Pediatric Considerations in Collegiate EMS

Ian P. Weston, MPP
Objectives

1. Identify why pediatric care is important to you, the underpaid collegiate EMS professional
2. Identify some general key differences between pediatric patients and adults
   ▪ Anatomical, Psychological & Physiological
3. Identify general considerations when assessing pediatric patients
4. Identify tips to properly prepare your agency for care of pediatric patients
Setting the Record Straight
Ian Weston, MPP

- Director, Emergency Medical Services for Children – National Resource Center
- Senior Director, Government Affairs & Policy for a health care lobbying firm – Kimbell & Associates
- Health Policy Advisor – Member of U.S. House of Representatives
- Member, Manhasset – Lakeville Vol. FD (1999-Present)
- Member, Falls Church Vol. FD / Arlington County FD (2008-Present)
- Member, Syracuse University Ambulance (2000-2004)
Who is a “Kid”?
What is a Pediatric Patient?
What is a Pediatric Patient?
Pediatric Demographics

- **Age of the Pediatric Patient – 0-18 Years***
- **Children younger than age 18 comprise over 26% of the US population**
- **Children account for 25% of all visits to US emergency departments (ED)**
  - Over 30 million ED visits per year
  - Over 6 million transported by EMS
- **10% of All EMS Runs / 13% of all transports**
Why is this important to Collegiate EMS

- On average 15% of incoming college freshman are under the age of 18.
- College EMS Agencies service
  - Faculty families
  - Employee daycare
  - Sports Fans
  - Prospective / Visiting Students
  - General community (Families, Schools, Community Centers, Religious Centers, etc.)
Why are kids soooooo important?

- Care is Based on Age
  - Children Change Constantly
    - Physical Size
    - Mental Capabilities
    - Behavioral Attitudes
  - 6 year old is different from a 35 year old, as a 4-week-old infant is different from a 12 year old child
- Ability to master appropriate care can seem impossible
What's the big difference?

- Significant difference between adults and children are important to consider when providing emergency care
  - Age and Growth Characteristics
  - Psychological Aspects
AHA Age Categories

- For BLS Care (Does not always apply to ALS Care)
  - Newborns and infants: Birth to 1 Year
  - Toddlers: 1 to 3 Years
  - Preschool: 3 to 6 Years
  - School Age: 6 to 12 Years
  - Adolescent: 12 to 18 Years
Psychological Considerations
Psychosocial Needs

- **HOW IS THIS PEDIATRIC PATIENT GOING TO REACT?**

- Greater, varying emotional needs based on developmental level

- Higher sensitivity to environmental factors during treatment
  - Age, event, parental reactions determines child’s reaction and recovery.
Psychosocial Needs

- Infants and Children
  - FEAR
    - Infants and young children fear and resist strangers and emergency care interventions
  - May not be able to give information about their problem or pain
    - Parents and Caregivers typically the source
  - Be prepared to manage mental health needs of both patient and parents
Psychosocial Needs

- Adolescents
  - Should be able to tell you exactly what happened or how they feel
  - In the presence of parents or peers – may not completely communicative or cooperative
    - Be tactful
    - Assessment more productive in private (also confidentiality issues)
  - Description of examination can eliminate awkwardness
    - Make them understand what you are doing and why it needs to be done
Anatomical Considerations
Anatomical Considerations

- Head Trauma with Children
  - Child’s head is proportionally larger and heavier than an adult until the age of 4
    - Serious mechanism of injury? – Suspect head trauma
  - Infants have a “soft spot” (fontanelle)
    - Sunken = dehydration
    - Bulging = elevated intracranial pressure (or crying)
Anatomical Considerations

- **Smaller Airway Structures / Tongue proportionally larger**
  - Difficult to establish and maintain airway

- **Flat nose and face**
  - Difficult to obtain good face mask seal

- **Abdominal breathers**
  - Difficult to evaluate breathing

- **Short Neck**
  - Difficult to stabilize or immobilize
Anatomical Considerations

- **Softer Bones**
  - More susceptible to injury as compared to adults
  - Less protection to organs
- **Less productive muscle around internal organs**
  - More susceptible to traumatic forces
- **Faster Respiratory Rate**
  - Quicker Muscle fatigue/respiratory distress
- **Larger Surface/Mass Ratio**
  - Prone to Hypothermia
Physiological Considerations
Respiratory Care Considerations

- Children have smaller airways
  - Mouth and nose are smaller and more easily obstructed than in adults
  - Tongues take up proportionally more space in the pharynx than do adults
  - Trachea is relatively narrower, softer and more flexible than in adults
    - Easily blocked by edema, secretions, foreign bodies or malpositioning.
    - Pressure considerations (ie. Less pressure when applying cervical collars or ET tubes)
    - Airway swelling from infection/inflammation causes respiratory distress
Respiratory Care Considerations

- Do not hyperextend neck – head should be in more neutral position than in adult for airway
- Suction for no more than a few seconds at a time
- Chest and Abdomen are less developed and more elastic
  - Makes distressed breathing obvious from a distance
  - Cannot maintain prolonged distressed respirations
  - Infants and Children use diaphragms for breathing more than adults
Respiratory Care Considerations

- Smaller Lungs
  - Increased risk of barotrauma from aggressive ventilation (pneumothorax)

- Respiratory Arrest is more common than cardiac arrest
Respiratory Considerations

Respiratory Rates – Children Vs. Adults

(Ranges According to PALS)
Respiratory Equipment Considerations

- Equipment Sizing Differences (Adult/Child/Infant)
  - Oxygen Masks
    - NRB, Nasal Canulas
  - Endotracheal Tubes
    - Cuffed and Uncuffed
Circulatory Considerations

- Blood Volume in Peds is lower than Adults
  - Newborn – less than 12 oz Soda Can
  - 8 year old – 2 liters
  - Adolescent – 3-4 liters
  - Adult – 4-6 liters
- Bleeding More Serious in Peds
- Less fluid reserve
  - Decompensated Shock develops more rapidly (Provide $O_2$)
Circulatory Considerations

Differing Pulse Rates
(Ranges According to PALS)

![Bar chart showing pulse rates for different age groups: Newborn, Infant, Toddler & School Age, Adolescent, Adult. The pulse rates range from 0 to 250.](chart.png)
Circulatory Considerations

Differing BP Rates

(BP not normally taken on child >3 y/o)
Other Considerations

- Higher Metabolic Rates
  - More susceptible to contaminants in food/water
- Diarrhea & Vomiting are common in childhood illness
  - Cause moderate to severe dehydration – children more susceptible to effects
Assessment / Transport Considerations
### Types of Patients Transported to Trauma Centers

<table>
<thead>
<tr>
<th>MOI</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>MVA</td>
<td>43.3</td>
</tr>
<tr>
<td>Fall</td>
<td>19.7</td>
</tr>
<tr>
<td>Struck by, against</td>
<td>7.4</td>
</tr>
<tr>
<td>Firearm</td>
<td>5.0</td>
</tr>
<tr>
<td>Bike Accident</td>
<td>3.7</td>
</tr>
<tr>
<td>Fire/Burn</td>
<td>3.1</td>
</tr>
<tr>
<td>Cut/Pierce</td>
<td>3.1</td>
</tr>
<tr>
<td>Environmental</td>
<td>1.3</td>
</tr>
<tr>
<td>Other</td>
<td>13.4</td>
</tr>
</tbody>
</table>

*Institute of Medicine, Emergency Care for Children, 2006*
Medication Dosage

- Medication Dosages must be calculated based upon the child’s weight (in kg) rather than the standard unit dosages used for adults.
Assessment Considerations

- Things to consider for Peds initial assessment
  - Mental Status – A well child is alert / sick child may be drowsy, inattentive or sleeping
  - Quality of Cry or Speech – Strong Cry = Good Air Exchange
    - Breathing – Look for nasal flaring
  - Emotional State – Crying is a normal response to pain or fear / Withdrawn or emotionally flat child is probably sick
  - Body Position – Pts with Respiratory Distress assume positions that seem to help them breathe (ie. Leaning forward)
    - Sick child may also be limp/exhibit poor muscle tone
Assessment Considerations

- Detailed Assessment
  - If child is only source of pt history
    - Consider a full focused physical exam
  - Physical exam is reversed in infants and children (toe to head)
  - Children’s bones are softer – consider internal injuries
Transport Considerations

- Ambulance is NOT a standard passenger vehicle
  - Ensure availability of pediatric restraint systems
    - DO NOT allow child held in arms or lap of parent during transport
    - DO NOT allow parents to be unrestrained if accompanying child during transport
  - Consider lower speeds with Peds patients
Transport Considerations

- Destination is VERY Important!!
  - Can the hospital you are transporting to support this type of patient?
  - Destination hospital on diversion/re-route.....now what?
Federal EMSC Program

- Assists states to implement/upgrade pre-hospital/trauma systems to incorporate pediatric care considerations

- 6 General Focus Areas
  - Essential Pediatric Equipment and Supplies
  - On-Line / Off-Line Medical Direction
  - Hospital Recognition – Medical & Trauma
  - Pediatric Education Requirements for certification
  - Legislation & Regulation
  - Agency Coordination
Ensuring Proper Equipment

- Pre-hospital providers MUST have appropriate pediatric equipment and supplies to care for ill and injured children
  - Achieve optimal pediatric outcomes.
  - Ensure adequate preparedness for treatment and care
- In 1996 (And Updated in 2009) ACEP Guidelines were developed for an essential pediatric equipment and supply list for pre-hospital providers and ambulances
### BLS List (35 total unique items)

<table>
<thead>
<tr>
<th>Suction catheters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rigid tonsil tip (1)</td>
</tr>
<tr>
<td>Flexible between 6-10 fr. (1)</td>
</tr>
<tr>
<td>Flexible between 12-16 fr. (1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Oxygen delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nasal cannula</td>
</tr>
<tr>
<td>1. adult (1)</td>
</tr>
<tr>
<td>2. child (1)</td>
</tr>
<tr>
<td>Non-rebreather masks</td>
</tr>
<tr>
<td>1. adult (1)</td>
</tr>
<tr>
<td>2. child (1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bag valve mask</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand operated self-expanding bags</td>
</tr>
<tr>
<td>1. child (450-750 ml) (1)</td>
</tr>
<tr>
<td>2. adult (&gt;1000ml) (1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Masks for BVM</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1ea) (4)</td>
</tr>
<tr>
<td>Adult</td>
</tr>
<tr>
<td>Child</td>
</tr>
<tr>
<td>Infant</td>
</tr>
<tr>
<td>Neonate</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Airways</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nasal Airways (2)</td>
</tr>
<tr>
<td>1 size between 16-24 fr</td>
</tr>
<tr>
<td>1 size between 26-34 fr</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Oral Airways - one in each size (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1</td>
</tr>
<tr>
<td>2-3</td>
</tr>
<tr>
<td>4-5</td>
</tr>
</tbody>
</table>

| Pulse oximeter with pediatric and adult probes (2) |
| Note: Pulse oximeter may be independent or integrated with a monitor/defibrillator or other device |

| Bulb suction for infants (if not included in OB kit) (1) |

| AED or defibrillator that includes pediatric capability (1) |

<table>
<thead>
<tr>
<th>Immobilization devices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rigid cervical for children 2 years through adult</td>
</tr>
<tr>
<td>1. small (1)</td>
</tr>
<tr>
<td>2. medium (1)</td>
</tr>
</tbody>
</table>

| 3. large (1)           |
| Lower extremity (femur) traction device |
| 1. adult size (1)      |
| 2. child size (1)      |

| Extremity immobilization devices to fit children and adults |
| 1. small (1)         |
| 2. medium (1)        |
| 3. large (1)         |

| OB Kit (commercially packaged or locally prepared) (1) |

| Receiving or thermal absorbent blanket and head cover or appropriate heat-reflective material (if not included in OB kit) (1) |

<table>
<thead>
<tr>
<th>Sphygmomanometer</th>
</tr>
</thead>
<tbody>
<tr>
<td>adult cuff (1)</td>
</tr>
<tr>
<td>pediatric cuff (1)</td>
</tr>
</tbody>
</table>

| Length-weight based tape or appropriate reference material for pediatric equipment sizing and drug dosing based on estimated or known weight (1) |

### ALS List

(Includes items on BLS list plus 34 or 35 additional unique items depending on end tidal CO₂ capability and with 2 ET tubes of same size counted as 1 Item)

<table>
<thead>
<tr>
<th>Endotracheal tubes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncuffed and/or Cuffed endotracheal tubes (2 each) (10)</td>
</tr>
<tr>
<td>2.5</td>
</tr>
<tr>
<td>3.0</td>
</tr>
<tr>
<td>3.5</td>
</tr>
<tr>
<td>4.0</td>
</tr>
<tr>
<td>4.5</td>
</tr>
<tr>
<td>5.0</td>
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<tr>
<td>5.5</td>
</tr>
<tr>
<td>6.0</td>
</tr>
<tr>
<td>7.0</td>
</tr>
<tr>
<td>8.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Laryngoscope blades</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miller in sizes (4)</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3 or 4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Curved sizes (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
</tr>
<tr>
<td>3 or 4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stylettes for Endotracheal Tubes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult size (1)</td>
</tr>
<tr>
<td>Pediatric size (1)</td>
</tr>
<tr>
<td>Item</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Meconium aspirator adaptor</td>
</tr>
<tr>
<td>Magill forceps</td>
</tr>
<tr>
<td>- Adult size (1)</td>
</tr>
<tr>
<td>- Pediatric size (1)</td>
</tr>
<tr>
<td>End-tidal CO2 detection capability: either quantitative capnometry (1) or colorimetric in sizes adult and pediatric (2)</td>
</tr>
<tr>
<td>Vascular access</td>
</tr>
<tr>
<td>Intravenous catheters sized 24-14 ga</td>
</tr>
<tr>
<td>- Range of 4 sizes with at least one smaller than 20 ga. (4)</td>
</tr>
<tr>
<td>Intraosseous needles (2)</td>
</tr>
<tr>
<td>- Adult size</td>
</tr>
<tr>
<td>- Child size</td>
</tr>
<tr>
<td>Assorted syringes; at least 2 sizes including 1 cc</td>
</tr>
<tr>
<td>Defibrillator with the appropriate paddles and/or pads to defibrillate children and adults (2)</td>
</tr>
<tr>
<td>Transcutaneous cardiac pacemaker with adult and pediatric pads/cables (may be integrated with monitor/defibrillator)</td>
</tr>
</tbody>
</table>
Ensuring Proper Equipment

- Consider carrying stuffed animals or toys to provide comfort
Ensuring Proper Protocols

- On-Line / Off-Line Medical Direction
  - Ensure medical direction both online & offline are available from dispatch through transport (BLS & ALS) 24/7
    - Allows providers to have appropriate info and provide best care
Ensuring Proper Transport

- **Regionalization**
  - Identify hospitals capacity and readiness for treatment
    - Only 6% of hospitals in US have essential supplies/personnel to care for peds emergencies
    - Ensures proper resources and protocols exist for Peds
  - Important to know which hospitals can handle specific types of patients (trauma vs. medical)
  - All agency providers/drivers/dispatchers/administrators must be aware
  - IOM - Better Patient Outcomes!
Ensuring Proper “Pediatric” Education

- Pediatric Education / Continuing Education
  - Infrequency of Peds transports warrants need for ongoing education of providers
  - Some states have Peds education requirement for certification, re-certification or continuing ed
  - Maintain necessary skills to treat peds trauma and med emergencies.
  - Agencies should adopt general and demographic-specific in-house training for providers
    - Devote a specific # of hours / variety of topics
Ensuring Proper “Pediatric” Education

- Pediatric Education is traditionally a small component of EMT training
  - 41% of programs >10 hours; 5% none
Ensuring Proper “Pediatric” Education

- Pediatric Education / Continuing Education
  - Online Courses
  - PEARS (Pediatric Emergency Assessment, Recognition & Stabilization)
  - PEPP (Pediatric Education for Prehospital Providers)
  - Case studies
  - Exploitation of new technologies
  - Scenarios / Drills
Ensuring Your Voice is Heard

- Legislative / Regulatory Change
  - Can be done on an agency/local/regional/state/federal level
  - YOU HAVE THE POWER TO AFFECT CHANGE!
    - Protocol Changes
    - Equipment and Transport Reimbursement
    - Training Resources
    - Grant programs
    - Volunteer Benefits
Ensuring Your Voice Is Heard
Ensuring Provider Care

- CISM
  - Is there a CISM program/team in place in case you encounter a pediatric trauma/death, etc.?
Ensuring Leadership

- Consider appointing a Pediatric Emergency Coordinator
  - Ensuring adequate skill and knowledge among providers
  - Oversee pediatric quality improvement initiatives
  - Ensuring availability of pediatric equipment and supplies (and Meds if ALS)
  - Ensuring providers are following protocols/guidelines
  - Monitor pediatric care issues
  - Community education
Important Points - Summary

- Equipment in sizes fitting all ages of children must be in EVERY ambulance
- Medical Direction must be available either with written protocols or by radio to guide care
- Prehospital care providers NEED training to assess and provide the most appropriate care for pediatric patients
References / Bibliography

Contact Information

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