The Use of New Technology in Mass Casualty Situations and the ICU

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Disclosures
- None financial
Outline

- Definitions
- Incidence
- Response Structure
- Educational Options
- Importance of Triage Accuracy
- Emerging Technologies for prehospital and hospital management

What is a Disaster or MCI?

- Magnitude of destruction or injuries exceeds that of routine emergency situations
- Major disruption of the infrastructure of a community or geographic region and its inhabitants
Incidence

- Among the 9,776,094 EMS responses in the 2010 National EMS Database, 14,504 entries were documented as MCI
- 47.6% documented experiencing a response delay compared to only 12.3% of non-MCI EMS responses

Response Structure

- Declaration of an MCI
- Initiation National Incident Management System (NIMS)
- Triage
- On-site Treatment
- Transport
- Definitive Care
- Demobilization

Schenk E, Wijet, et al.
FEMA: Center for Disaster Preparedness

- AWR-160, WMD/Terrorism Awareness for Emergency Responders;
- IS-100.HCb, Introduction to Incident Command System for Healthcare/Hospitals;
- IS-200.HCa, Applying ICS to Healthcare Organizations; and
- IS-700.a, National Incident Management System, An Introduction.
- HERT PER-902 Hospital Emergency Response Training for Mass Casualty Incidents


Course Objectives
Identify key considerations and strategies for preparing for mass casualty incidents, including:
- Understanding the threats and challenges.
- Establishing planning processes.
- Assessing and mitigating vulnerabilities.
- Establishing response procedures.
- Planning for recovery.
- Staying prepared.

https://training.fema.gov/is/courseoverview.aspx?code=IS-360
Triage

START – Simple Triage and Rapid Treatment

- **Immediate**: Patients who have major life-threatening injuries, but are salvageable given the resources available
- **Delayed**: Patients who have non-life-threatening injuries, but are unable to walk or exhibit an altered mental status
- **“Walking Wounded”**: Patients who are able to ambulate out of the incident area to a treatment area
- **Deceased or Expectant**

Importance of Triage Accuracy

Triage and trauma workload in mass casualty: a computer model.
J Trauma. 2010 Nov;69(5):1074-81; discussion 1081-2.
Hirshberg A, et al.
Emerging Technologies

- Wireless Physiologic Monitors
  - SpO2, HR, BP and ECG, accelerometer
  - **Geolocation capability**
  - Adequate monitoring range and data storage with seamless uploading
  - Color-coded vitals and automated triage support
  - Minimal footprint
  - Can stay with patient from prehospital to hospital and beyond
  - **Battery life**
  - Multiple casualties can be monitored by single provider
  - **Automation (AI)**

WVSM® (Wireless Vital Signs Monitor)

https://athenagtx.com/products/wireless-vital-signs-monitor/
HSPRO...for medical providers

https://athenagtx.com/rd/#accs

Patient Status Engine

http://www.isansys.com/
Limitations of Monitoring Devices

- FDA approval process, decision making vs diagnosis
- Pediatric Cases
- Range
- Cyber Security

Drones

http://newsroom.medsystems.com/university-medicalexplorers-studying-use-drones-mass-casualty-events/
“Drones at the service for training on mass casualty incident A simulation study”


Automated Transportation

https://www.army.mil/article/184593/medical_operations_in_the_multidomain_battlefield
ion mobility spectrometry (IMS)

- Chemical threats
- Explosive precursors

https://www.fema.gov/authorized-equipment-list-item/07cd-01-dpsi

Asiana Airlines Flight 214

Saturday, July 6, 2013

- 192 Injured
- 3 deaths
- 63 evaluated at San Francisco General Hospital
- In the first 48 hours, 15 operations were performed and 117 total units of blood products were transfused
- A total of 370 nursing overtime hours were required to treat the injured patients on the day of the event

Applying minimal footprint technology to overcoming language barriers during humanitarian, overseas mission, and/or trauma mass casualty scenarios

- On average, 8.5% of the US population is limited-English-proficient (LEP)
- Another 2% are deaf or hard-of-hearing
- The LEP population among traditional immigrant-destination states such as California can be as high as 19% according to 2013 census data

Remote Continuous Medical Interpretation

The ICU of the Future
Needs Assessment

- Wireless integration (Decrease Cable "spaghetti")
- Improve ergonomics (Obtrusive overhead booms)
- Automation
- Ease of use
- Improve reliability, predictability and repeatability
- Improve patient safety and decrease complications
- Plug and play
- Integration between bedside technologies for monitoring, diagnosis, intervention and data transfer
- Diagnosis and decision support
- Research capability (high resolution data)
- Portability

Market Segment

- Civilian
- Military
- Global Healthcare Initiatives
- Space Travel
- Education
Technology Platforms

- Fluid Monitoring
- Infection Control
- Physiologic Monitoring
- Language Translation
- Mobility/Physical Therapy
- Simulation
- Telemedicine
- Sleep Hygiene
- Patient Safety
- Diagnosis (tests/labs)
- Medication Tracking/Administration
- EMR/Data integration
- Predictive Algorithms/Decision support
- Minimally invasive/nanotechnology
- 3D Printing

Current Projects

- Automated urine output measurement device
- Automated hand hygiene alert device
- Limited Footprint and Easily Portable Real-time Physiologic Monitoring System (Isansys)
- Applying minimal footprint technology to overcoming language barriers (Martti)
- Applying technology to improve mobility in the ICU
- Adverse event simulation in the ICU environment
OSU Innovations Collaborative

- Undergraduate student capstone projects

1865…
Liquid Ventilation

- Liquid Ventilation
- Perfluorocarbon
- Respiratory support or therapeutic lavage
- Improves lung compliance and reduces ALI
Optimal Control of Inspired Perfluorocarbon Temperature for Ultrafast Hypothermia Induction by Total Liquid Ventilation in Adult Patient Model.


Suspended Animation
- Suspended animation inducer hydrogen sulfide is protective in an in vivo model of ventilator-induced lung injury.


“Any sufficiently advanced technology is indistinguishable from magic” Arthur C. Clarke

2001: A Space Odyssey

2010: A Space Odyssey
Thank you! Questions?

Other References: