bombings with the highest ED utilization rates usually have the lowest rates of immediate mortality, because bombings that kill fewer victims on-scene generate more immediately surviving injured (and vice versa). The relationship between ED utilization rates and the number of injured survivors may be more complex. Meanwhile all patients should be carry through the bomb detect apparatus in the triage field. Because of some terrorist patients could be having bomb on their bodies.

The maximum numbers of injured survivors seeking emergency care at the EDs helps define the upper limits of the demand for ED capacity during MCIs and disasters. Several factors are likely to influence the maximum number of injured survivors utilizing a single ED in a mass casualty, terrorist bombing, including the number of immediately surviving injured, as well as hospital proximity to the bombing site, primary distribution of casualties by prehospital EMS to hospitals, and the number of available EDs.

Hospital admission rates influence the demand for hospital capacity in MCIs and disasters. A number of factors are likely to influence hospital admission rates due to terrorist bombings including the pattern of injury severity, the practice of over-triage, and the demand for specific hospital services, such as operative therapy or observation. <sup>(3,4,5,6,7)</sup>

Hospital admission rates were greatest from the confined space and terrorist-suicide subgroups, presumably because the overall injury severity tended to be greater from these events. Greater hospitalization rates also may reflect the over-triage of ED patients to beds inside the hospital, which, in turn, may be influenced by institutional policy or the inexperience of responding physicians. <sup>(8)</sup>

The time interval from the onset of an event to the arrival of the first injured survivor at the ED helps to define the immediacy with which such events impact the EDs. Factors likely to affect this time interval include the ability of injured victims to transport themselves (or be transported) to hospitals by modes of transportation other than using

prehospital EMS vehicles, hospital proximity, and ambient traffic conditions. (8,9,10,11,12,13,14) In general, victims with relatively minor injuries, who are not entrapped or incapacitated, tend to bypass the prehospital EMS system and go rapidly by other means to the nearest hospital. (12,13) For example, in the 2003 Istanbul Bombing, a first wave of injured survivors with relatively minor injuries began arriving at the EDs 5 minutes after the blast, while victims with injuries requiring hospitalization tended to arrive later in a second wave via prehospital EMS. (15,16)

The first priority of any ED faced with the aftermath of an explosion is to activate the hospital emergency or disaster plan in order to mobilize the capacity, (facilities, pharmaceuticals, and personnel) equipment, supplies, and personnel required by large numbers of victims. Concomitantly, a clear chain of command within the ED staff should be initiated by personnel well-trained in advance to work together under mass-casualty incident (MCI) conditions. The Hospital Emergency Incident Command System (HEICS) provides a useful organizational tool for the command and coordination of hospital and ED emergency response. (17) The HEICS provides a predictable chain of command, clear lines of communication, prioritized actions, accountability of performance, and harmonized nomenclature.

Most EDs will have at least a few minutes from the time they are first notified of the event until the time the first victims arrive. During this brief period, the ED should be immediately cleared of as many patients as possible through discharge home or admission to the hospital. A pre-determined ED evacuation plan is critical, since the arrival of casualties into an ED still half-full with regular patients can lead to significant confusion. Hospital capacity also should be expanded rapidly. Hospitalized patients should be evaluated by pre-designated teams for possible disposition home. Elective surgery cases should be canceled and the recovery room should be cleared. Patients in intensive care units (ICUs) should be evaluated by pre-designated teams for possible transfer out. Besides their obvious uses, these critical care areas also may be needed to resuscitate victims in the rare instance when the number of critically injured exceeds the number of ED beds. While ED patients are being evacuated, the ED resuscitation area should be prepared to receive the most critically injured victims.

Since most patients will have soft tissue, orthopedic, ocular, and minor burn injuries, sufficient equipment, supplies, and

medication (including analgesics, antibiotics, and tetanus immunizations) for the management of these clinical entities should be deployed. (18)

At the same time that material resources are being mobilized, essential personnel also must be assembled. Injury patterns in those seeking emergency care in terrorist bombings suggest that emergency physicians and trauma surgeons are the medical personnel most likely to be needed by large numbers of injured survivors, since they are trained in rapid assessment and general trauma care. Since virtually all mass casualties, terrorist bombings produce a variety of serious injuries requiring specialty care, neurosurgeons, vascular surgeons, orthopedists, maxillofacial surgeons, and ophthalmologists also should be included in the initial response. (19,20,21) In addition, obstetricians should stand by for the assessment of pregnant casualties. Anesthesiologists also will be needed for the many expected emergency operations and possibly to bolster ED resuscitation efforts, while radiologists and radiology technicians will be needed to expedite diagnostic imaging. (22) Adequate numbers of ED nurses and ancillary staff also should be organized.

All medical personnel involved in the direct care of victims require water-impermeable gowns, surgical masks, goggles, and gloves ("universal precautions") to protect against the transmission of blood-borne viral disease. At the same time that other supplies are being mobilized to anticipated patient care areas, personal protective equipment should be distributed unless already pre-deployed.

Another immediate priority is to setup a triage area at the entrance into the ED treatment area, which allows for unimpeded ambulance flow outside the ED and helps to avoid the immediate need to re-triage casualties once inside the ED. Triage can be performed capably by experienced emergency physicians or mid-level surgeons, saving senior trauma surgeons for more effective roles in the ED or operation room.

### **CONCLUSION**

The integration and implementation of the above guidelines and principles throughout the medical system should enable them to handle MCI resulting from terrorist bombings better. The management of MCI is not a hospital-based mission, and should be handled as a cooperative task of the entire medical system.

A rational approach to the emergency management of acts of terrorism requires that the lessons learned from previous

mass casualty, terrorist bombings be incorporated into current planning and preparedness.

Hospitals, urgent care clinics, and other providers should work proactively with area prehospital event command systems to develop plans for ultimate patient disposition. Local communities must take the lead in developing incident command systems for initial management of such events. Hospital and pre-hospital providers play a key role in such planning. Ultimate management and disposition of large numbers of casualties, especially if contaminated, cannot follow standard patient management protocols; new protocols are needed. To avoid a total, overwhelming break down of in-hospital resources, hospitals need to assume a lead role in addressing such issues in their local communities.

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