

Medical Management of Terrorist Attacks

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Until recently the medical community was required to deal with conventional terror. However, the dire circumstances of the last year have catapulted healthcare providers to anticipate other forms of mass destruction weapons – namely, biologic, chemical and radiation terror assaults [1].

We define a mass casualties event as an incident in which the medical system is overwhelmed and the balance between resources and demands is undermined. Hence, the medical management of MCE presents a formidable challenge to the medical system. The principle aim of the overall medical management of the event is to decrease mortality and morbidity of the entire affected population, even at the cost of providing inferior treatment to the individual patient [2].

This article will discuss common elements of the medical management of terror and provide guidelines for MCE medical organization and administration, while emphasizing characteristics of some unique forms of terror, based on the medical literature and on the Israeli experience.

Pre-event medical preparedness for the terrorist attack

The element of utmost importance in forecasting success in the management of the MCE and minimization of the chaos involved is extensive early preparations.

Planning

The first stage is to define and recognize the threats [Table 1]. These include: a) *conventional terror* – associated with penetrating, blast and crush injuries and burns [3]; b) *biologic* – anthrax [4], plague [5], smallpox [6], Ebola [7], and tularemia [8]; c) *chemical* – mustard gas [9], botulinum toxin [10] and nerve gas such as organophosphates [10]; and d) *radiation* – resulting from dispersal of radioactive materials [11,12].

The MCE medical management plan should comprise two protocols. The first relates to the organization of the pre-hospital phase and the cooperation and communication between the

different rescue teams and medical systems in the region. The second relates to the hospital and includes the general algorithm of the hospital management throughout the MCE. These protocols are supplemented by other relevant elements that pertain to the specific protocols for each medical department and administrative division.

Resources

Medical and paramedical staff should be reassigned to the different stations according to the operative plans. Assets should be evaluated. Locations for additional emergency departments should be pre-designed. Decontamination facilities should be prepared. Other critical equipment such as reliable communication systems (walkie-talkies), ventilators and certain antidotes should be purchased by the hospital or by warehouses. Sources for extra blood should be designated. Critical gaps should be outlined and sources for reinforcement, if needed, should be mapped [13–15].

Instruction and drills

Medical staff training should be provided using a number of different methods and formats. Tutorials are to be presented through lectures, multimedia devices and written materials given to individuals on a personal level. At a later stage this information should be reinforced and supplemented by training mission-oriented teams (e.g., decontamination area, emergency department). The more advanced level of training consists of two types of drills:

- *Managers' drill*, in which all directors are seated around the table and react to virtual MCE. Visual aids such as hospital architectural models and multimedia devices will assist in making this drill more realistic [16].
- *Full-scale drills*, in which all members of staff participate, using a range of equipment (chemical protection devices if needed, etc). In order to obtain more realistic results, volunteers should play the role of injured patients. Medical personnel "acting" as victims greatly enhances the crucial insight and feedback gained from such an exercise. A debriefing process should follow each drill [17].

MCE = mass casualties event

Table 1. Characteristics of conventional and mass destruction weapons terror

Terror type	Conventional	Chemical	Biological	Radiation
Presentation	Overt, casualties present immediately	Overt/silent, casualties present immediately	Silent, casualties present gradually	Silent, acute prodrome: latent phase radiation sickness
Triage	Advanced Trauma Life Support (ATLS) principles	Lying & ventilated, lying & breathing, walking	Severe cases treated in hospitals, mild cases in the community	Priority to salvageable (radiation equivalent mean < 600)
Treatment protocol	ATLS principles	Antidotes Antitoxins Oximes Supportive	Antibiotics Vaccination Supportive	Decorporation agents, supportive
Physical protection in threatened areas	Helmets & anti-bullet protective jacket	Protective suits & closed ventilation system	Universal precautions or P3, P4 protection devices	Protective suits & closed ventilation system
Decontamination	Not needed	Needed	Not needed unless externally contaminated with spores	Not needed unless externally contaminated with radioactive material
Isolation	Not needed	Not needed	According to disease type	Needed for patient protection

Event management

The outbreak of the MCE is typically accompanied by a brief period of chaos. Therefore, directors should act according to the protocols and checklists [Figure 1]. Improvisation should be avoided if possible. The announcement of the onset of an event will usually arrive from bystanders or policemen. This is followed by gleaning as much information as possible regarding the location, nature of the event and estimated number of casualties. It should be realized that initial information might be vague, inaccurate or even absent. MCE status should be declared only after confirmation of the data is validated, preferably by cross-checking with another source. The event can be short term, such as a bus explosion or chemical terror; or it may be prolonged, for example, a situation necessitating extrication of injured trapped in buildings following bombing, or as in biologic or radiation MDW terror [3]. The MCE can be overt, as in bombings or sometimes in chemical attacks, or silent, as in biologic or radiation MDW terror attacks [1]. All the medical and administrative staff and aides should be wearing identification vests that are distinctive and easily seen. These should include clearly visible name-tags defining the role of the staff member (director, nurse, etc).

Pre-hospital phase

Following arrival at the location of the terror MCE, it is of crucial importance to ensure the safety of the emergency medical system staff. Teams should be defended from ongoing shooting and explosives and from chemical, biologic or radiologic agents as needed. The medical commander should be the most senior medical officer of the EMS. The commanding officer should assess the area, estimate the needs, and summon extra teams and evacuation devices, ambulances and helicopters as required. The command station for all rescue forces should be established in a location with a good view of the event area, and it should be

- ✓ Confirm information
- ✓ Gather data: Type of event, location, estimated number of casualties, severity of injuries, estimated time of hospital arrival
- ✓ Call for extra medical and paramedical staff
- ✓ Notify operating rooms, X-ray, blood bank
- ✓ Assign a triage officer
- ✓ Decide whether decontamination will be needed
- ✓ Decide whether to open extra emergency departments
- ✓ Open command station
- ✓ Open public information center

Summary points

- Early preparations will minimize chaos during a mass casualty event
- Optimal triage will assist in a better utilization of limited medical resources
- It may be necessary to step down the level of treatment for a short period
- Good management of mass casualty event might decrease mortality and morbidity.

Figure 1. Checklist for in-hospital management of a mass casualty event

equipped with communication systems. The medical leader should be part of the multi-task commanding team, while his deputy should be in the immediate MCE area assisting the process of team designation and triage [18]. The deputy officer should use a mobile loudspeaker and walkie-talkies for better control. The most experienced medical officer should perform triage, which may be one of the following: a) immediate – for those requiring urgent evacuation; b) delayed – for casualties that can await transfer; c) expectant – for dying patients who should only be provided with comfort measures; or d) deceased – should be positioned in a remote area.

Color codes may be helpful. It should be emphasized that priorities of treatment and evacuation may differ. For example, tension pneumothorax, once adequately drained, is of low urgency

MDW = mass destruction weapons
EMS = emergency medical system

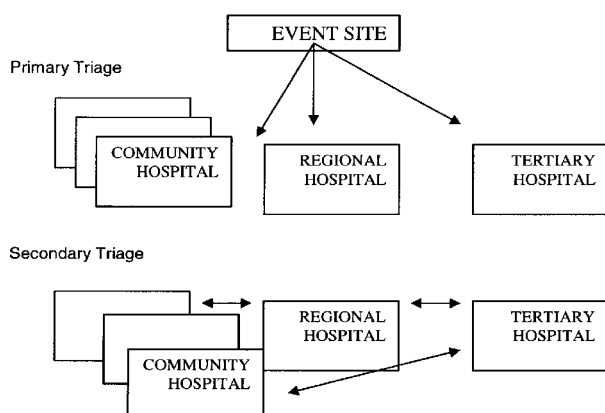


Figure 2. Primary and secondary triage

for evacuation. Another important consideration for the triaging officer is to evacuate patients with special injuries to hospitals capable of treating those injuries, and to manage a balanced flow of patients, dividing the load among different hospitals so that the chaos will not overcome any of the hospitals involved. This process is called *primary triage* [Figure 2]. It should be recalled that some of the injured may have been evacuated earlier to a nearby hospital by well-meaning bystanders. Therefore, the field triaging officer should preferably be an experienced physician or paramedic with a good working knowledge of the capabilities of the regional medical facilities [16].

At the hospital: immediate preparations phase

After confirmation of the MCE announcement, the staff member receiving the message should inform the hospital administration. Medical and paramedical staff should be called to their stations by all available means – paging, phones and loudspeakers.

Elective operations are to be halted as soon as possible. In accordance with the estimated number of casualties and the characteristics of the assaulting weapons, the hospital director decides whether decontamination is needed and if it is necessary to open extra emergency treatment facilities in keeping with the protocols. The regular emergency department will remain designated for the most severe casualties. It should be noted that in cases of certain biologic events, strict isolation measures should be prepared. We strongly emphasize that the safety of the staff is of utmost importance and early measures to avoid contamination of the staff or physical facilities should be taken. A suitable site for patients with acute stress disorders should be opened. If possible, hospital command stations should be positioned to facilitate a view of the drop-off location for ambulances discharging patients. The command center should be equipped with all necessary communication aids and computers. Inter- and intra-hospital communication transfers will be managed through this center [19,20].

The public communication center will be located in a remote area. The role of its staff, mainly social workers, is to provide information to victims' families, assist with the identification of unknown patients, and gather and supply data from and to other hospitals, primary physicians and other qualified authorities.

Treatment process

In a chemical terror attack, patients must be decontaminated under showers with detergents. This is done by staff wearing protective suits in areas with closed-circuit ventilation devices. Decontaminated patients or those who are not contaminated should be triaged. In conventional trauma, triage is best conducted according to the Advance Trauma Life Support criteria [2]. In a chemical attack it is best to triage ambulatory patients as mild injuries, while patients who are supine should be triaged according to their respiratory condition. Thus victims are subdivided into two major categories: those who breathe spontaneously (moderately injured) and those who need assisted ventilation (severely ill). Biologic and radiologic victims are triaged according to their clinical presentation. Patients who are pronounced dead must not be brought to the treatment zones but taken directly to the morgue. Patients may be referred to different emergency treatment sites corresponding to the severity of their injury [21].

A medical director is placed in charge of each treatment site, together with a head nurse and administrator. Dedicated medical staff should be reserved for each severely injured patient or for a group of mild casualties. It may be necessary to 'step-down' on the level of medical treatment required for a short period due to insufficient resources. Medical information should be registered briefly to enable reasonable continuous care. Forensic evidence should be kept to assist the police and enable the identification of unknown victims. It should be stressed that in order to minimize confusion, patients should be transferred in a unidirectional route (e.g., a patient who leaves the emergency department for a CT scan will not return to the emergency department but will be taken directly to the operating room). Each transfer of a patient should be documented to facilitate follow-up. Patients may also be sent to another hospital owing to special injuries that require treatment in specific facilities or due to insufficient resources in the admitting hospital. This process is called *secondary triage* [Figure 2].

The hospital spokesman should communicate with the media and provide information, without interfering with treatment requirements and the preservation of patients' rights.

Post-event procedures

A debriefing meeting should be held as soon as possible following termination of the event. During this meeting each site director will give a brief report, presented openly and honestly as this candid information is essential for determining and assessing the effectiveness of the process. The discussion of all participants will be reported and followed. Conclusions and lessons to be learnt will be disseminated to other hospitals, to the EMS, and to regional health authorities. Protocols should be corrected and updated in accordance with the debriefing process. Surveillance should be maintained to enhance our preparedness. Gaps in manpower, knowledge and equipment should be filled as soon as possible: the next MCE may be just around the corner [22].

Conclusion

Terror is becoming an increasingly real threat to society each day. The different modes of terror comprise a new field of epidemiology

that demands ongoing activities at all levels of prevention. Continuous preparations and readiness on behalf of all components of the medical society (administrators, EMS rescue teams, community medical staff, personnel of community, regional and tertiary hospitals, and rehabilitation centers) will enhance the strength and durability of society against conventional and MDW terror attacks.

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