Boston Marathon Bombings
Lessons Learned and Medical Aftermath

Joseph S. Blansfield, MS, RN, ANP-BC
Trauma & Acute Care Surgery Program Manager
Boston Medical Center
Colonel, Army Nurse Corps
United States Army Reserve

BOSTON TRAUMA

BOSTON MEDICAL CENTER
EXCEPTIONAL CARE. WITHOUT EXCEPTION.

The Boston Marathon Bombings 4.15.2013

World's oldest annual marathon

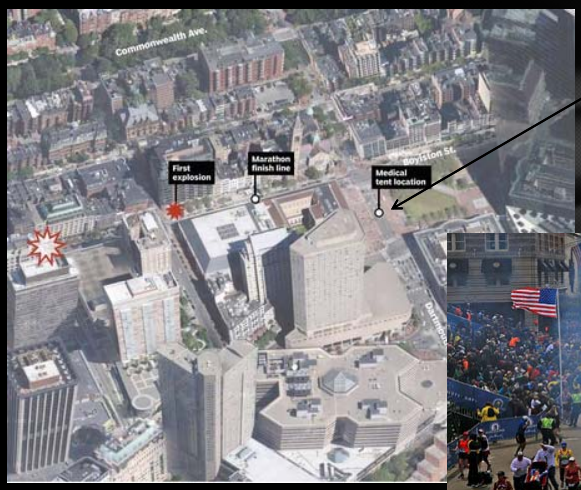
- First started in 1897

Attracts 500,000 spectators

- Making it the most widely attended athletic event in New England

2:50 pm: AN EXPLOSION OCCURS JUST BEFORE THE FINSH LINE AT MARATHON SPORTS

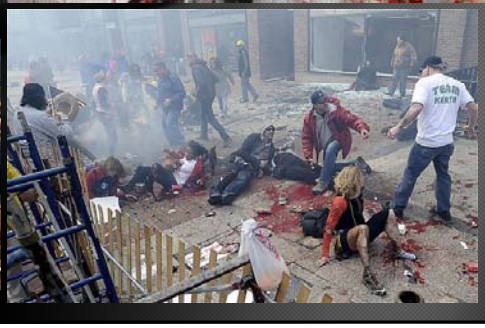
THIRTEEN SECONDS LATER, A SECOND EXPLOSION, 1500 YARDS AWAY FURTHER UP BOYLSTON ST.

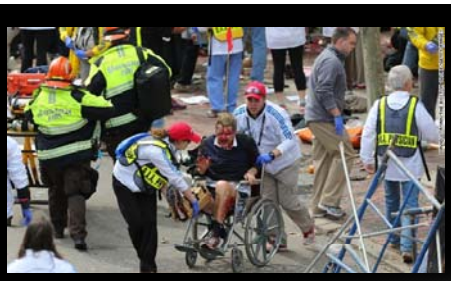


Note Medical Tent proximity to the Explosions

Immediate Aftermath






Boston Medical Center receives first marathon patient at 3:08pm

First call – colleague on scene called BMC ED "something just happened."

2 mins later – C-MED Radio: Bomb had gone off.

Fortunate circumstances:

Boston has 5 Adult Level I trauma centers

Patriots Day Holiday

ORs were open

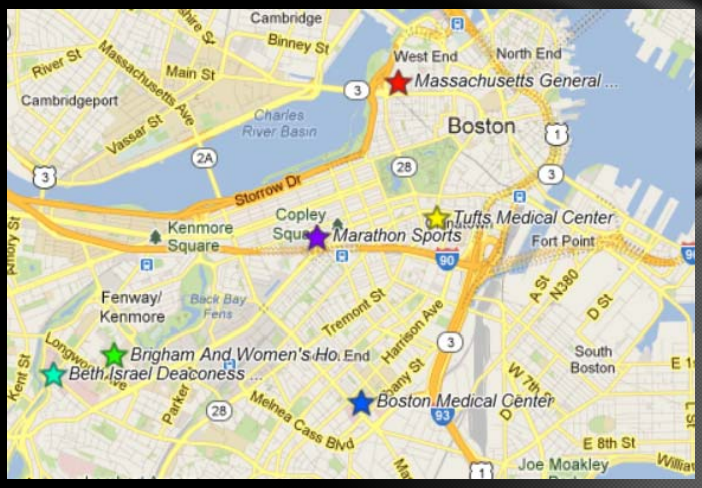
Change of shift

EMS were already at the scene

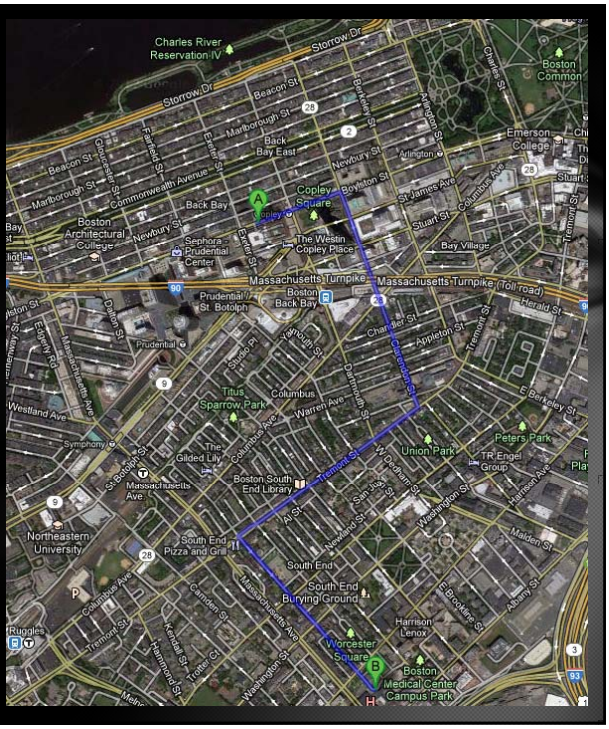
EMS SUCCESS

- Mutual Aid called immediately
- 90 patients transported in 30 minutes
- 30 of the most severely injured were transported out 18 minutes after the blasts
- 3 people dead on scene (not transported)
- 264 Injured, Many Critically

Adult Level 1 Trauma Centers in relation to Marathon Sports



Route from first explosion to BMC emergency department



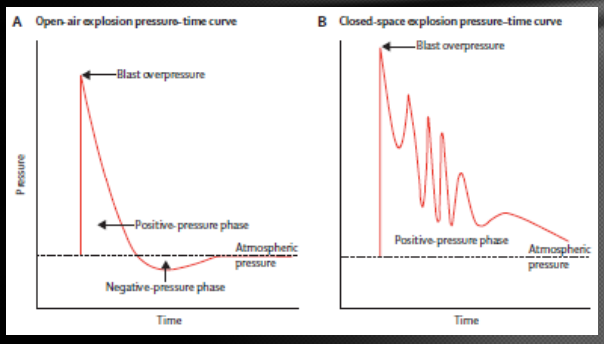
45 minutes after the blasts, all seriously injured patients had been transported to the 5 adult level 1 trauma centers

- Beth Israel Deaconess Medical Center
- Boston Medical Center
- Brigham and Women's Hospital
- Mass General Hospital
- Tufts Medical Center

PHYSICS OF BLAST INJURIES

Open vs Confined Space

- Effective overpressure amplified by reflection
- Open spreads circumferentially & dissipates
- Confined raises the overpressure and duration of positive pressure phase
- Increases ISS, incidence of primary blast injury, overall mortality



J Trauma 1996 41: 1030-35.

MECHANISMS OF BLAST INJURIES

Primary
- Blast overpressure
- Atmospheric wave

Secondary
- Physical debris that is displaced by overpressure
- Penetrating injuries, fragmentation wounds

Tertiary
- Physical displacement of the person
  - Blunt injuries
    - Closed head injuries, blunt abd trauma, fractures

Quaternary
- Everything else
  - Burns, toxic substance exposure (radiation, carbon monoxide, etc)

Lancet 2009; 374: 405-15

Outcomes

BMC PATIENTS

28 (bomb-related) patients, 19 admissions

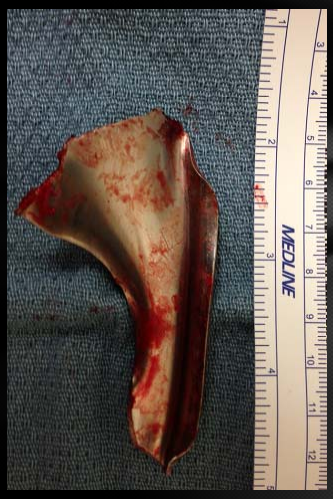
Age range: 5-70

6 males, 13 females,1 child ; Most spectators; 1-2 runners

16 operations first 8 hours -11 major, 5 minor (52 total)

- 7 amputations in 5 patients
- 3 major vascular injuries
- 1 significant penetrating abdominal evisceration
- 2 head injuries
- 1 pulmonary blast injury
- 12/19 had acoustic trauma
- All with lower extremity fragment injuries

Fragment removed from abdominal evisceration patient



Crucial to success at the scene:

Timely interventions by pre-hospital personnel and bystanders (pressure dressings and tourniquets)

Minimal treatment at the scene

Rapid transport to trauma centers that could provide definitive care

Equal distribution of critical patients

Crucial to success at BMC:

Early replacement of improvised tourniquets with effective tubing/clamp tourniquets

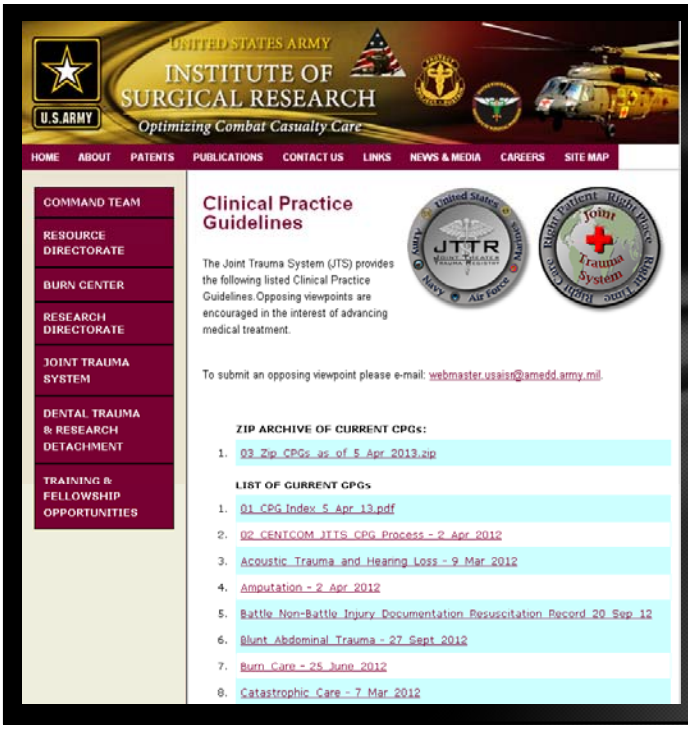
Simultaneous resuscitation

Treatment of shock early and aggressive blood transfusion (47 units O neg blood given in the ED)

Expedient movement to the OR for definitive care

Utilization of lessons learned from the military experience in Iraq and Afghanistan

- Debridement of War Wounds
- Damage Control Procedures



http://www.usaisr.amedd.army.mil/clinical_practice_guidelines.html

Additional Considerations for the ED

- ✓ Don't count on meaningful scene triage
  "All Initial Reports are False"
- ✓ Have senior Trauma surgeon in ED to Triage, not to operate
- ✓ Place Critical pts. in one large space, so they can be managed together, maximizing resources
- ✓ Parallel Process: Move people out of ER ,OR ,ICU, Floor
  Establish staff and family support area
  Facility security, managing the 4th estate
- ✓ Expect the unexpected: Acoustic Trauma
  Infectious Diseases
- ✓ Be Prepared and Practice

Additional Considerations

AAR / Lessons Learned

Internal, departmental, institution and citywide

Acoustic trauma / ENT consults

Infectious disease / unprotected blood exposures

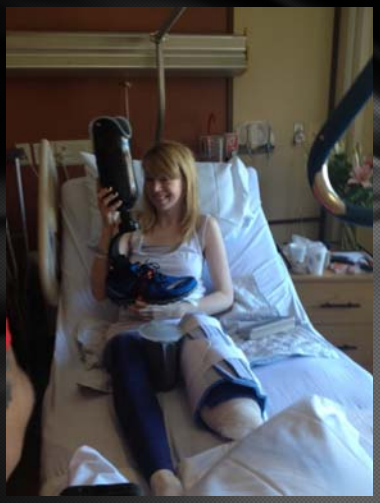
Social work support for patients and families

Reuniting displaced families

Plans for follow-on rehab

Collaborative process amongst all level 1 trauma centers for IRB/publications

Visits from veterans, politicians, celebrities and athletes



Early Conclusions

Sustain
- Equal distribution of patients
- Early use of tourniquets
- Family support center

Improve
- Patient tracking system
- Abbreviated medical record
- Defined surgical triage officer
- Comprehensive patient identification/notification process

Thank You!