

Hospital Preparedness for Emergencies

Isaac Ashkenazi*, Mollie Mahany*

Key Points

- Hospital emergencies occur as a result of a mismatch between the needs of the patient and the resources available for care.
- Hospital emergencies are likely to simultaneously involve four different types of mass events: mass casualty event, mass fatality event, mass anxiety event and mass onlooker event.
- The success of medical response to a mass casualty incident depends upon prehospital care, distribution of casualties and hospital preparedness.
- There are key characteristics common to most hospital emergencies.
- Hospitals may apply basic principles of preparedness that will better enable an effective emergency response throughout the facility and protect its occupants.

Introduction

There are two main types of hospital emergencies: *internal* and *external*.

Internal hospital emergencies arise when specific events occur that limit the ability of the hospital to function effectively (i.e. power outage, fire, structural damage, etc.). The internal functional safety of hospitals is addressed in Chapter 149. This chapter will focus on external hospital emergencies that most commonly occur as a result of a mass casualty incident (MCI) in the community.

Global terrorism events of the past few years have taught us that communities should be well trained, well equipped and ready to respond to events such as bombings, plane crashes

and other events that result in large numbers of casualties. An MCI is an adverse event, which generates more patients at one time than locally available resources can manage using routine procedures. It requires exceptional emergency arrangements and additional or extraordinary assistance.¹

During a disaster, health care systems will be confronted with increased demands and decreased availability of health care resources. Regional health care systems best understand their own needs and resources, and must therefore develop their own comprehensive systems for providing mass casualty care. These regional systems are particularly important for acute medical emergencies such as a bombing terrorism mass casualty event, since national

resources may not be available for the critical first 24 hours.

The chaos generated by an MCI evolves over time, moving progressively and intensively through all involved and many uninvolved, individuals and organisations. A sudden and unpredictable disaster requires an immediate response, but at the same time it disrupts communication systems; interrupts transportation of casualties, medical personnel and supplies; and overwhelms the responding agencies. The resulted chaos is often also shifted to the hospitals.² Although the chaos on the scene of an MCI is predictable and not preventable, the chaos that occurs at the hospitals can be predicted and prevented with planning and exercises.

*International Expert for Crisis Management & Leadership, Harvard University and the Ben Gurion University of the Negev, Yehud, Israel.

The medical response to an MCI consists of two spheres of emergency medical management and care: the incident scene and the receiving hospitals. These spheres should be connected tightly by a critical and vulnerable link—the process of effective distribution of the casualties by emergency medical services (EMS). Policies and procedures for prehospital care and hospitals are often reasonably established, whereas the casualty distribution component is often overlooked, particularly in countries with limited experience with medical emergencies. Medical preparedness and planning for MCIs have traditionally focused on the scene of the event and prehospital management. Comprehensive mass casualty care, from a health care systems perspective, has received far less attention and has evolved separately from the rest of the emergency response communities.

Because MCIs place such profound demands on the health care system, advance preparedness must be made to ensure that care will be delivered to the greatest possible number of casualties. The aim of preparedness should be to keep the entire health care system operational, flexible and functional, and to deliver acceptable quality of care to preserve as many lives as possible.³

The success of the medical response to an MCI depends on the following three interconnected areas:

1. Prehospital care
2. Distribution of casualties
3. The hospital preparedness to provide medical care to the victims

Distribution of casualties is the art of matching casualty medical needs to transportation assets and available medical facilities. Disregarding the importance of appropriate casualty distribution will rapidly move the victims from the event site directly to the closest hospitals, which will quickly become overwhelmed and would collapse, due to its inability to handle the patient load. Hence, the smart and controlled distribution of casualties during an MCI is critical for two main reasons:

1. *Minimising hospital overload:* Only centralised coordination of casu-

alty transport can minimise hospital overloading and maximise the use of all available medical facilities.

2. *Matching:* Whenever possible, specialised casualty treatment requirements should be matched to the most appropriate hospital. It should be emphasised that the vast majority of survivors of an MCI have minor injuries and will likely be discharged home after evaluation and treatment in the emergency department (ED).

Hospital Emergencies

Mismatch of Needs and Resources

In a disaster, the health care system is challenged with a large number of patients and casualties with little or no advance notice. An immediate gap is created between the patient load and available resources. In the case of an MCI, many health care resources will be overwhelmed or eliminated including the following:

- *Health care personnel:* Lack of a sufficient number of specialists, physicians, nurses, emergency medical technicians and other essential workers in the healthcare setting.
- *Physical items:* Lack of sufficient supplies including medical supplies, pharmaceuticals, beds, equipment, stretchers, cervical collars, oxygen, ventilators, negative pressure rooms, etc.
- *Services:* Overloading of hospital EDs, intensive care units (ICUs), burn care units, nursing care, laboratories, diagnostic imaging, mental health care, security and basic facility services.
- *Processes:* Breakdown in supply chains (medical supplies and logistics support), aggravation of communication barriers, collapse of the existing minimal coordination and information sharing among emergency providers.

During events such as this, it will be necessary to allocate scarce medical

resources in a manner that is appropriate to the circumstances and that may be very different from day-to-day emergency operations. Making optimal decisions concerning the allocation of scarce medical resources will make a big difference in saving lives.

Characteristics of a Mass Casualty Incident

Four Types of Mass Events

Hospital emergencies are likely to involve four different types of mass events:

1. Mass casualty event
2. Mass fatality event
3. Mass anxiety event
4. Mass onlooker event (e.g. families, media, curiosity seekers, volunteers and public officials who arrive at the hospital for various reasons)

Hospital emergency leaders should take these into account and be prepared for a simultaneous appearance of all four mass events.

Self-Referral

Most victims in a large-scale MCI self-transport (e.g. walk, private vehicles, public transportation) to hospitals, effectively bypassing the EMS system. The walking wounded (those with minimal injuries) and the ‘worried well’ (healthy persons who were exposed to the stressful event) represent the majority of the MCI survivors. These individuals tend to leave the scene and go to the closest hospital, overwhelming the receiving hospital and delaying treatment of more critically injured patients. In reality, there is no practical way to prevent this situation, and health systems must be ready to manage it (see below).

Proximity to the Event

Mass casualty incident victims are commonly transported and self-referred to the hospital(s) nearest to the event. These hospitals often become quickly overwhelmed and lose their functionality, whereas hospitals farther from the event may receive few or no casualties.⁴

Delays in Declaring a Mass Casualty Incident

There are three common delays during an MCI:

1. *Late incident recognition:* The point in time in which the hospital leadership becomes aware that a significant event is evolving. Limited or ineffective situational awareness is the main factor preventing adequate response.
2. *Delayed notification and activation:* Once informed about incident onset, activating the response system through a 'reactive' approach. Partial, gradual and linear activation of the emergency systems in an 'ad hoc' manner instead of using a proactive approach, which includes full and simultaneous activation of all emergency systems and gradual withdrawal depending on the gathered information.
3. *Late and linear mobilisation of resources:* The transition from baseline operations to the response level should be simultaneous and not linear.

Time Constraints

Medical emergencies are time sensitive, require rapid intervention and must be based primarily at the local level. Therefore, hospitals should expect and plan for the following:

- Limited federal involvement: The urgency of the MCI limits the ability of the federal government to own and control medical resources necessary for an immediate response to an MCI.
- 'Warm systems work': The local emergency operation plans will be fully operational during a large-scale crisis only if they also function during times of non-response (small emergencies and drills), particularly with the outside responders.

Poor Triage

Triage is the process of prioritising or 'sorting' patients for treatment according to the severity of their injury or illness. In the case of an MCI, the triage process is different than the system used

in routine circumstances in the ED. With a large number of patients and limited resources, it is critical for the triage process to be quick and simple. It is common for the triage process to not function as expected due to 'over-triaging' or failure to alter the balance between quality and quantity of care as necessary for the situation.

Limited Health Care Workforce

There may be a tendency for health care workers to not report for work during emergencies. Health care workers may refuse to report because of uncertainty or fear (for themselves or family members) or be incapable of arriving at work during such an emergency. The protection of health care personnel and their families is paramount, and ignoring this fact will lower the motivation for health-care personnel to respond to work in the midst of a crisis.⁵

Principles of Hospital Preparedness

In order to prepare the hospital for medical emergencies and mass casualty events, leaders need to focus on the following principles.

Provide Meta-Leadership

Apply the following dimensions of the 'meta-leader' to build connectivity and coordination during preparedness and during the crisis in a flexible and adaptable way.⁶

An appropriate persona of the meta-leader that allows for leadership and their ability to objectively assess and understand the problem

- The character of the problem, change or crisis that compels response
- Leading one's entity and/or operating within one's designated purview of authority
- Leading up to bosses or those to whom one is accountable
- Leading cross-system connectivity among our colleagues and peers to proactively build, and maintain

relationships, and to establish clear channels of communication

Each emergency response discipline brings unique and valuable expertise, which contributes importantly to MCI readiness in the community.

However, the multitudes of medical and non-medical responders who have a critical piece of responsibility in saving lives typically have different plans, emergency terminology, standards, operation methods and classifications. Most have minimal understanding of one another's roles and responsibilities in an MCI. Vertical and horizontal integration of existing medical resources in a timely and efficient manner is the main tool for saving lives during an MCI. Connectivity is thus built during preparedness and examined during crisis.

Decide Who Is in Charge

It is critical to identify who is in charge, especially during a crisis. The process for leadership, including the chain of command, responsibilities and coordination should be made clear as part of the hospital planning effort in advance of a disaster.⁷

Be Proactive

Good preparedness must be undertaken ahead of time. Crisis situations are bad times for planning. Much of the medical response to an MCI will rely on planning and actions that were in place and tested well ahead of time.⁸

Learn from Others and Be Committed to Lifelong Learning and Teaching

Useful lessons can be learned and adapted from the many real cases of disasters and medical emergencies that occur worldwide every year. These events provide other countries and public health services the opportunity to learn from each other's experiences. Emergency leaders must become committed to a lifetime of learning and teaching, having both a student and a professor mindset.⁹

Prevent and Be Ready for Casualty Care Bottlenecks

A bottleneck in the casualty flow for care throughout the incident may limit the capacity of the entire medical system and contribute to a high level of morbidity and mortality as well as public frustration from emergency agencies and authorities.

Coordinate the Flow of Casualty Care

Prevent a 'silo' response. One central command and control entity should coordinate the entire spectrum of casualty flow and ensure communication among all critical participants.

Exercise Emergency Response Plans

Drills and tabletop exercises are a major tool not only to improve MCI preparedness and response capability within a hospital, but also to interface and connect with the larger response system within the community. Disaster preparedness policies and procedure should be practiced by all those who may be involved in an actual event. Responders must understand, practice and implement the processes of all preparedness factors. Simply having a plan written on paper is not sufficient. 'Paper-preparedness' can give a dangerous 'placebo perception' of being prepared. Exercises should include the types and numbers of patients expected, simulating actual casualties, and should include some victims who are the 'worried well'. Exercises should include all emergency response partners from public, private, community and governmental agencies. Decrease paper preparedness and start experiencing, exercising and building self and organisational resilience.

Share with the Public

Individuals in a community are the first 'preventers' and the first responders. They should be an integrated component of any MCI preparedness and response activities. Planning a medical

response to an MCI must be comprehensive, community based and provide clear communication with the public, before, during and after an MCI.¹⁰

Work with the Media

Set up a strategy to ensure that clear, reliable, professional and continuous messages reach to the public about the progress of the event and actions they should take.¹¹ Without effective pre-event planning and coordination, including the clear articulation of a message from all authoritative agencies, the media will be ineffective and even dangerous in communicating with the general public.

Stop Inventing Disconnected Emergency Plans

It is important to identify the existing federal and state emergency preparedness policies. Emergency plans within facilities and communities should be built upon each other and based on existing federal and state plans, protocols, processes, tools and terminology.²

Be Prepared for Legal and Ethical Issues

During an MCI, difficult decisions may have to be made regarding the allocation of available, and perhaps scarce, resources. Ideally, decisions and policies regarding resource allocation within hospitals should be crafted in advance of an MCI in accordance with local and national certified guidelines. Preparedness should address all potential legal and ethical problems that could be related to mass casualty response. Ethical considerations should be made explicit during preparedness so that when a crisis strikes, critical decisions are made based on the spirit of the ethical judgments that guided the planning process.

Relax Standards of Care

Casualty overload adversely affects the quality of trauma care given to individual casualties according to the severity of the event. During an MCI, conventional

standards of medical care cannot be delivered to all casualties despite the best efforts. Therefore, leaders should consider a relaxation of existing standards for medical care during the preparedness phase and implement the adapted standards during crisis.¹²

Expect the Unexpected

Expect that planning will be imperfect, and unexpected events will occur. Hospital leaders should learn to expect the unexpected and be resilient enough to adjust to the circumstances.

Develop Resilient Medical Surge

Medical surge is the ability of a health care system to adequately care for an influx of large numbers of patients (surge capacity) and/or victims with unusual or highly specialised medical needs (surge capability). Medical surge is the art of planning and implementing a system that can manage medical and health needs of the community during an MCI.

Communication During a Mass Casualty Incident

Maintaining open and continuous communications among all emergency participants is crucial. Emergency responders must be able to effectively communicate with one another in real time using common terminology and resilient communication networks. Timely and accurate information gathering and analysis must be coupled with effective and rapid dissemination of such information to those who need to respond.¹³

Hospital-Based Mass Casualty Care

The general concept of operations for casualty care is based upon the principle of ensuring and maintaining patient flow throughout the system. This is accomplished through a process of prioritisation and patient distribution that best align patient care needs with resources available throughout the hospital.

Hospital Decompression

Large numbers of casualties from a terrorist incident commonly self-refer or self-transport to hospitals in the immediate vicinity of the event. There are three main approaches to enable hospital decompression and to prevent collapse:

1. Outside diversion of additional casualties and other patients
2. *Secondary relocation (interfacility transfer)*: An overloaded hospital triages casualties to another hospital. The chaos during an MCI is a predictable and non-preventable surprise, but the chaos that exists at the hospitals that receive casualties is predictable and almost always preventable. The main goal of primary distribution is to create order out of chaos and convert the mass casualty event into a multiple small casualty event for each hospital. The hospitals should carefully consider their limitations and casualty thresholds and be prepared to give advance warning to the central command before they reach exhaustion and collapse.
 - Determine the type of patient population to be relocated, priorities for evacuation and consider the appropriate receiving facility.
 - The launching hospital (the hospital requesting assistance) is responsible for arranging transportation and transmitting the patient's chart and other information.
 - The accepting hospital receives full responsibility for the patient once the patient reaches one of its physicians.
 - Identify patient needs during transfer: Type of care providers, availability of basic life support and advanced cardiac life support.
 - Identify transportation routes with law enforcement.
 - Maintain effective communication between launching and receiving hospital to ensure casualty care continuity.
 - Maintain records of all evacuated patients and provide paper documentation reflecting medical activities.

3. *Triage hospital*: When capacity is exhausted, the affected hospital is declared a 'triage hospital'.

- Only lifesaving procedures are performed at the triage hospital, and casualties are then immediately transferred to other hospitals.
- The central command should immediately send helicopters and ambulances for immediate evacuation.
- An EMS officer is deployed to the triage hospital to determine the types of vehicles needed for patient transfers.

Overview of Patient Flow

Casualty care begins when patients present in the prehospital and/or hospital setting. These patients are typically received, triaged, registered and entered into a chain of care that involves the entire hospital. This process starts at the door of ED. It is important to perform this initial evaluation before allowing entry to the hospital in case of patient exposures to hazardous materials that could contaminate the hospital facility and occupants. After triage, patients enter the system through the ED.

To accommodate a rapidly increasing or overwhelming number of victims, hospitals should use predesignated treatment sites within the facility to place patients. The sites are chosen according to severity of injury based on the triage priorities outlined below and the level of medical support (i.e. medical equipment and personnel) available. For example, the ICU or operating room (OR) might be designated to hold those victims identified as Red (or critical). The general wards are appropriate for the yellow zones as patients are stable but require observation. Green patients are generally sent home, to alternative sites such as a shelter, or grouped in a non-medical area in the hospital (cafeteria, etc.). Finally, ancillary services are also triaged to serve with higher priority those high acuity areas of the hospital. This may involve a combined and focused effort for laboratory, respiratory therapy, radiology and support services such as housekeeping, central supply, maintenance and security.

Mass Casualty Incident Sites (or Primary Emergency-Response Areas)

During the hospital emergency, leadership should immediately activate the following hospital areas, as needed:

- Incident command centre
- Triage sites (main and alternative)
- Immediate treatment area(s)—for high acuity patients
- Delayed treatment area(s)—for moderate acuity patients
- Minimal treatment area(s)—for mildly injured patients and the 'worried well'
- Decontamination area—usually outside of the hospital to prevent cross-contamination
- Family area
- Fatality management area or morgue
- Public information centre (managed by a public information officer)

Casualty Reception

There are four stages in receiving casualties:

1. *Erecting the system*: Call in hospital staff, assure reverse-triage, etc.
2. *Arrival of casualties*: The incident is evolving, and the ultimate scope of the incident is still unknown. At this stage, trauma care provided to non-critical casualties is less than optimal. The leader should conserve key trauma-related resources for a yet unknown number of critically injured casualties.
3. *Casualties are no longer arriving*: The patient load is well defined, and hospital resources are still mobilised. Once it is discerned that definitive care to all casualties is feasible, further mobilisation of hospital resources be stopped.
4. *Recovery*: Returning back to normal hospital capacities and being ready for another MCI.

Casualty Triage

A simple model of triage for victims of an MCI should be used. Casualties fall under two general categories:

‘walking’ and ‘non-walking’. The ‘walking wounded’ and the ‘worried well’ do not require immediate medical treatment. The ‘non-walking’ casualties fall under two subcategories: those who are too injured to survive (‘likely to die’) and those who are deemed to require immediate emergency medical treatment or surgical procedures in a hospital.¹⁴ The goal of triage is to assign limited critical resources (resuscitation rooms, trauma teams, ventilators, surgery, blood, laboratory testing) to those patients most expected to benefit.

1. *Triage officer*: The primary role for successful management of an MCI. The triage officer should be an emergency physician or surgeon experienced in trauma care.
2. *Triage site*: Located at the ED entrance. Be ready to open a secondary triage site if the original triage site becomes overwhelmed by an influx of casualties.
3. There are four levels of priority for traumatic injuries:
 - Green: Delayed treatment; has minor injuries which do not pose a threat to life or limb. These ‘walking wounded’ may be sent home, to alternative sites or to the ‘minimal treatment area(s)’.
 - Yellow: Intermediate; has injuries that require observation, but whose condition is stable for the moment. The patient is not in immediate danger of death and may be sent to the ‘delayed treatment area(s)’.
 - Red: Critical; has injuries that will result in death without immediate medical treatment, but who are expected to survive. These patients are sent to the ‘immediate treatment area(s)’.
 - Black: Expectant or deceased; patient is expected to die due to severity of injuries or has already died. The patients expected to die should be grouped in an area away from the other patients and given basic palliative care (analgesia, sedation).

The system should build in flexible methods for reviewing and revising

triage decisions when the status of the affected person changes (either for the better or for worse).

Patient Decontamination

A chemical, biological, radiological or nuclear attack (CBRN) can result in a mass casualty event thus, precipitating the need of the first responders and ED personnel to be prepared for exposures to hazardous materials. It is preferable to do all the decontamination at the scene of the event and thus avoid contamination at the hospital. The management of contaminated patients is addressed in Chapter 146. However, during an MCI many individuals self-refer to the hospital without undergoing decontamination procedures at the event site.¹⁵ A hospital decontamination plan will not only handle the exposed patients but also protect the hospital staff from the secondary exposure.

Hospital plans should assign a decontamination zone (warm zone) including shower stalls with cold and warm water, and the postdecontamination zone (cold zone). Both of these zones require wearing proper personal protective equipment (PPE), and appropriate training is essential for decontamination and patient care while wearing the PPE.

Level of Care

Hospital personnel should be prepared to modify standards of medical care during an MCI. The number of patients will likely exceed available resources, requiring clinicians to prioritise victims for treatment, and decrease the level of individual care.¹⁶ The ultimate objective is to save the maximum number of lives while minimising disabilities:

- Develop protocols that are flexible enough to be modified depending on the nature and extent of the emergency.
- Prioritise ‘salvageable’ casualties over those who are likely to die (not salvageable).
- Reduce the usual use of imaging and laboratory testing.
- Reduce provider documentation and other administrative policy burdens.

Mass Fatality

Hospital responsibilities for management of excess casualties will change during an MCI. Every effort should be made to prevent the hospital’s functional collapse due to the mass fatality.

1. Do all that is possible to document the identity of the dead and the disposition of the body for the benefit of the survivors.
2. Plan for a mass mortuary site away from EDs.
3. Use a computerised system for
 - Digitally photographing each incoming victim who is unconscious as he/she arrives at the hospital. Assign photographers to take digital photos of these victims.
 - Input the digital pictures and any descriptions of victims and their personal belongings into a computerised database.
 Through this system, citizens can call any hospital throughout the region to locate their family members. This system saves the panic of searching from one hospital to the next for the loved ones.
4. Each patient’s belongings should be placed in a pre-prepared nylon sack, which accompanies the patient at all times.

Psychological Support

Hospitals should identify special sites to receive and treat the ‘worried well’ and mildly injured. These sites are deliberately located away from the hospital’s ED. The potential target populations for receiving preventive mental care and counselling are the following:

- *Injured victims*: With or without explicit symptoms.
- *Worried well*: Healthy individuals who were exposed to the stressful event.
- *First responders*: Build in psychological support for front-line responders.
- *Family members*: The death of loved ones quite reasonably incites strong emotions and responses in family members.

- *Hospital workers:* Regular management debriefings should be held every 6–8 hours.

Victim Tracking

During an MCI, hospitals are overwhelmed with a sudden influx of casualties (alive and dead). It is essential to use a casualty-tracking system that is coordinated across all medical facilities. A system for registering, documenting and tracking victims helps with making family search for missing relatives as efficiently as possible.

Key Components of Hospital Preparedness

Medical Surge Capacity and Capability

The major challenges that hospitals will face in an MCI include medical surge in emergency and trauma services, as well as other medical, paramedical, administrative, logistical and security concerns. Medical surge has two components¹⁷:

1. *Surge capacity:* The ability to evaluate and care for a markedly increased volume of patients—one that challenges or exceeds normal operating capacity.
2. *Surge capability:* The ability to manage patients requiring *unusual* or *very specialised* medical evaluation and care (e.g. burns or hazardous material exposures). Requirements span the range of specialised medical and public health services (expertise, information, procedures, equipment or personnel) that are not normally available at the location where they are needed.

Hospital Bed Surge Capacity

Hospitals have to plan for dramatically augmenting patient space to care for a large influx of casualties (reverse-triage).² Admission capacity is deter-

mined particularly by the number of available beds and available hospital personnel.

- *Facilitate inflow:* During an MCI, the hospital experiences a massive influx of individuals in a very short period of time, including hospital staff, trauma casualties, dead casualties, the ‘worried well’ patients, families, media, volunteers, first responders and many others. Hospital plans should be specifically designed to receive that massive inflow and distribute it using predetermined routes and sites.
- *Emergency department:* Rapid discharge from the ED for outpatients who can continue their care at home or at another nearby medical facility.
- *Expansion of critical care capacity:* Critical care and ICU beds are limited resources in most hospitals. Rapid discharge of surgical inpatients who can safely be managed out of the ICU to step-down units is necessary.
- *Expansion of hospital bed capacity:* Rapid identification and discharge of those patients who may continue their care at home or another medical facility is needed.
- *Operating rooms:* Determine availability of OR, cancel elective surgeries and procedures and prepare OR for urgent procedures.
- *Alternative care sites:* Use predesignated alternative care sites (libraries, lobbies, cafeterias, auditoriums, waiting rooms, parking lots) to increase space capacity and to add beds and supplementary equipment such as extra ventilators, suction and oxygen outlets.

Hospital Staff Surge Capacity

A hospital’s response competence is primarily dependent on the capacity to mobilise adequate numbers of qualified personnel to care for victims.¹⁸ It should be emphasised that hospital capacity for severely injured casualties cannot be expanded by reinforcement of employing personnel who do not deal with trauma on

a daily basis. The following issues should be considered:

1. Knowledge refreshment and trauma training:
 - Mandatory component of disaster management training for all health care workers and senior medical students.
 - Physicians and nurses must have up-to-date knowledge of the types of injuries and the treatments required particularly after bomb blasts.
 - Hospital administrators should be an integral part of the training exercises for an MCI.
 - Hospital senior leaders should lead drills and be an integral part of the training exercises.
2. *Staff rights:* Personal safety, family concerns, compensation (for extra hours and for physical and mental injuries), potential legal liability and the use of licensed professionals outside their normal scopes of practice are all issues that must be addressed in advance.
3. *Call in hospital staff:* Call in off-duty staff members and arrange for transportation of those who need it.
4. *External specialists:* Call for small numbers of specialised staff members (e.g. burns, paediatric critical care, psychiatrists) from other health facilities.
5. *Volunteers:* Call for health professional volunteers, use family members and volunteers to provide basic patient care and be ready for managing spontaneous volunteers.
6. *Shifts:* Include strategies to modify staff scheduling to expand personnel coverage as needed (duration of shifts, double shifts).
7. *Expand responsibility:* During an MCI, all varieties of personnel will be called upon to perform various functions, both within and outside of their typical scope of duties.
8. *Report to duty:* Hospital workers, including medical and support staff, may be unwilling or unable to work during an emergency. Be prepared for implementing incentives for hospital staff to arrive at work (ensure workers and their family’s safety and facilitate transportation to work).

Medical Supply Surge Capacity

The second most important factor for surge capacity and capability during an MCI is the availability of necessary medical supplies (as mentioned earlier, the first one is personnel). Hospitals must increase access to supplies through activating contracts with commercial vendors. Pre-equipped mobile carts with medical supplies and critical equipment should be mobilised to the specific MCI sites. Plans should be in place to ensure availability of immediate blood and blood products and to include the ability of the existing supply chain of resources to meet the manufacturing, testing, storage and distribution of these products.

Capacity and Capability Mapping

Hospitals should develop a planning framework (a capacity and capability map), which presents all available and relevant internal and external resources. This framework should be transparent, updated and shared with key disaster response participants, both during preparedness and response. The surge map should include a description of the potential resources and the appropriate contact information. The resource assessment of any health care facility should be part of the internal disaster plan. Before an MCI takes place, the capacity and capability of each health care facility in a given region should be evaluated clearly and be part of the surge map.

Planning for Hospital Emergencies

Emergency Operation Plans

Hospitals should have coordinated emergency plans that are integrated with other organisations and relevant agencies. The main partners relevant for these plans are EMS, regional hospitals and health facilities, public health departments, law enforcement,

fire departments, local military facilities, utility companies, government, schools and the private sector.¹⁹ Plans, protocols and checklists facilitate hospital management of the incident and minimise chaos during emergencies. During disasters, people often have difficulty making good decisions; this is the rationale for implementing and utilising prepared crisis protocols. Managing by standardised procedures reduces the occurrence of confusion and mental perplexity, which is characteristic in individuals under severe stress.

Protocols should be simple, short, realistic and practical based on interaction with other key agencies. The protocols should be evaluated continuously depending on threats, lessons learned and past experiences. The protocols or policies should be easily compiled and be located in an easily accessible place. These preparedness policies will enable functioning of an integrated and unified system during an emergency response. Too often, leaders are told to think ‘outside the box’ during a massive crisis. However, in an MCI, hospital personnel must first ‘go into the box,’ for example be fully aware of the protocols and procedures in the emergency plan and implement them immediately. Once this is accomplished, the allowance for adaptation and innovation may be considered if deemed necessary and practical.

Hospital planning should develop a framework for allocating scarce resources during an event. By identifying potential resource shortfalls and their impact on clinical care, a plan can be put in place to facilitate surge capacity strategies for overcoming the shortfalls.²⁰

Drills and Exercises

All hospitals should take part in regularly scheduled, mandatory exercises with the local and regional emergency services, and enforce the requirement for regular exercises focusing on mass casualty management.²¹ Exercises should be conducted on regular basis. Following each hospital exercise, the hospital emergency leaders should evaluate the exercise and modify the emergency plan according to their findings. There are four levels of hospital drills:

1. Focal (vertical) exercise for a specific task or process
2. Table-top (horizontal) exercise for senior personnel
3. Skeleton (functional) exercises for all personnel in charge
4. Full-scale real-time drills with full participation of hospital staff, the CEO and representatives from all relevant agencies

Hospital Incident Command System

In order to respond to the demands of an MCI, hospital directors should develop an integrated and coordinated incident command system.²² The presence of a well-defined incident command system reduces confusion. The Hospital Incident Command System (HICS) has overall authority and responsibility for hospital operations during an MCI. The HICS should define responsibilities, prioritised responses based on a predictable chain of management; develop clear reporting channels and a common nomenclature to facilitate communications. As an incident unfolds and details begin to emerge, the hospital management team should quickly transition from reactive to proactive management. The HICS requires the following main components:

- *Incident commander:* The individual who assumes overall authority and responsibility for the hospital preparedness for and response to an MCI. The incident commander is responsible for activating the emergency plan.
- *Command centre:* The place from where the response to the emergency will be coordinated. It should be equipped with multiple alternative means of internal and external communication and properly trained staff.
- *Operations officer:* Responsible for gathering and building the ‘picture of the event’ and to record any actions taken by the HICS.
- *Liaison officers:* Responsible for communicating with external relevant agencies, including EMS, other

health facilities, police, fire, search and rescue, public health, local office of emergency preparedness, military and other governmental agencies.

- *Public information:* The HICS serves as a contact for the media and coordinates communication between the hospital and the public. Prepared ‘template’ messages should be available in the HICS (see below).
- *Hospital security chief:* Responsible for maintaining order and overall security.

Hospital Redundancy

Hospital should be designed and constructed with the goal of minimising potential hazards and improving work flow during emergencies. Directors should ensure backup power capability during an emergency, protect communication systems and computer infrastructure and prepare plans for hospital evacuation or ‘shelter in place’ during direct or indirect exposure to a disaster.²³ There should also be special provisions for backup or redundancy of other mission-critical infrastructure and services such as water, environmental control, sanitation, alternate care sites, etc.

Family Support Services

Hospital emergency leaders should identify an area for family members and other concerned individuals who are looking for information about their missing relatives (required resources include water, food, emotional counsellors, religious services, simple pharmacy needs, etc). Personnel should be assigned to telephones to assist with victim identification and family liaison. Experienced nurses and social workers should be stationed in the visitor’s area to minimise anxiety and stress.

Security

In the stress, confusion and chaos that accompany an MCI, security measures attain an increased level of importance, especially since law enforcement resources are severely taxed. In this case, it is important for hospitals

to maintain a sense of control and security.

- Increase uniformed security presence (private security staff, police officers, the National Guard or adequate preset volunteers).
- Ensure security for hospital personnel, supplies and assets.
- Enhance monitoring of sensitive entry points and hospital surroundings.
- Address crowd control and handling of the influx of individuals seeking missing relatives who might be unidentified casualties.
- Prevent terrorists from targeting hospital facilities.

Communication

Internal Communication

Hospitals should have multiple modes of communication and important telephone numbers, and staff contact information must be available and updated on a regular basis.

External Communication

Effective external communication during an MCI is a key factor for a coordinated response. Telephones are the main mode of communication during response to an MCI, and radio communication is an effective backup. Phone numbers must be updated regularly and checked for accuracy.

Public Information

Leaders have a great deal of influence over the individuals’ and community’s expectations, understanding and responses to an MCI. The management of the acute situation sets the tone for the way society will respond. The accurate description of ongoing efforts and successful forecasting of predictable events will enhance the credibility of authorities and diminish negative perceptions. The communications campaign should be a joint effort by EMS, hospitals and other health care facilities. Informing the public on time could decrease the flow of ‘worried well’ patients and lessen demands on the health care

system (encourage the ‘worried well’ to seek care from community clinics through public messaging). Reassurance imparted by information is the key to garner trust and confidence in the public.

Joint Information Centre

Messages during crisis should come from accurate sources in a timely and consistent manner. Communication strategies must be established and practiced prior to the event, and they should include the use of risk communication, regular media releases and press conferences. The joint information centre (JIC) should take responsibility for overall hospital communication management. This includes information provided to EMS, other hospitals and critical health facilities, emergency agencies as well as the provision of public information.

The JIC is responsible for centrally handling communications related to emergency events. It serves to gather incident data and give appropriate information to special targeted audiences and the public in an accurate and comprehensive way. The flow of information should be more proactive in response to the information needs of the public, government and others. The JIC should be prepared to undertake the following functions:

- Preventing conflicting instructions: After an event, there is a golden opportunity for education. Organisational representatives from the JIC will have the opportunity to speak to the media and convey the reality to the public.
- Reporters and the public will be looking for experts; there cannot be conflicting messages from the subject matter experts and politicians.
- Authorities should have prerecorded and distributed videos and pamphlets to the multiple media channels that instruct the public regarding appropriate actions to take following an event.

The media has a profound influence on public resilience. The media tend to sensationalise problems and deficiencies, but at the same time,

media can also serve as a delivery system of instructions and information to the public. Communication with the public should be done by professional, experienced and trusted persons in a direct, honest and simple fashion.

Hospital Recovery (Ending the Emergency Status)

While it is critical that a hospital be able to make an immediate transition from normal status to that required during

an emergency, it is also important to prepare the hospital to return to routine activities as quickly as possible. Debriefing from the emergency is a key step to release stress and to obtain inputs with regard to the 'lessons learned' for use in the event of future crises.

References

- World Health Organization. Health Action in Crises, Mass Casualty Management Systems. 2007. Available at: http://www.who.int/hac/techguidance/MCM_guidelines_inside_final.pdf. [Last accessed 13 July 2009].
- Auf der Heide, E. The importance of evidence-based disaster planning. *Ann Emerg Med.* 2006; 47:34–49. Available at: http://www.atsdr.cdc.gov/emergency_response/importance_disaster_planning.pdf. [Last accessed 7 July 2009].
- GOI-INDP DRM Programme. Guidelines for Hospital Emergency Preparedness Planning. 2008. Available at: http://safehospitals.info/index.php?option=com_content&task=view&id=167&Itemid=121. [Last accessed 12 July 2009].
- Bloch Y, Dagan Schwartz D, Pinkert M, et al. Distribution of casualties in a mass-casualty incident with three local hospitals in the periphery of a densely populated area: Lessons learned from the medical management of a terrorist attack. *Prehosp Disast Med.* 2007; 22:186–192.
- Chaffee M, Willingness of health care personnel to work in a disaster: An integrative review of the literature. *Disast Med Public Health Prep.* 2009; 3:42–56.
- Marcus L, Ashkenazi I, Dorn B, Henderson J. Meta-leadership: Expanding the scope and scale of public health. *Leadership Public Health, UIC.* 2008; 8:1, 2.
- Christen H, Maniscalco P, *The EMS Incident Management System.* Upper Saddle River, NY: Prentice-Hall 1998.
- Keim M, Giannone P. Disaster preparedness. In: Ciottone G. (ed.) *Disaster Medicine.* Philadelphia, PA: Elsevier/Mosby 2006, pp. 164–173.
- Seynaeve G, Archer F, Fisher J, et al. International standards and guidelines on education and training for the multi-disciplinary health response to major events that threaten the health status of a community. *Prehosp Disast Med.* 2004; 19:S17–S30.
- Wineman N, Braun B, Barbera J, Loeb J. Assessing the integration of health center and community emergency preparedness and response planning. *Disast Med Public Health Prep.* 2007; 1:96–105.
- Covello V, Best practices in public health risk and crisis communication. *J Health Commun.* 2003; 8:5–8.
- Pesik N, Keim M, Iserson K. Terrorism and the ethics of emergency medical care. *Ann. Emerg Med.* 2001; 37:642–646.
- Auf der Heide E. *Disaster Response: Principles of Preparation and Coordination.* St. Louis, MO: CV Mosby Co. 1989.
- Ashkenazi I, Kessel B, Khashan T, et al. Precision of in-hospital triage in mass-casualty incidents after terror attacks. *Prehosp Disast Med.* 2006; 21:20–23.
- Hildebrand S, Bleetman A. Comparative study illustrating difficulties educating the public to respond to chemical terrorism. *Prehosp Disast Med.* 2007; 22:35–41.
- Holt R. Making difficult ethical decisions in patient care during natural disasters and other mass casualty events. *Otolaryngol Head Neck Surg.* 2008; 139:181–186.
- Barbera J, McIntyre A. Medical Surge Capacity and Capability: A Management System for Integrating Medical and Health Resources During Large-Scale Emergencies. CNA Corporation Web site. 2004. Available at: http://www.cna.org/documents/mscc_aug2004.pdf. [Last accessed 13 July 2009].
- Nap R, Andriessen M, Meessen N, Miranda D, van der Werf T. Pandemic influenza and excess intensive-care workload. *Emerg Infect Dis.* 2008; 14:1518–1525.
- Auf der Heide E. Principles of hospital disaster planning. In: Hogan D, Burstein JL (eds.) *Disaster Medicine.* Philadelphia, PA: Lippincott Williams & Wilkins 2002, pp. 57–89.
- Kelen G, McCarthy M, Kraus C, et al. Creation of surge capacity by early discharge of hospitalized patients at low risk for untoward events. *Disast Prep Public Health Prep.* 2009; 3:S10. Available at: http://www.dmp.org/cgi/reprint/3/Supplement_1/S10. [Last accessed 13 July 2009].
- Joint Commission International Accreditation Standards for Hospitals.* 3rd ed. 2010, Joint Commission International.
- Hospital Incident Command System. HICS IV. 2006. California Emergency Medical Services Authority Web site. Available at: http://www.emsa.ca.gov/HICS/files/Guidebook_Glossary.pdf. [Last accessed 7 July 2009.]
- WHO/PAHO Publication. *Safe Hospitals: A Collective Responsibility.* 2005. Available at: <http://www.paho.org/english/dd/ped/SafeHospitalsBooklet.pdf>. [Last accessed 13 July 2009].