

Mommy I Got A Boo-Boo



Katrina Altenhofen, MPH Paramedic

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Injury is the #1 Killer of kids

- Unintentional and/or intentional injury is the number one threat for children
- Injury can cause minor to major trauma
- Types of trauma can be lacerations, burns, fractures, open or closed

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Objectives

- Explain the unique anatomic features of children leading to specific injury patterns
- Outline the initial assessment of the injured child
- Integrate trauma resuscitation in the ABCDE's

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Pediatric trauma

- Kids aren't "small adults"
 - Differ anatomically
 - Differ physiologically
- Requires
 - Prepared personnel
 - Expertise
 - Materials
 - Equipment
 - Meds



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Need specific pediatric supplies

• Monitors	• Central lines
• ETT	• Urinary catheters
• Laryngoscopes	• NGT/OGT
• Bronchoscopes	• Resuscitation drugs
• IV	• Resuscitation devices
• IO trocars	

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Anatomic and Physiologic Differences

- Recognition of anatomic and physiologic differences between adults and children is a critical component of trauma care
- Children may present with subtle signs or symptoms of serious injury
 - Kids are the energizer bunnies they keep going and going and going and going and...

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Head

- Proportionately larger than body
 - Most common cause of serious
 - Due to the disproportionate nature the head acts like the heavy end of a lawn dart becoming the lead point of contact
 - Severity of traumatic brain injury (TBI) usually defines the patient's medical and functional outcome




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Head

- Smaller diameter of the airway
 - Respiratory system is the number one survival system of the pediatric patient
 - Smaller airway=increase in obstruction
 - Increase of obstruction=poor oxygen flow
 - » Poor oxygen flow=YUCK!!!!!!




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Increased risk of head and neck injury

Large head



Weak neck muscles






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Spinal Column

- Extremely flexible
 - Requires a high-energy mechanism of injury with axial loading of the spine or extreme flexion to create damage
 - Traumatic spinal cord injury or disruption of the central nerve pathways is rare in children
 - Spinal injury does occur without vertebral injury
 - Most common lower spine injuries occur mid-lower thoracic
 - Mechanism includes direct blows, falls, or spinal compression via motor vehicle crash




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Cervical spine considerations

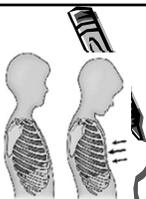
- Upper cervical spine often involved
 - Younger = higher
- Injury possible with minimal musculoskeletal effect
- Spine films and CT may not confirm absence of injury
- Symptoms and mechanism dictate care




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Chest

- Softer and thinner
 - Ribs are more pliable and compressible since they are mainly comprised of cartilage
 - Lung injury frequent due to poorly protected chest wall from fat, or muscle





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Chest Injuries

- Pulmonary contusions
 - Bruising of the lung tissue
- Tension Pneumothorax/Sucking Chest Wounds
 - Penetrating chest trauma

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Abdomen

- Poorly protected highly vascular organs
 - The solid organs of the upper abdominal cavity such as the liver, spleen, and kidneys are disproportionately larger and more exposed
 - The hollow organs such as the stomach, small bowel and bladder are less common points of injury for the pediatric patient

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Extremities

- Bones are more flexible and muscles are not as well developed
 - Especially vulnerable to fractures at their respective weak, cartilaginous growth plates at the ends of the bones
 - Common injuries include:
 - Greenstick-disrupts the periosteum on only one side of the bone
 - Buckle-compression of the pliant bone due to axial loading (vertical pressure)

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Skin

- Larger body surface to mass ratio
 - Poor immune system with children
 - Skin is disrupted the bodies natural "armor" of protection is removed
 - Skin provides temperature regulation
 - More skin surface area in relation to overall size and weigh can cause increased incidence of heat loss

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Shock

- A condition that develops when the circulatory system is unable to deliver a sufficient amount of blood to the organs
 - Results in organ failure and eventually cardiopulmonary arrest
 - Compensated shock is the early stage of shock.
 - Decompensated shock is the later stage of shock.

Shock

- Common causes include:
 - Trauma injury with blood loss
 - Especially abdominal
 - Dehydrations from diarrhea or vomiting
 - Severe infection
 - Neurologic injury
 - Such as severe head trauma

Shock

- Common causes include (cont'd):
 - Severe allergic reaction/anaphylaxis to an allergen
 - Insect bite or food allergy
 - Diseases of the heart
 - Collapsed lung
 - Pneumothorax
 - Blood or fluid around the heart
 - Cardiac tamponade or pericarditis



Shock

- Children have less blood circulating than adults.
 - Small amount of blood loss may lead to shock.
- Children react differently than adults to fluid loss.
 - May respond by increasing heart rate, increasing respirations, and showing signs of pale or blue skin



Shock

- Signs of shock in children
 - Tachycardia
 - Poor capillary refill time (> 2 seconds)
 - Mental status changes
- Treat shock by assessing ABCs, intervening as required.



Shock

- Treatment
 - In assessing circulation:
 - Assess rate and quality of pulses.
 - Assess temperature and moisture of hands and feet.
 - A 2-second capillary refill time is normal.
 - Assess skin color.
 - Changes in pulse rate, color, skin signs, and capillary refill time suggest shock.



Shock

- Treatment (cont'd)
 - Blood pressure difficult to measure in children
 - Cuff must be proper size
 - Blood pressure may be normal with compensated shock.
 - Low blood pressure may be sign of decompensated shock.



Shock

- Treatment (cont'd)
 - Determine when signs and symptoms first appeared and whether:
 - Decrease in urine output
 - Absence of tears
 - Sunken or depressed fontanelle (infants)
 - Changes in level of consciousness and behavior



Shock

- Treatment (cont'd)
 - Ensure airway is open; prepare for artificial ventilation.
 - Control bleeding.
 - Give supplemental oxygen by mask or blow-by.
 - Continue to monitor airway and breathing.
 - Position with head lower than feet.
 - Keep warm with blankets and heat.

Shock

- Treatment (cont'd)
 - Provide immediate transport.
 - Contact ALS backup as needed.
- Anaphylactic shock
 - A major allergic reaction that involves generalized, multisystem response
 - Airway and cardiovascular system are common.
 - Common causes are insect sting or food allergy.

Shock

- Anaphylactic shock (cont'd)
 - Signs and symptoms
 - Hypoperfusion
 - Stridor and/or wheezing
 - Increased work of breathing
 - Altered appearance
 - Restlessness, agitation, and sometimes a sense of impending doom
 - Hives

Shock

- Anaphylactic shock (cont'd)
 - Treatment
 - Maintain airway and administer oxygen.
 - Allow caregiver to assist in positioning the patient, oxygen delivery, maintaining calm.
 - Assist with epinephrine auto-injector based on protocol.
 - Transport promptly.

3-year-old child

- You are called to the street where a 3-year-old child is found lying after a 20-foot fall from a third-story window.

THINK.....

Scene safe?

PAT (Pediatric Assessment Triangle)

Primary survey

- Cornerstone of trauma care
- Life threatening conditions
 - Evaluate
 - Stabilize
 - Treat
- Moves forward on all fronts by team
- Often listed sequentially **ABCDE**

Pediatric Assessment Triangle

- Rapid, initial assessment
 - Appearance
 - Surrounding environment, position of child
 - Work of Breathing
 - Rate, use of accessory muscles
 - Circulation of Skin
 - Pale, red, blue

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You Assessment reveals

- Critical injury.
 - Abnormal appearance (due to head injury or shock)
 - Tachypnea (a response to poor perfusion and metabolic acidosis and retractions may indicate chest injury)
 - Pale skin (due to hemorrhage)

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Initial Assessment

- Airway - Clear, no stridor
- Breathing - RR 40 breaths/min with good air movement bilaterally
- Circulation - HR 190 beats/min; pulses thready; CRT 4 seconds; BP 70 mm Hg/palp

Status good or bad? What is "normal"

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Respiratory Rate

- Newborn-6 Weeks
~30-60 breaths per minute
- 6 Months-1 Year
~25-40 breaths per minute
- 1 Year-3 Years
~20-30 breaths per minute
- 3 Years-6 Years
~18-25 breaths per minute
- 6 Years-10 Years
~15-20 breaths per minute

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The Bottom Line-

Below 15 is BAD, BAD, BAD----
Greater than 60 is BAD, BAD, BAD----

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Heart Rate

- Newborn-6 Weeks
~100-160 beats per minute
- 6 Months-3 Years
~90-120 beats per minute
- 3 Years-6 Years
~80-120 beats per minute
- 6 Years-10 Years
~70-100 beats per minute

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Bottom Line (again)

- Thumpy-thumpin greater than 160- BAD, BAD, BAD!!!
- Thumpy-thumpin lower than 70- BAD, BAD, BAD!!!




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VOLUME LOSS

This patient is in decompensated shock due to hemorrhage.

how much "volume" loss is too much for a pediatric?

for a 3y/o; the 6 y/o; than the 9 y/o or 12 y/o

REMEMBER the AAP states a "pediatric" is anyone 0-21 years of age!!!!!!




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Initial Assessment Continued

- Disability - AVPU=U
 - Right pupil larger than left and unresponsive
- Exposure - Right parietal scalp contusion, abdomen distended and tender to palpation, right thigh deformity

Unequal pupils are indicative of what?




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- Unequal pupils may reflect severe brain injury due to intracranial hemorrhage or swelling and increased intracranial pressure.

What are the likely injuries and initial management priorities?




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Management Priorities-BLS

<u>Injuries</u>	<u>BLS Management Priorities</u>
• Traumatic brain injury	• Open airway and maintain spinal immobilization
• Abdominal injury	• Suction as needed
• Long bone fracture	• Assist ventilation with BVM
	• Control external bleeding
	• Immobilize injured extremity
	• Transport




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- During transport, the child's color improves with initial interventions. There is no change in the size of the right pupil.

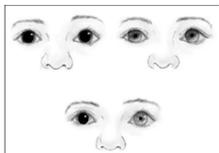
Are we missing anything??? What else should we consider???




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REMEMBER:

- Children with fixed, dilated or unequal pupils and signs of serious head injury need mild hyperventilation.
- Increase ventilation to:
 - 35 breaths/min < 12 months
 - 25 breaths/min > 12 months



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- After hyperventilation, the child's right pupil constricts.
- The child's HR, BP and level of consciousness improve.

Don't forget other transport priorities..

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Limit secondary injury

- Hypotension, hypoxemia & hypercarbia
 - Significantly increase mortality
- Aggressive measures to maintain cerebral perfusion and oxygenation

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Exposure

- Expose entirely to evaluate thoroughly
- Hypothermia risk
 - Exposure
 - Large Body Surface Area (BSA)
 - Thin skin
 - Minimal fat
 - Rapid loss of body heat



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Hypothermia consequences

- Increased risk in rural setting
- Increased morbidity and mortality
 - Myocardial contractility decreased
 - Dysrhythmias
 - Arrest

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Transport Priorities

- Perform frequent reassessment of the ABCDEs, pulse oximetry, and ECG
- Prevent hypothermia
- Defer focused history and physical exam, and detailed physical exam

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A "Happily Ever After"

- Child is transported and further resuscitated in the emergency department.
- Child admitted to a pediatric intensive care unit.




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Communication with the "Injured Family"

- Consider the emotional impact of serious injury or death on family members
- Provide caregivers/parents with facts, but avoid speculation
- Assure that uninjured children are provided with safe transportation to the families "designated area"
- Attempt to keep family members together




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Plummer by day -EMS by night

Your "to-do" list is already "to-long" to get it "to-done" by today

BUT

The death of a child is a nightmare to every parent-knowing it was preventable is a societal tragedy that we **CAN CHANGE!!!!!!**




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Why us?

- Fewer individuals are as qualified to address the issue of injury than EMS providers
- The men and women who staff out-of hospital EMS agencies deal directly with the effects of preventable injuries
- The credibility born of "hands-on" experience offers an opportunity for impact




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Injury Prevention Basics

- The goal is to familiarize EMS professionals with the factors that cause injuries and influence their severity





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Steps to Primary Prevention Interventions

- Define the Problem
 - Data
 - What your trip report function could be
 - Community profile
 - Injury profile
 - When
 - Who
 - What
 - Where
 - Why




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Steps to Primary Prevention Interventions

- Intervene:
 - Plan/Implement an event
- Share your results
 - Media/Community/Policy Makers




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Dead is Dead

You don't get much deader than dead

More than-
22,000 children die yearly
400 per week
60 per day
2 per hour

For every child that dies 45 are hospitalized!




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Injuries

- Every day more than 38,000 children ages 14 and under are injured seriously enough to require medical treatment
- Each year, injuries lead to ~300,000 child hospitalizations, 8,700,000 emergency room visits, 10,500,000 physicians' office visits




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Brakes! What Brakes??





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Do it Yourself Build a Ladder Kit





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Have a 2x4-you've got a jack!





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Walking the fine line...



Despite we would like to bubble wrap

OR-

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Cushion them as much as possible we have to be realistic
-YET-
We don't have to be complacent with
Kids will be Kids!!

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Conclusion

- Unique anatomic features of childhood predispose to different injury patterns
 - Airway small and easily obstructed, lungs vulnerable to contusion, solid organs and long bones poorly protected
- Treatment goals are to avoid hypoxia and hypotension
- Short time on scene and rapid transport to the most appropriate facility is crucial

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Conclusion Cont

- Trauma will happen-that is a reality
 - EMS systems need to continue being "proactive" vs. "reactive" to injury prevention projects and initiatives
 - Numerous initiatives are already canned and ready for distribution.
 - » RESOURCES: the have brochures, posters, handouts, programs, projects
 - EMSC-www.ems-c.org
 - NHTSA-www.nhtsa.dot.gov

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????QUESTIONS????



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Thank-You



Katrina Altenhofen, MPH, Paramedic
Emergency Medical Educational Services

Washington Field Office-P.O. 24
Washington, IA 52353
Katrina.Altenhofen@gmail.com
Phone: 319-461-7270

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