Crisis Averted: The Importance of Trauma Centers

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Here, it's different.™

Disclosure

I have no financial disclosures

Session Objectives

Discuss the importance of trauma centers

Discuss Resuscitation Priorities

- ATLS
- Massive Transfusion
- Rapid OR mobilization

Discuss Signs of Shock

Our Story Begins……

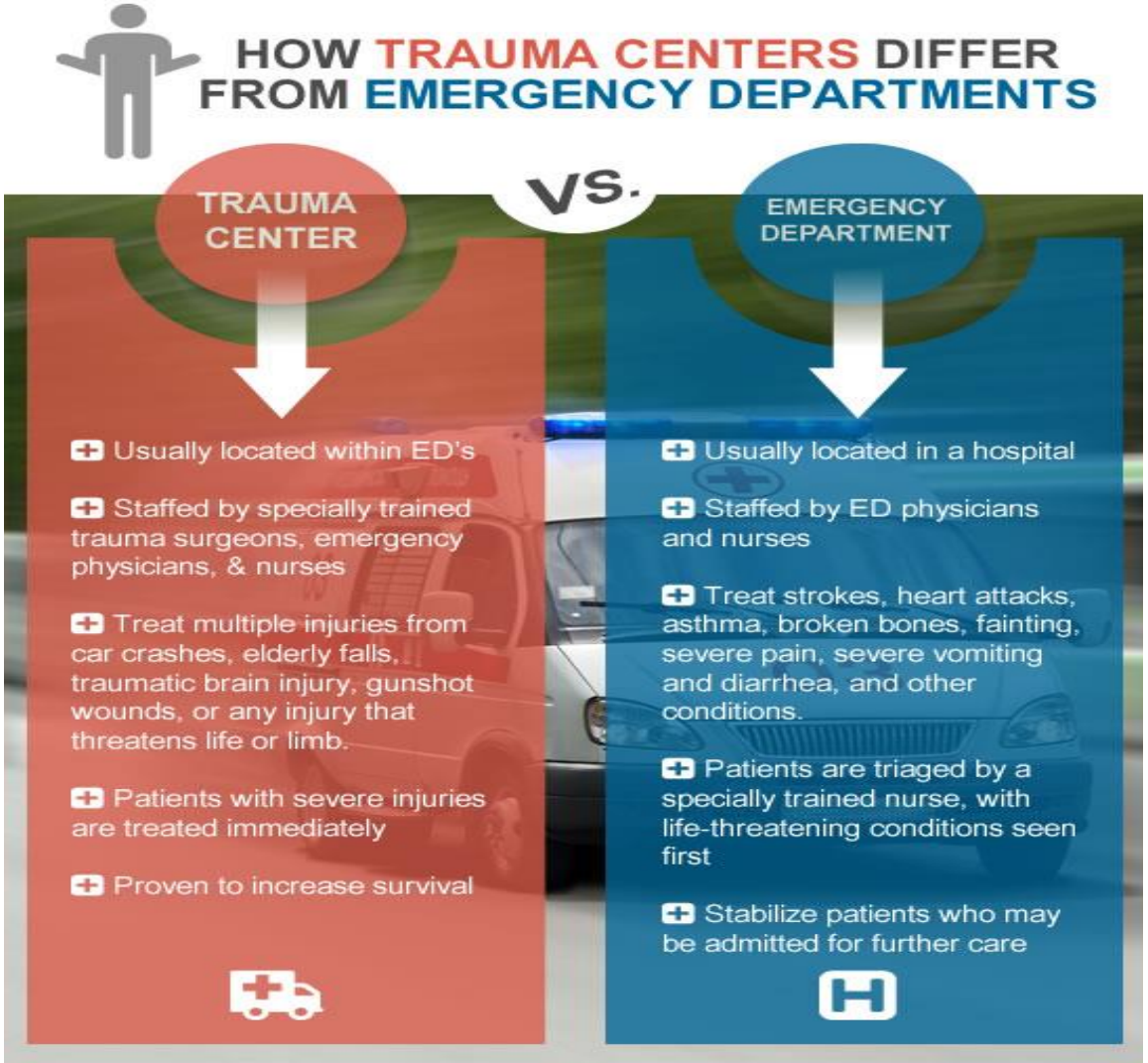
What We Know…

- 4 y/o male who arrives to ED triage by parents. Upon arrival to the triage desk, family is carrying child and he is limp and listless
- Appears apneic
- Triage nurse immediately takes child to trauma bays
- CPR started

- What are we thinking ?

Definition of a Trauma Center

A **trauma center** is a hospital equipped and staffed to provide care for patients suffering from major traumatic injuries such as falls, motor vehicle collisions, assaults, penetrating and other injuries

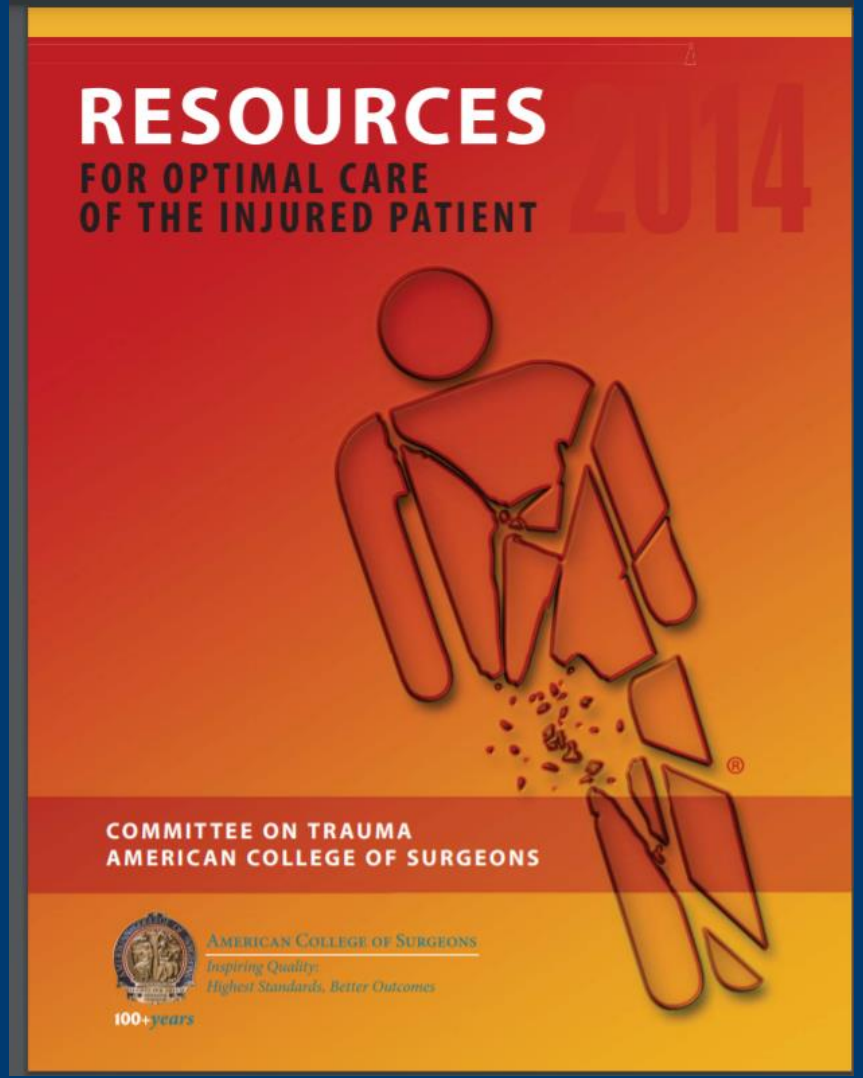


Where should I go ?

History of the Trauma System

- Systems of care for injured service members were first implemented during the Civil War from 1861-1865
- **1922:** American College of Surgeons (ACS) recognized injury as an important national issue and created its Committee on Fractures to focus on improving patient care.
- **1950:** It was renamed the Committee on Trauma
- **1966**: The Highway Safety Act created the National Highway Traffic Safety Administration (NHTSA) and required all states to develop EMS systems
- **1973**: The Emergency Medical Services Systems Act established a grant program to support regional EMS systems, emergency medical technician (EMT) training and development of air transport services

THE COMMITTEE ON TRAUMA



Trauma Center Guidelines

1976: The ACS released the *Optimal Hospital Resources for the Injured Patient* , outlining the criteria for an ideal trauma center. This publication set the stage for the components of an optimal trauma system from prevention to pre-hospital care to acute care, to rehabilitation, and research

Back To Our Story

- 4 y/o male who arrives to ED triage by parents. Upon arrival to the triage desk, family is carrying child and he is limp and listless
- Appears apneic
- Triage nurse immediately takes child to trauma bays
- CPR started

- What are we thinking ?

ED Course Begins:

Immediately initiate our PALS algorithm

- CPR: 30:2
- BVM
- I/O x 2 placed
- Epinephrine every 3 minutes

Potential Differential Diagnosis

- Sepsis
- Electrolyte abnormalities
- Undiagnosed cardiac anomalies
- Trauma
- Non-accidental trauma
- Respiratory failure

History of Present Illness

Per report from mother:

Child was outside riding his scooter when he fell.

Thoughts ?

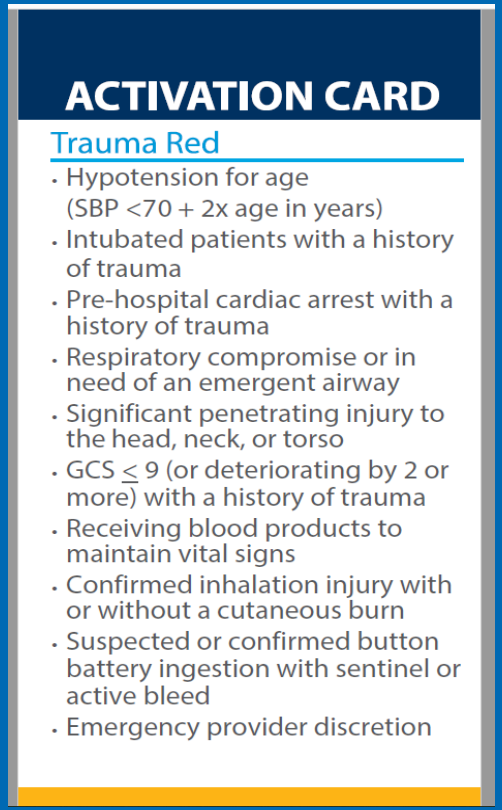
History of Present Illness

Per report from mother:

- Riding scooter outside and fell directly onto handlebars.
- Did not hit head
- Immediately stood up and started crying
- Mother assisted child to step to sit
- Child then began to vomit
- Started to loss consciousness
- Lips began to turn blue
- Taken to ED by parent

ED Assessment

- Initially, we initiated PALS algorithm
- After HPI: Trauma Red activated
- Physical assessment: There is a circular ecchymosis on the inferior ribs of the RUQ



What Are We Thinking Now ?

SHOCK

Obstructive Shock

Pericardial Tamponade	vs	Tension Pneumothorax
•anxiety and restlessness		Shortness of breath
•low blood pressure		Chest pain
•Weakness		Hypoxia
•chest pain radiating to your neck, shoulders, or back.		Hypotension
•trouble breathing or taking deep breaths.		Tachycardia
•rapid breathing.		Tachypnea
•discomfort that's relieved by sitting or leaning forward.		
•fainting, dizziness, and loss of consciousness.		

Although cardiac tamponade also can cause hypotension, neck vein distention, and sometimes respiratory distress, tension pneumothorax can be differentiated clinically by its unilateral absence of breath sounds and hyperresonance to percussion.

Hypovolemic Shock

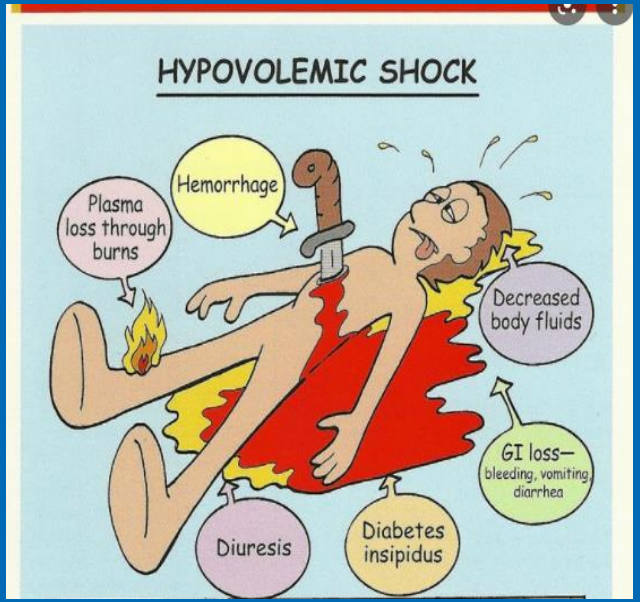
Hypovolemic shock results from significant and sudden blood or fluid losses

Mild symptoms can include:

- headache
- fatigue
- nausea
- profuse sweating
- Dizziness

Sever symptoms:

- cold or clammy skin
- pale skin
- rapid, shallow breathing
- rapid heart rate
- little or no urine output
- confusion
- weakness
- weak pulse
- blue lips and fingernails



Advanced Trauma Life Support

Objectives

- Assess the patient's condition rapidly and accurately
- Resuscitate and stabilize the patient according to priority
- Determine if the patient's needs exceed a facility's capabilities
- Arrange appropriately for the patient's definitive care
- Ensure that optimum care is provided

What are Resuscitation Priorities in this Kid

YOUR VOTE COUNTS

Airway / Breathing

- BVM
- ETT vs LMA

Circulation

- NS bolus 20 cc/kg
- I/O x 2 placed

ATLS™ ADVANCED TRAUMA LIFE SUPPORT

Shock → Resuscitate → Identify Source → Treat Source

Simultaneously

ED Course Continued

- FAST showed initially minimal cardiac filling and + abdominal fluid c/w hemorrhage.
- After 2 units PRBC and 4 rounds of epinephrine with continuous CPR - ROSC was obtained.
- Repeat cardiac images after PRBC and ROSC showed no pericardial fluid and good cardiac function.
- Central line placed
- C-Collar in place

What are Resuscitation Priorities in this Kid?

Airway / Breathing

- BVM
- ETT vs LMA

Circulation

- NS bolus 20 cc/kg
- I/O x 2 placed
- MTP initiated 10cc/kg PRBC x 2

Shock ✓ → Resuscitate ✓ → Identify Source ✓ → Treat Source

Resuscitation

Transfuse? Massive transfusion?

- Absolutely needs MTP activated
- Remember MTP may require a runner
- Remember the FFP is not thawed – minimum 20min
- What is the most important lab to draw in this patient?

So should we just keep pouring blood into this kid?

Hemorrhage Control

Now What

Catastrophic Intra-abdominal Hemorrhage

- Should we go to the CT Scanner ?
- BP 72/40 – can we travel to OR?
- Second unit of RBC's being hung
- Needs to be in the operating room

Call the blood bank and redirect MTP!!!

In the OR

What should we be prepared to do

Patient transported to OR Hypotensive

- OR Team priorities
  - Prep patient
  - Ensure needed instruments/supplies present
  - Ensure blood bank sending MTP coolers

In the OR

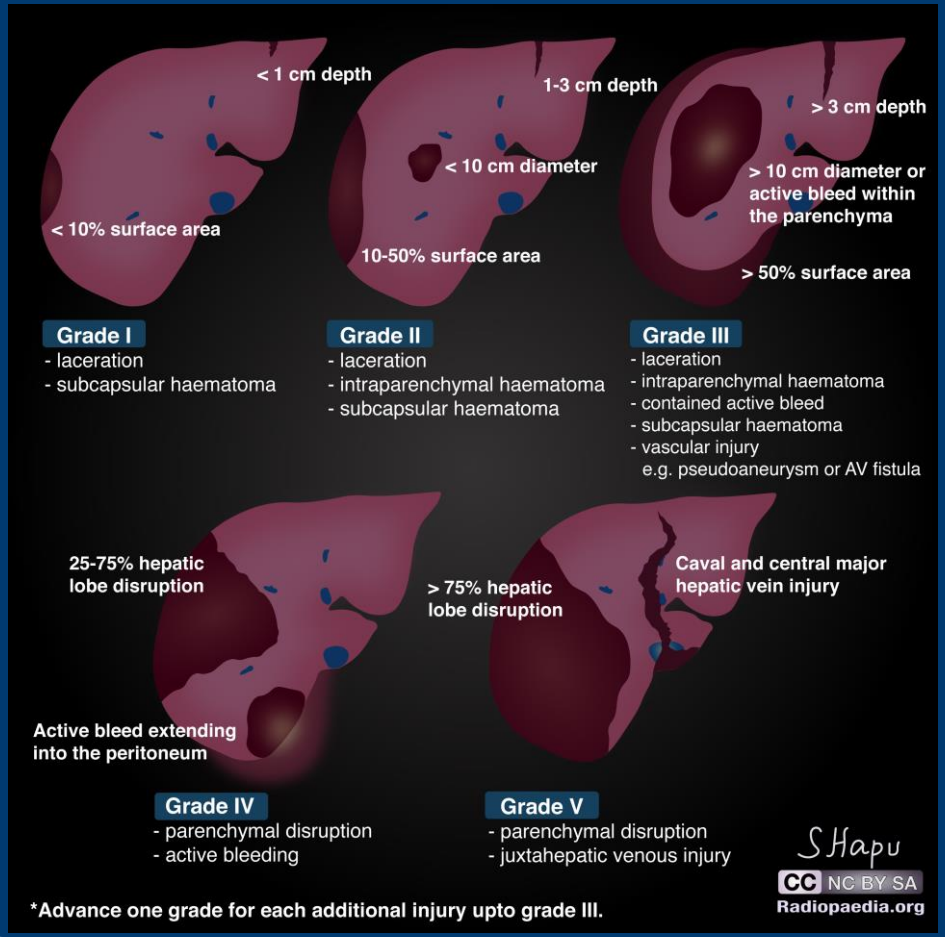
Operative Findings

Postoperative diagnosis: Hemorrhagic shock 2/2 trauma, grade 5 liver laceration

Findings: Liver laceration extending to across the majority of segments 5 and 8 , large volume hemoperitoneum.

Long and deep laceration of the right lobe of the liver, extending from the diaphragm, at the level of the hepatic veins across the entire anterior surface of the right lobe.

Estimated Blood Loss: 1.5L



AAST Grading

Post-op CT Abdomen/Pelvis

IMPRESSION:

Grade 5 laceration of the liver with contained vascular enhancing structure may represent a contained extravasation/hematoma in continuity with the portal venous system or an arterial pseudoaneurysm.

Diffuse fluid-filled small bowel loops most likely representing ileus.

Open anterior laparotomy with associated pneumoperitoneum

Shock Index

Shock index (SI) is defined as the heart rate (HR) divided by systolic blood pressure (SBP)

The **Shock Index** indicates level of occult shock, especially in trauma or acute hemorrhage, based on heart rate and systolic blood pressure.

0.5-0.7 is believed to be a normal shock index. Higher numbers have been shown to be more sensitive than vital signs alone in diagnosing occult shock, need for transfusion and/or operation

Shock Index-Pediatric Adjusted

Surgery. 2017 Mar;161(3):803-807. doi: 10.1016/j.surg.2016.08.050. Epub 2016 Nov 1.

Shock index, pediatric age-adjusted (SIPA) is more accurate than age-adjusted hypotension for trauma team activation

Shannon N Acker [1], Brooke Bredbeck [2], David A Partrick [3], Ann M Kulungowski [3], Carlton C Barnett [4], Denis D Bensard [4]

Shock Index Pediatric Adjusted

Background: We demonstrated previously that shock index, pediatric age-adjusted identifies severely injured children accurately after blunt trauma. We hypothesized that an increased shock index, pediatric age-adjusted would identify more accurately injured children requiring the highest trauma team activation than age-adjusted hypotension.

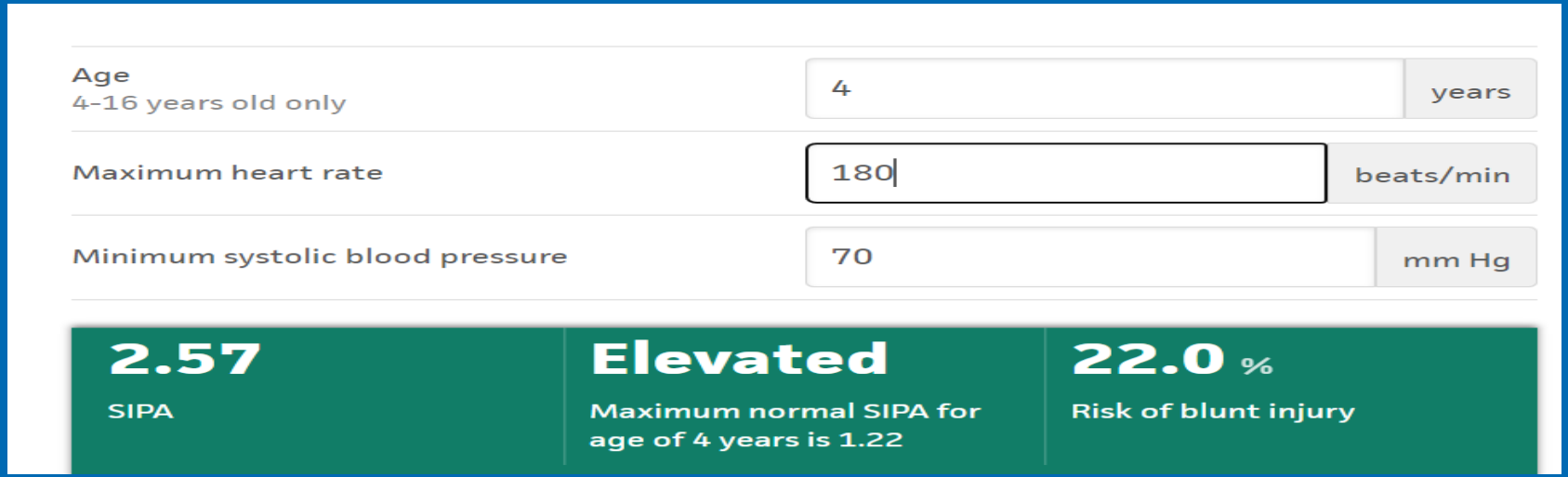
Methods: We reviewed all children age 4-16 admitted after blunt trauma with an injury severity score ≥15 from January 2007-June 2013. Criteria used as indicators of need for activation of the trauma team included blood transfusion, emergency operation, or endotracheal intubation within 24 hours of admission. Shock index, pediatric age-adjusted represents maximum normal shock index based on age. **Cutoffs included shock index >1.22 (ages 4-6), >1.0 (7-12), and >0.9 (13-16). Age-adjusted cutoffs for hypotension were as follows: systolic blood pressure <90 (ages 4-6), systolic blood pressure <100 (7-16).**

Results: A total of 559 children were included; 21% underwent operation, 37% endotracheal intubation, and 14% transfusion. Hypotension alone predicted poorly the need for operation (13%), endotracheal intubation (17%), or transfusion (22%). Operation (30%), endotracheal intubation (40%), and blood transfusion (53%) were more likely in children with an increased shock index, pediatric age-adjusted; 25 children required all three interventions, 3 (12%) were hypotensive at presentation, 15 (60%) had an increased shock index, pediatric age-adjusted ($P < .001$).

Conclusion: **An increased shock index, pediatric age-adjusted is superior to age-adjusted hypotension to identify injured children likely to require emergency operation, endotracheal intubation, or early blood transfusion**

Shock Index-Pediatric Adjusted (SIPA)

Shock index, pediatric age-adjusted has not only been validated as a tool to prospectively identify severely injured children, but also as a predictor for mortality and trauma team activation. Therefore, SIPA has been promising in identifying the pediatric patients requiring intensive treatment services and management



Post-op Management

PICU

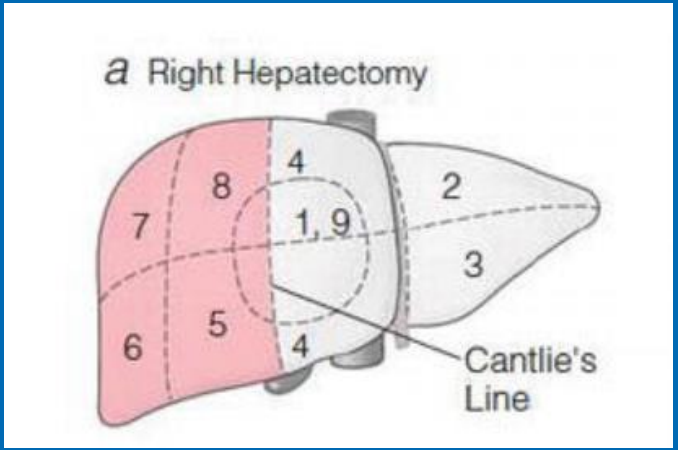
- Arrived to PICU intubated, sedated, unresponsive, pupils 3mm and sluggish bilat,
- Lungs clear throughout,
- Heart RRR without murmur
- Abdomen with circular bruise over RUQ, vertical ex lap incision, open abdomen and wound vac in place
- Right groin CVC in place
- IO sites de-accessed
- Peripheral pulses 1/4 and equal, peripherally cool

Post-Op Day 1

- Required transfusion overnight of 1-unit PRBC
- CT scan performed due to abdominal distention

Returned to OR and procedures performed:

- Right hepatectomy.
- Closure of abdomen



PICU Course

- Returned to PICU after second OR
- Extubated on hospital day 3:
- Moving all extremities
- Answers all questions appropriately with GCS 15
- Hemodynamically stable
- Transferred to pediatric ward in evening

Hospital Days 3-9

- Continued to monitor UOP
- Gradually increased diet
- Pain control
- Working with PT/OT
- On hospital day 9 cleared for discharge to home

What Went Well ?

1. Early recognition by triage nurse
2. Immediate CPR started
3. Immediate activation of trauma team after identification of trauma
4. Quick activation of MTP
5. Rapid transport to OR

Why Do We Need Trauma Centers

- Specialized training of staff
- Resources
- Quick response times of surgeons / staff
- Blood banks
- Fast turn-around-times of labs
- Immediate OR availability
- Decrease mortality

What should do in the field?

PreHospital Trauma Life Support (PHTLS)

- Started in late 80’s
- Curriculum designed specifically for prehospital providers
- Mission of PHTLS is to promote excellence in trauma patient management by al providers involved in the delivery of prehospital care
- Developed in collaboration with the American College of Surgeons-Committee on Trauma
- Improves the care and decreases mortality

What should do in the field?

1. 2 Large bore IV
2. IV Fluids
3. Whole blood
4. TXA
5. Needle thoracostomy if suspected chest trauma
6. C-spine precautions
7. Oxygen
8. Monitor
9. Get to the trauma center

Injury Prevention

The Injury Prevention Program (IP) **aims to reduce and prevent injury and death,** due to acute trauma or violence.

What measures can we take:

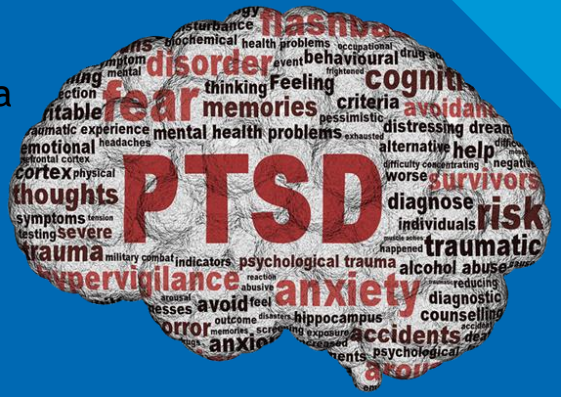
1. Helmets
2. Proper size of bike / scooter
3. Parental education
4. Proper terrain

PTSD is REAL in These Kids

High Incidednce of PTSD after Traumatic Injury

A few notes…

- *Van Meijel 2015* – 12% incidence for kids treated at Level 1 Trauma Centers
- *Zatzick 2014* – Cognitive behavioral therapy decreases weapon-carrying in adolescents after injury by (69%!)
- *Duzinski 2012* – Parental (loved-one?) presence at scene of injury increases risk of PTSD 14-fold.
- *Winston 2002* – Severity of injury is not associated with increased risk of PTSD.
- *Schreier 2005* – Younger age and severity of parental PTSD associated with increased PTSD risk in kids



PTSD in Hospital Staff

A few notes…

- Iranmanesh et al-2015 35-40% of paramedics reported moderate PTSD.
- **Drewitz-Chesney -2013** Paramedics have the highest rate of posttraumatic stress disorder (PTSD) among emergency service workers, higher than police or firefighters
- Phelps – 2018 In international studies, the rate of anxiety among paramedics has been estimated to be as high as 22%, depression 10%, and suicidal ideation 10%. This compares to rates in the general community of 14.4% for anxiety, 6.2% for depression and 2.3% for suicidal ideation.

Questions ?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CHILDREN'S EMERGENCY


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TOP 10
IN THE NATION
Putting Kids #1