Disaster Preparedness for Surgeons

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Today’s Topics

• Overview of disaster planning
  – Why do you need to know this?

• Typical hospital response
  – Organization and response in ED
  – Role of surgeons
    • Traumatic MCIs
    • Other events

• IEDs and blast injuries
Disaster Planning

- Formal process
  - Nationally standardized format
  - National Incident Management System (NIMS)
  - Surgeon on disaster committee required in Trauma Centers
The “All Hazards Model”

- Tornado
- Earthquake
- Hurricanes
- “Man Caused Disasters”
  - Bombings
  - Plane crashes
  - CBRNE
Emergency Management Program

• Multiple components
  – Hazard Vulnerability Analysis (HVA)
  – Emergency Operations Plan
    • Event specific annexes
      – Chemical, Biological, Burn, Evacuation
  – Training
  – Exercise Program
    • Exercise plan, improvement process
Hazard Vulnerability Analysis

<table>
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<tr>
<th>EVENT</th>
<th>PROBABILITY</th>
<th>RISK</th>
<th>PREPAREDNESS</th>
<th>TOTAL</th>
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<td></td>
<td>HIGH</td>
<td>MED</td>
<td>LOW</td>
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<td>WMD (BIOLOGICAL)</td>
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<td>WMD (NUCLEAR)</td>
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<td>INFANT ABDUCTION</td>
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<td>CIVIL DISTURBANCE</td>
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<td>BOMB THREAT</td>
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<td>ILLEGAL CHEMICAL LAB</td>
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Action Point determined to be 9 or above
Incident Command System (ICS)

- Originated 1970s
- Tested in multiple disasters
- Similar organization across all responders
  - NIMS: National Incident Management System
  - Joint Commission
IEDs

- Highest FBI ranked threat in USA
- Easily made devices
- Primary bombing
  - Maximize casualties and PR impact
  - Closed spaces
- Secondary devices common
  - Targeted at first responders
- Hospitals targeted overseas
IEDs

• Present large surges of patients
  – About 10% critical
• Even larger psychological casualties
  – Acute stress reactions
  – PTSD
• U.S. surge capacity low for these events
• Limited experience with blast injuries
US 1983-2002

- Bombing Incidents: 36,110
- Injuries: 5,931
- Deaths: 699
- Examples
  - Oklahoma City bombing
  - Olympic Park bombing
  - Abortion clinic bombings

Hospital Trauma Capacity

- 1 critical patient/100 beds – normal operations
- 2-3 critical patient/100 beds – maximal response
How does casualty load affect trauma care in urban bombing incidents? A quantitative analysis.
MCI Hospital Response

• EOP Activation
  – System wide notifications
  – UCH uses AlertFind
    • Notifies staff, physicians are separate

  – Overhead page of “Plan D”
MCI Hospital Response

• Security
  – Lockdown vs controlled access
    • No badge No entry
  – Security staff numbers limited
  – UCD/UCH campus area access plan
ED Initial Response

• ED Organizes
  – Red (Immediate, Critical)
  – Yellow (Intermediate, Delayed)
  – Green (Minor, Ambulatory)
  – Triage area set up
  – Disaster Registration commences
  – Form treatment teams for Red
    • Physician, nurse, ancillary
Surgery in Trauma MCI

- Report to Red Area
- Chief or Attending confer with ED Branch Director (ED senior physician)
- Senior surgeon assigns OR priority
- Form treatment teams for Red patients
- Patients to PACU for surgery holding
  - Coordinate with anesthesia
MCI Hospital Response

- ED empties of all noncritical patients
  - Use hall beds
  - D/C stable patients
- All patient flow is unidirectional
  - ED, critical studies, ICU or OR
- Operate in minimalist mode
  - Defer tests not immediately mandatory
Hospital Response

• Hospital Command Center Opens
  – Coordinate Response
  – Push out resources
    • Labor Pool
    • Supplies
  – Family Center
  – Behavioral Health Area
  – Morgue
MCI Hospital Phases: Chaos

- Duration: minutes to hours
- Poor communications
- Minimal and unreliable information
- Implement disaster plan, reorganize resources
- Staff checks family
Casualty Receiving

- Duration: few hours
- Hospital resources limited to on hand only
- Damage control mode, limited treatment of life and limb threatening injuries to maximize surge
Consolidation

- Duration: about 24 hours
- All casualties received
- Restock supplies
- Tally patients and prioritize surgeries
- Rotate staff
Phases continued

- Definitive Care: weeks
  - Further surgeries as needed
- Rehabilitation: months
MCI Triage

- Experienced Clinician in Ambulance Bay
- Red, Yellow, Green, Blue, Black
  - Modified START triage
  - Add behavioral component
- Tagged with tags/tape/folders/writing
- Stream to treatment areas
- Re-triage
- Mix in non-event patients
Special Triage Situations

- Pandemic
  - CDPHE Pandemic Triage Plan
  - Altered standards and places of care

- Radiation
  - Treat life threatening injuries before decon
  - Decon others first

- Nerve agents
  - Decon and wear PPE
  - Apnea with pulse becomes Immediate
  - Give antidote
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Disaster Record

TRIAGE CATEGORY
Red Yellow Green
Blue Black

Field Tag#__________________
Rad Survey Y N
Time By:
Decon Y N

NOTES

Impression

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Signatures: Nurse
Resident
Attending
HCC Response

• Send staff and beds to ED
  – ICU and PACU personnel ideal
  – Cross train
• Floor teams discharge all appropriate patients
  – Use discharge holding area
• Further guidance by HCC
  – Based on event magnitude
Family Center

- Hospital Family Information Center
  - Social worker staffing
  - Computer linked
  - Phones for families

- CDPHE HC Standard
  - Patient tracking
    - State wide
    - Need wide access
Behavioral Health Center

- Near but separate from hospital ED
- Staffed with social workers and psychological support staff
- Refer patients for medical screening if needed
- Screen for individuals needing intervention
- Quite setting, provide food and rest
Mental Health Issues

- Physically injured: acute stress reactions
  - 1:5
- Somatization issues
  - Chest Pain, dyspnea
  - May have injured patients in mix
  - Continuously retriage
IEDs  Continued

• Large IEDs
  – Common in Iraq and Afghanistan (VBIED)

• Suicide Bombers
  – Smaller devices
  – Closed spaces
  – Added shrapnel
  – Biologic issues

• Multiple devices
  – Secondary bomber common
IED Injuries

• Casualties: a few to 100-200
  • Multiple bombs > 1000 (Madrid)
• Approximately 60% of patients require surgery
• Average 1.5 operations/patient
• 5:1 ratio of Acute Stress Reactions to physically injured.
<table>
<thead>
<tr>
<th>Demographic Detail</th>
<th>Prevalence Among Admitted Patients*</th>
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<tbody>
<tr>
<td>Sex</td>
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<td>187</td>
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<tr>
<td>Female</td>
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<td>Age</td>
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<td>0–14</td>
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<td>15–29</td>
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<tr>
<td>1–8</td>
<td>151</td>
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<tr>
<td>9–14</td>
<td>56</td>
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<tr>
<td>16–24</td>
<td>44</td>
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<tr>
<td>25–75</td>
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In-hospital resource utilization during multiple casualty incidents
In-hospital resource utilization during multiple casualty incidents

<table>
<thead>
<tr>
<th>Admission Characteristics</th>
<th>n</th>
<th>%</th>
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<tbody>
<tr>
<td>Sent to CT scan from the ED</td>
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<td>39.7</td>
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<td>Underwent operation</td>
<td>196</td>
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<td>Direct transfer to the OR</td>
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<td>1st admitting department†</td>
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<td>ICU</td>
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<td>Other surgical</td>
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<td>Nonsurgical</td>
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<td>Pediatric surgery</td>
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<td>Chest surgery</td>
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<td>0.9</td>
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<tr>
<td>Mortality</td>
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<td>Died prior to transfer to department</td>
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<td>Overall inpatient mortality</td>
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<td>8</td>
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<td>Number of Patients for Whom Noted</td>
<td>All Casualties (n = 94,653)</td>
<td>Severe Injuries (ISS 16+) (n = 9670)</td>
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<tr>
<td>----------------------------------</td>
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<tr>
<td></td>
<td>Explosion (n = 1155)</td>
<td>Other (n = 93,498)</td>
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<td>In the ED</td>
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<td>Ultrasound scan</td>
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<td>In the OR</td>
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<tr>
<td>Thoracotomy</td>
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<td>Laparotomy</td>
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<td>Vascular</td>
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<tr>
<td>Craniotomy</td>
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<td>1.9</td>
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<tr>
<td>Fracture management</td>
<td>21.8</td>
<td>29.8</td>
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</table>

ISS indicates Injury Severity Score; ED, emergency department; OR, operating room; CT, computed tomography.
Primary Blast Injuries

- Blast wave (rapid overpressurization)
  - Affects gas filled structures
  - Lungs: “blast lung”, diffuse aveolar hemorrhage and air leaks
  - Middle ear: TM rupture, ossicle or cochlear disruption
  - GI tract: hemorrhage and perforation
  - Brain: TBI and concussion
Blast Lung

- Alveolar hemorrhage and airway disruption
- High risk of air embolism and pneumothorax
- Low ventilation pressure/volumes/PEEP
Secondary Blast Injuries

• Flying objects and shrapnel
  – Penetrating ballistic injury
  – Blunt injury
  – Biologic issues
    • Body parts
    • Hepatitis
    • HIV
    • Toxins

• Multiple patients with penetrating injuries
• Up triage patients with multiple punctures
Initial Treatment

• Typical trauma stabilization and evaluation
  – Fluid resuscitation
  – Screening ultrasound
    • Aids with immediate OR
  – Peritonitis or unstable to OR
• Liberal use of radiology and CT
• Hepatitis B vaccination
Multiple Penetrating Injuries

- Up triage multiple puncture wounds
- Damage control laparotomy
- Extensive use of interventional radiology
- Ophthalmology and ENT needed
- Multiple orthopedic cases
- Vascular surgery
Tertiary Blast Injury

• Caused by blast wind: individual thrown into objects
  – Any injury type
  – Fractures
  – Amputations
  – TBI
Quaternary Blast Injuries

• All other injuries
• Burns
• Crush injuries
• Exacerbation of pre-existing diseases
  – E.g. asthma
Mental Health Issues

• Open Family Center
  – Support
  – Reunification

• Behavioral health areas

• Staff support
  – Debrief
  – Formal Counseling
IED Summary

- Real risk for mass casualty events
- Will present multiple patients rapidly
- Markedly strain hospital resources
- Unique injury patterns and treatment