Welcome Back!

Motor Vehicle Crashes and Trauma
Prepared for you by 'Dr. Jimmy'
James M. Nania M.D., F.A.C.E.P.

First Road Traffic Death

August 17, 1896, Crystal Palace, London, UK
Bridget Driscoll 44F and mother of two is hit from behind by another car traveling at "tremendous speed" and died of a head injury.

The driver of the other car had tampered with the belt, causing the car to go at twice the intended speed and was also said to have been talking to the young lady passenger beside him.

After a 6 hour inquest the jury returned a verdict of "Accidental Death"
Coroner remarked: "I trust that this sort of nonsense will never happen again."

Today in America

- Traffic fatalities were up 9% in the first 6 months of 2016
- An estimated 19,100 people were killed on U.S. Roads from January to June of this year and 2.2 million were seriously injured.
- Estimated costs: $205 billion
- At this rate we could exceed 40,000 fatalities this year.

Trauma and the “Golden Hour”

"There is a golden hour between life and death. If you are critically injured you have less than 60 minutes to survive..."
R. Adams Cowley M.D.

The Golden Hour?

Our search into the background of this term yielded little scientific evidence to support

- There are no large, well-controlled studies in the civilian population that either strongly support or refute the idea that faster is universally better in trauma care.
- The intuitive nature of the concept and the prestige of those who originally expressed it resulted in widespread application and acceptance.

The golden hour: scientific fact or medical "urban legend"?
Lerner EB, Moscati RM. Acad Emerg Med. 2001 Jul;8(7):758-60
**Trends in Time Critical Death from Trauma**

**Causes of Death After Trauma**

**Trimodal Peaks**

First Peak: Seconds to Minutes
- Brain, High Spinal Cord, Major Vessel

Second Peak: Minutes to Hours
- Airways, HTHX, PTHX, Sub/Epidurals, Spleen and Liver Lacerations

Third Peak: Days to Weeks
- Sepsis and Multi-organ Failure

"Acute subdural hematoma: severity of injury, surgical intervention and mortality"

The mortality of patients with GCS scores of 4-6 operated on within 4 hours of injury was 62% in contrast to 33% for those operated on from 4 to 10 hours.

Shorter time from injury to surgical evacuation does not affect Mortality within 10 hours of injury.


"Prognosis after acute subdural or epidural hemorrhage"

Outcome was influenced by the duration of the interval between Onset of coma and surgical decompression.

- When this interval exceeded two hours, mortality from SDH rose from 47 to 80% (good outcomes 32% to 4%).
- In acute EDH an interval under two hours lead to a 17% mortality and 67% of good recoveries compared to 65% mortality and 13% of good recoveries after an interval of more than two hours.


"Outcome after acute traumatic subdural and epidural haematoma in Switzerland: a single-centre experience"

"Only age, GCS at admission and pupil abnormalities seemed to be associated with outcome. Time to surgery was not. (if treated within 3 hours of injury)


"Time Criticality of Surgical Intervention for Epi/Subdural Hematomas"

"Acute subdural hematoma: Outcome and outcome prediction"

"Time from injury to surgical evacuation and type of surgical intervention did not affect mortality."

Redefining hypotension in traumatic brain injury


“Patients with isolated moderate to severe TBI should be considered hypotensive < 110 mmHg.”

Prehospital Life Saving Treatment

Airway AND Breathing

“Traumatic Brain Injury and Prehospital Ventilation”

- Targeted CO2 (30 – 35mmHg) with prehospital ventilation was associated with lower mortality after TBI
- It was as harmful for our patients to have a low CO2 as it was to have a high CO2
- Mortality: Low CO2 – 25
- Target V.: - 16.1%
- Mild high CO2: - 26.6%
- Very high CO2: - 36.6%

RSI and Outcomes

“A follow-up analysis of factors associated with head-injury mortality after paramedic rapid sequence intubation.”


- Paramedic RSI was associated with an increase in mortality compared with matched historical controls. The association between hyperventilation and mortality was confirmed
- The association between hyperventilation and mortality was confirmed.

Hypotension and Hypoxia during Resuscitation

Secondary insults after TBI are common, and are associated with disability.

Hypoxia in the prehospital setting significantly increases the odds of mortality after brain injury controlled for multiple variables.

Modern Goals of Airway and Breathing Management

A Ewe with a hat = Eucapnia (35-45 mmHg)
Farmer Norm with his Ox = Normoxia (94-100 %)
Sucking Chest Wounds

Needle Thoracostomy

Distance to Pleura

Ant. 2nd ICS = 46mm
Lat. 5th ICS = 53mm

"Anterior Versus Lateral Needle Decompression Of Tension Pneumothorax: Comparison by Computed Tomography Chest Wall Measurement"


How Good are we at making the ‘call’?

Patients needle "decompressed" for CLAIMED Tension Pneumothorax

57

Patients found to have Tension Pneumothorax AFTER needle "decompression"

42

Patients with Tension Pneumothorax BEFORE needle "decompression"

??

Patients with REAL Tension Pneumothorax BEFORE needle "decompression"

?

Technique for Shorter Scene Times

Volume Repletion – Or Not?

Contemporary Themes:
Permissive Hypotension and Delayed Fluid Resuscitation

"Prehospital Intravenous Fluid Administration is Associated with Higher Mortality in Trauma Patients: A National Trauma Data Bank Analysis"


The ‘Old’ Way

Two Large Bore IVs Wide Open!
### Prehospital Fluid Resuscitation in the Injured Patient


- Fluids (in the form of small boluses, i.e., 250 mL) should be given to return the patient to a coherent status or palpable radial pulse.
- In the setting of traumatic brain injury, however, fluids should be titrated to maintain a SBP > than 90 mm Hg (or a MAP of > 60 mm Hg).
- There is insufficient evidence to show that injured patients with short transport times benefit from blood transfusions.

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### Placement of Venous Access

- Placement of venous access at the scene delays transport and placement of access enroute should be considered.
- In patients with penetrating injuries and short transport times (<30 min) fluids should be withheld in the prehospital setting in patients who are alert or have a palpable radial pulse.

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### What About Meds?

- An IV is critical for the administration of medications for RSI, pain & suffering, agitation, and nausea.

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### Control of Hemorrhage

- Blunt trauma outcomes improved by early transfusion
  - Brown et al. ASST Oct. 2013

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### BLOOD

- "Blunt trauma outcomes improved by early transfusion" Brown et al. ASST Oct. 2013
Open Book Pelvic Fractures

TPBs effectively reduce unstable pelvic fractures as well as definitive stabilization and decrease pelvic volume (Level III recommendation)

TPBs may limit pelvic hemorrhage but do not seem to affect mortality. (Level III recommendation)

TPBS work as well or better than emergent EPF in controlling hemorrhage (Level III recommendation)

"Pelvic Fracture Hemorrhage—Update and Systematic Review"

Femur Fracture Stabilization

Traction splints are believed to reduce pain, blood loss and secondary injury

"There are limited data available on the benefit of traction splint use for femur fracture in the prehospital or transport environment.

One study found an estimated blood loss of 1,276 cc.


Temperature Management

The Lethal Triad

Acidosis
Death
Hypothermia
Coagulopathy

Source: Nakos XL, Moore EE, Feliciano Dv. Trauma. 7th Edition: www.accessmedicine.com

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Tranexamic Acid

"The importance of early treatment with tranexamic acid in bleeding trauma patients: an exploratory analysis of the CRASH-2 randomised controlled trial.


"Tranexamic acid should be given as early as possible to bleeding trauma patients."

On-scene time and outcome after penetrating trauma

"On-scene time and outcome after penetrating trauma: an observational study"

A higher mortality was found among patients treated on-scene for more than 20 min, although on-scene time was not a significant predictor of 30-day mortality.

Impact of Out-of-Hospital Scene and Transport Times on Trauma Mortality

"Emergency medical services out-of-hospital scene and transport times and their association with mortality in trauma patients presenting to an urban Level I trauma center"

- We observed increased odds of mortality among patients with penetrating trauma if scene time was greater than 20 minutes compared to a scene time of less than 10 minutes.

- We did not observe associations between increased odds of mortality and out-of-hospital times in blunt trauma victims.

If your patient has severe internal bleeding from penetrating trauma:

Load and Go!
But, don’t forget
Damage Control!
“Damage Control” in the Field

1. Establish a Definitive Airway AND oxygenation and ventilation.
2. Treat Sucking Chest Wounds and Tension Pneumothoraces.
3. Control Exanguinating External Hemorrhage.
4. Bind Unstable Pelvic Fractures
5. Splint Femur Fractures
6. Establish IV Access AND give fluids if needed to maintain vital organ perfusion.

Key Performance Indicators of the Future

- Time to normoxia
- Time to eucapnia
- Time to chest decompression
- Time to targeted blood pressure
- Time to normothermia
- Time to external hemorrhage control
- Time to internal hemorrhage mitigation

Trauma

- Take Immediate “Damage Control” actions to prevent death from things you can fix or improve at the scene and/or during transport
- Expedite the transport of patients with penetrating trauma and/or severe internal bleeding.
- Establish a definitive airway immediately and with great care

Initiate: Targeted management of the ABCs and body temperature.

 Activate: the receiving trauma center’s response

Other Factors to Consider...

…Of Course Consider Transport Time
Lights and Sirens?

“In this urban EMS system L&S reduce ambulance response times by an average of 1 minute, 46 seconds.”
“Do warning lights and sirens reduce ambulance response times?”

Hot Loading?

“Helicopter loading time study: hot versus cold.”
Results: Loading Time:
Hot load: 3.071 min.
Cold load: 5.033 min.
Total Scene Time:
Hot Load: 10.54 min.
Cold Load: 13.615 min.

Glamour and Aeromedical Response

“In Pa., new “hot load” air med procedure saves lives!
“The Medical Technicians, clad in their glistening helmets and matching flight suits”
The Evening Sun Nov. 08, 2011, Craig K Paskoski

Safety and Time Criticality

There is no interval of Prehospital time as it relates to patient outcomes that justifies any compromise of SAFETY!

Summary

The Time criticality of the Emergency Care for these major causes of premature death and disability in our nation have unique elements of both Prehospital and Hospital based Emergency care.

Our Role in Saving Life and Limb

“In our hurry to get our patients to the hospital we must not forget that sometimes what they need the most and the soonest are the things we can do!”
Mark Olsky MD, FACEP
Questions?
James M. Nania MD, FACEP
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Post-Test
1. Safer cars and tougher DUI and cell phone use laws have reduced the occurrence of highway fatalities in America.
   a) True
   b) False

Post-Test
2. The “Golden Hour of Trauma”
   a) Means you have about one hour to be saved after a major trauma
   b) Was a term applied by R. Adams Cowley to advocate for funding the Maryland State Trauma System
   c) Is actually composed of three periods of death after a major injury one occurring up to weeks after the injury
   d) B & C

Post-Test
3. Airway and Breathing control of trauma patients should:
   a) Attempt to keep good levels of oxygen saturation
   b) Maintain Carbon dioxide within a normal range
   c) Should include vigorous hyperventilation in head injury patients
   d) A&B

Post-Test
4. “Sucking” chest wounds should be covered by an occlusive dressing taped on 3 of the four sides to allow air to escape.
   a) True
   b) False

Post-Test
5. Blood pressure in patients with severe isolated head injury should be kept:
   a) Within normal range
   b) In a lower range: just enough to allow vital organ perfusion
   c) In a higher range to support cerebral circulation
Special thanks to
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wcsocrow@yahoo.com

For providing our Secret Question prize

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