Automating Hospital Mass Casualty Incident Response: What Matters and Why?

NH EMERGENCY PREPAREDNESS CONFERENCE

Overview

• Review of the threat landscape
• “Lessons learned”
• Describe the need for an MCI Protocol
• Identify the essential elements and actions within an MCI Protocol
Disaster Events are Increasing

Global Terrorism
Planning for “Real” Disasters

- Planning for disasters has often focused more on “myths” and how we would like disasters to happen rather than how they actually happen
  - Auf der Heide, E. The Importance of Evidence-Based Disaster Planning Annals of Emergency Medicine 2006 (47) 34-49
- Lessons are “learned”, re-learned, and re-re-learned because they are never really understood
**Epidemiology of Acute Disasters**

• There may be little or no warning before many disaster events
  – Walk-in patients may precede official notification of an event
  – Average time from event to presentation of the first patient at the closest hospital can range from 4-18 minutes
  – 50% of casualties generally arrive within a 1-hour window
  – Second 50% can present up to many hours later

• A substantial number of patients (as many as 80%) may travel by means other than EMS to the hospital
  – Patients not triaged, treated or decontaminated
  – Sickest do not arrive first
  – Majority typically go to the closest hospital
**Epidemiology of Acute Disasters**

- 1/3 of casualties are admitted
  - Usually do not arrive first at the hospital
  - 10-20% critical
  - 10-20% urgent and admitted
- 2/3 of casualties are released from the ED
- “Worried well” can outnumber injured patients by 5-10x

**MCI Planning at MGH**

- MGH is very closely located to a number of locations where a Mass Casualty Incident (MCI) could occur with little or no warning
  - Logan Airport – Government Center
  - Boston Garden Arena – North Station Commuter Hub
  - Public Garden – Multiple MBTA stations
  - Esplanade
- MGH redoubled efforts to improve overall emergency planning after 9/11
  - Focus on improving the overall EOP and C4
  - Special attention to MCI, as well as hazmat, biothreat, radiation protocols
Learning From Others

• MGH had learned key lessons before the Marathon Bombing from colleagues and others who have experience managing similar events
  – Israeli disaster management conference in 2005
  – CDC symposium with representatives from London, Madrid, Mumbai, Israel
  – Aurora, CO mass shooting incident
  – Medical staff members with military experience
  – Harvard TH Chan School of Public Health
  – Deployment experience (DMAT, IMSURT)

MCI Planning: Conclusions

• Response to an MCI requires hospitals and communities to mobilize an enormous number of resources with little to no warning
• Effective response requires scripted actions and pre-specified targets of mobilization
• There is an evidence base available to guide prospective planning for MCIs

“We’ll do the best we can with what we have” is no longer good enough…. 
MCI Lessons from Colleagues Imbedded in MGH MCI Protocol

- Notification interval will be very short, if it exists at all
- Early information will be inaccurate, incomplete, or both
- Patient distribution may be uneven
- Patients will arrive by mechanisms other than EMS
- The ED and hospital will likely be full
- Many response actions have to happen very, very quickly
- Triage must be brief, but must also be repeated
- Chaos and disorganization are inevitable, but must be managed as quickly as possible
- Practice is essential

The MGH MCI Protocol

- MGH must be able to streamline the multitude of decisions and actions immediately needed following an MCI:
  - Secure the facility
  - Prepare the ambulance area for MCI triage
  - Make room in the ED for incoming victims
  - Ensure sufficient staff for multiple simultaneous resuscitations
  - Obtain sufficient trauma surgical resources
  - Obtain sufficient supporting personnel, materials and resources (blood coolers, respiratory therapists, ventilators, etc.)
  - Make sufficient clinical space available for minor-injured patients, who are likely to be the majority of the victims
- There is not enough time to make each decision and take each action before patients arrive if the process is not automated
The Boston Marathon
Monday, April 15, 2013

- 117th Boston Marathon
- 26.2 miles
- 26,839 runners
- Over 500,000 spectators
- Coincides with a Red Sox home game

Boston Marathon Bombing Notification

- At 2:50 pm two explosive devices were detonated near the finish line of the Boston Marathon
- At 2:55 pm Boston EMS and COBTH disaster radios transmitted notification of the explosion to all area hospitals. Additional notifications reported casualties
- Hospital CODE DISASTER activated at 3:03 pm. Disaster plan and mass casualty protocols implemented
- Hospital Emergency Operations Center (EOC) opened in administrative conference room per plan
- First patient arrived at 3:04 pm
Marathon Bombing Scene Response
Scene Response

- Medical tents were staged at the finish line to care for injured runners
- EMS and other medical responders rushed to the scenes to attend to victims
  - Some victims moved well away from the initial blast area
  - Significant bystander efforts as well
- Victims received mostly BLS interventions
  - Open airway
  - Control of hemorrhage
  - Transport
- Loading officer managed most of the EMS transport destination decisions
  - Scene was cleared of critical victims in 18 minutes
  - Numerous victims transported 2, 3, 4 per ambulance

First MGH Patients

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Patient Injuries

- Multiple below and above the knee amputations
- Severe blood loss
- 2nd and 3rd degree burns
- Open fractures, open wounds, lacerations, embedded shrapnel with tissue injury
- Closed fractures with contusions, sprains and strains
- Head injuries, post-concussion syndrome
- Hearing loss with tympanic membrane injury
- Acute anxiety

Acute Hospital Response

- The Acute area of the Emergency Department was cleared of all existing patients to make room for the injured
- Existing ED patients needing admission were quickly accepted by inpatient units with limited handoff to decompress the ED
- Triage disaster protocols implemented and led by ED attending physicians. Trauma teams staged outside of each bay.
  - External triage on the ambulance ramp staffed by EM MD and RN
  - Internal triage area created in ED waiting room
- Perioperative services reserved several operating rooms for expected incoming cases. Anesthesia, nursing, and surgical teams alerted staff.
  - Six patients underwent surgery within 30 minutes of ED arrival
- Security secured the ED, ambulance bays, and front entrances
Emergency Department Decompression

- ED volume decreased 97 to 39 patients within 1.5 hours

Mitigating Factors

- This event occurred during the day near shift change, which facilitated the response (essentially double coverage of staff)
  - Emergency plans need to consider rapid 24/7 response when staffing will be more limited
- Bombs were detonated outdoors and did not cause any major internal structural collapse requiring extrication
- Close proximity to six level-1 major trauma centers (BIDMC, BMC, BWH, Children’s, MGH, Tufts)
- Finish line staffed with emergency responders and medical tents
Critical Lessons Reinforced, New Lessons Learned

• The fundamentals of our MCI protocol were essential in our response
• We needed additional planning for:
  – Patient registration and tracking
  – Blood product surge
  – Managing ED crowding
  – Use of internists in surge
  – Communicating with the rest of the hospital

Creating an MCI Protocol: Guiding Principles

• Safety is always the primary consideration
• Department leadership and personnel need simple tasks to follow during an MCI event
• Rapid deployment of appropriate materials and personnel is paramount to ensure effective response to an acute MCI event
• Should the number of patients arriving at the hospital from an MCI overwhelm the hospital’s maximally mobilized resources, responding personnel may be forced to make difficult choices. In these situations the focus must be on doing the greatest good for the greatest number of patients.
Developing an MCI Protocol: Collaborative Planning

The Emergency Department is critical, but it is only one department …

- Admitting
- Anesthesiology/perioperative services
- Blood bank
- Environmental services
- Internal medicine
- Labs
- Materials management/patient transport
- Police and security
- Pharmacy
- Psychiatry/social work
- Radiology
- Respiratory therapy
- Surgery

Mobilizing Specific Resources

Must establish clear capacity immediately:

- 5 Residents
- 2 Portable X-Ray
- 4 Operating Rooms
- 20 Stretchers
- 10 Ventilators
- 2 Surgeons
- 2 Coolers, 10 Units of PRBC in each
Essential Decisions for an MCI Protocol

- Activation of the protocol
  - Who can activate?
  - What is an MCI?
  - What mechanism is used?
- Scope
  - Who is included?
  - How fast must they respond?
  - How many resources should be mobilized?

Key Questions When Activating the Protocol

- Is the event a potential or confirmed MCI?
- How many patients are estimated, or known, to exist?
- Is there any possibility of hazardous substances (chemicals, radiation, biologics)?
- Are there any known, or possible, security threats to the hospital?
- What level of certainty do we have about the information currently available?
Essential Elements of an MCI Protocol

1. Facility security  
2. Triage  
3. Patient registration  
4. Patient tracking  
5. Creation of immediate ED capacity  
6. Creation of resuscitation teams  
7. Creation of OR capacity  
8. Creation of support capacity  
   - Blood bank  
   - Labs  
   - Imaging  
   - Morgue  
9. Creation of inpatient capacity

Topics Requiring Special Attention

- Patient registration and EHR use  
- Creating immediate ED capacity  
- Creating capacity for minor injuries  
- ED crowd control  
- Patient tracking and connections with community tracking systems  
- Special populations  
- “Triage” hospitals
Expediting Patient Registration Using EHRs

Original Protocol (without EHR)
↓ Event recognition, Protocol activated
↓ Retrieve tags
↓ Place tags on disaster patients as they arrive
↓ Activate accounts or document on paper (wait)
↓ Send pre-filled lab slip
↓ Lab orders processed using downtime procedures (wait)
↓ Results called and relayed to patient’s clinical team (wait)

Revised Protocol (w/EHR)
↓ Event recognition, Protocol activated
↓ Retrieve mobile workstations
↓ Arrive patients using standard anonymous patient arrival process (wait)
↓ Place wrist band on patient
↓ Submit lab orders via Epic
↓ Labs expedited
↓ Lab results available via Epic

Creating ED Capacity

- ED clinicians must review the active ED census immediately on MCI protocol activation
- Admitting office, nursing leadership, medical leadership must mobilize to organize care for active ED patients and help move them out of the ED
Accommodating the Patient Surge

- Data shows that patients with minor injuries (green-triaged) can represent 50% or more of the patient population in an MCI
  - Minor-injured patients need less intensive monitoring
  - Reserve the ED bed spaces for higher acuity resuscitations
- Diverse planning committee can develop a Minor Injury Treatment Area
  - Supply carts to be delivered to the area to support wound repair, orthopedic care
  - RN staffing and administrative support to appropriately support the area
  - Efficient patient flow through

ED Crowd Control

- Must ensure access to ED for critical responders
  - Limit ED access for all others
- Limited resources to cover multiple entrances
- Provide external perimeter control
**Patient Tracking and the Community**

- Patients may be spread across multiple hospitals in the Region
- Hospitals and the community must create a system that re-unites patients and families as quickly as possible without violating patient privacy
  - MA system uses the Red Cross and public health

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**Unique Needs of Specific Populations**

- Pediatric patients
  - Family reunification
  - Security concerns
- Non-English speakers
  - Delayed response due to immigration concerns
  - Language barriers
  - Fear of retribution against a specific ethnic group
- Suspected perpetrators
  - Evidence collection
  - Security concerns
  - Impact to staff, patients, visitors
“Triage” Hospitals

• It is entirely possible that many or most patients may arrive at a hospital without sufficient trauma capabilities
• It is essential for hospital, public health and EMS leadership to develop similar “community MCI” protocols that support the best possible triage and transport away from these hospitals to available trauma centers

Training

• Tabletop Exercises
  – Discuss resource allocations to the ED amidst discharges and other patient movement
• Focused Drills
  – Confirm specific action items expected of each department upon notification of a protocol activation
• Full Scale Exercises
  – Evaluate interdepartmental coordination, including the movement of patients and resources throughout the building
• Ongoing “No Notice” Exercises
  – Maintain skill sets across all shifts to ensure a well rehearsed, automated response
“No Notice” Exercises

• Low impact, 15 minute commitment
• Maximize staff exposure across shifts
  – Resource RN, Lead Physician, Non-Clinical representative
• Focus on priority responsibilities within the initial moments of an event
  – Top three priorities for each role
• Increase muscle memory
• Practice in a familiar space

Response

• Communication
  – Mass Notification Platform
  – Front line staff, onsite and able to take immediate action
  – Leadership to guide overarching hospital operations
• Continued readiness to support an automated response
• Leveraging Hospital Incident Command (HICS)
  – Emergency Department Supervisor
Information Sharing

Who:
- Scene to the ED
- ED to ED
- ED to OR
- ED to EOC
- EOC to Staff
- External partners

How:
- Twitter
- Text Message
- Paging Systems
- Internal Website
- Radio
- Social Media

Thank you