Multiple- and Mass-Casualty Critical Care

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Triage during a Mass-Casualty Incident: Change of Mindset for the Intensivist

- **Multiple-Casualty Incident**
  - The number of patients and the severity of injuries do not exceed the ability of the facility to render care
  - Life-threatening injuries treated first

- **Mass-Casualty Incident**
  - The number of patients and the severity of their injuries exceed the capability of the facility or the community
  - Patients with the greatest chance of survival are managed first
  - “the greatest good for the greatest number”

  – ATLS, Student Course Manual, 7th edition, American College of Surgeons, Committee on Trauma
Triage during a Mass-Casualty Incident: Change of Mindset for the Intensivist

- Finite resources, both human and equipment, for large number of injured
- Judicious use of resources on those who will gain most benefit, not on others
- Minimal Qualifications for Survival
Treatment

- Early deaths prevented by: airway protection, hemorrhage control, tube thoracostomies, IV fluid

- Late deaths prevented by: aggressive wound care, antibiotics, laparotomy, amputation
  - Small soft-tissue wounds: tetanus, PO Abx, home care by family
  - Large soft-tissue wounds: IV fluids and Abx, debridement

- Mortality: 5% for patients who arrived within 6 hours

Great White
Station Nightclub Fire

- 439 patrons
- 215 casualties at 16 hospitals
- At Rhode Island Hospital
  - 64 evaluations
  - 47 admissions
  - 28 intubated/inhalation injury
  - Avg age: 31 (18-43)
- 8 Transfers
Rhode Island Hospital Response

- **ED Cleared and Stocked**
  - Acute Pts Admitted/Moved to HCH ED
  - Nonacute Patients D/C’ed with F/U

- **Burn Units Created – 5th Floor**
  - 10 Bed TICU + 11 Bed ISCU = Burn ICU
  - 22 Bed Ward (Capacity 34) = Burn Ward

- **Trauma teams created**
Creating a Burn ICU and Burn Ward
Creating a Burn ICU and Burn Ward
1 in-house surgeon, 4 more called in from home
- 2 in ED
- 2 in TICU/Burn unit
- 1 in surgical floor

30 surgical house officers

1st week
- 2 attending, 4 residents in burn units at all times
RIH Experience—1st 48 Hours

- 22 Intubated Pts, All Had Bronchoscopy
- 17 Pts Had Escharotomies
- Bedside Debridements
- OR Plan
- Family Meetings
- Press
- Govt. officials
Rhode Island Hospital Aftermath

- Over next 4 weeks
  - 43 operations
  - 9 bedside trach
  - 132 bronchoscopies

- 100 died (96 at scene)
Lessons Learned from a Nightclub Fire: Institutional Disaster Preparedness

Eric J. Mahoney, MD, David T. Harrington, MD, Walter L. Biffl, MD, Jane Metzger, RN, DNSc, Tomomi Oka, MD, and William G. Cioffi, MD

● Strengths
  ■ Strong hospital commitment
  ■ Frequent disaster drills
  ■ Experienced trauma surgeon overseeing patient triage
  ■ Quick formation of trauma teams
  ■ Attending surgeon presence in key hospital locations

● Weaknesses
  ■ Poor communication with disaster scene
  ■ Disaster plan lacking specific instruction for patient relocation/movement and redistribution
Opportunities for Improvement

- Centralized Communications Linked to Level I Trauma Center
- Online Database of Hospital Resource Availability, Surge Capacity
- Destination Protocols
- Statewide Trauma System
- Regional Disaster Plans
Emergency Mass Critical Care

- Develop coordinated regional plan
  - Graded regional response plan
- Anticipate for 300% capacity for 10d
- Prepare for minimal qualification for survival
- Identify minimal critical care services
- Stockpile equipment
Augmentation of hospital critical care capacity after bioterrorist attacks or epidemics: Recommendations of the Working Group on Emergency Mass Critical Care

Lewis Rubinson, MD, PhD; Jennifer B. Nuzzo, SM; Daniel S. Talmor, MD, MPH; Tara O’Toole, MD, MPH; Bradley R. Kramer, BS; Thomas V. Inglesby, MD; for the Working Group on Emergency Mass Critical Care

- Critical Care Medicine, 2005, 33(10), E2393

- Provides recommendations for minimum critical care services in the wake of a bioterrorist attack
  - Basic mechanical ventilation
  - Hemodynamic support: Fluids and pressors
  - Antibiotic/disease-specific countermeasures
  - Prophylactic interventions
    - HOB 45’, DVT and GI prophylaxis
Ventilators

- Oxygenate/Ventilate adults and pedi
- Function with low-flow oxygen and without pressurized gas
- Accurate MV
- Sufficient alarms
- >4 hour battery life

Do not rely solely on vendors/stockpiles
Required EMCC Medications

- Sedation/analgesia: benzo, opioids, paralytics
- Bronchodilators: anticholinergic and β-agonist
- Crystalloids: NS, LR
- Vasopressor
- Antimicrobials
- Anticoagulant
- Hormone: Insulin, Hydrocortisone
Adding ICU Beds

- Transfer existing patients out of disaster area
- Preexisting specialty units
  - PACU / Same day surgery
  - CCU
  - Dialysis Units
- Increase # beds/room
- Hallways
- Annex neighboring units
EMCC supply carts

Predetermined checklist; rotate in new for rapid replacement
Trained Physicians

- **Klein and Weigelt, Surg Clin No. Amer, 1991**
  - Reviewed response to 3 successive MCI
  - Too many physicians with limited MCI experience trying to care for patients → hampered response
  - Limited access/ developed teams for next MCI

- **New Orleans’ Physician experience**
  - Hematologist assigned to assist HCA Tulane during hurricane Katrina
  - “Hospitals enlist the doctors who happen to be on call”
    – Curiel, NEJM, 2006
Anticipate shortage of experience, MCI-trained intensivists during a disaster

Recommend a two-tiered staffing model

- Non-intensivist clinicians each responsible for general medical management of six critically ill patients
- Intensivists responsible for acute emergencies (e.g. airway and ventilator management) while each overseeing 4 non-intensivists

[Experienced leadership frequently re-triaging ICU patients and in communication with incident commander]
Expanding Intensivist Coverage

Non-Intensivist

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Critical Care Nurses

- Sudden urgent need for MCI trained nurses
  - Extend work hours
  - Staggered recall of off-duty personnel
  - Recruit ICU nurses from other units (e.g. MICU)
  - Recruit ICU nurses from other states / FEMA / DMAT
  - Steady recruitment and training of volunteer nurses (Haifa Medical Center, Israel)
  - Retrain / update ICU nurses who have changed jobs (US military model)
Expanding Critical Care Nurse Coverage

Critical Care Nurse

Non-Critical Care Nurse

Patient

Patient

Non-Critical Care Nurse

Patient

Patient

Non-Critical Care Nurse

Patient

Patient
Expect to lose everything!

- Air-conditioning
  - Bellevue, NYU, HCA Tulane, Charity
- Advance radiographic capabilities
  - Bellevue, NYU, HCA Tulane, Charity
- Primary / Secondary Generators (Floods)
  - HCA Tulane, Charity, Medical Univ. Hosp, SC
- Food, water, fuel, plumbing
  - HCA Tulane, Charity
- Morgue Capabilities
  - HCA Tulane, Charity
- Communication
  - HCA Tulane, Charity