Planning Treatment

The three most common causes of death are:
- Airway obstruction
- Blood loss
- Central nervous system (CNS) injury

Consider these critical issues in pediatric trauma:
- Beware of hypothermia. Children lose body heat rapidly. The room and IV fluids should be warmed.
- Multisystem injury is common. Check all regions.
- Head injury is frequent. Observe closely for altered consciousness.

Determine Pediatric Trauma Score (Figure 1)

1. Airway & Breathing

A child’s airway anatomy is special:
- The upper airway may easily be occluded
- The tonsils and tongue are large
- The larynx is anterior and high in the neck
- The trachea is short — avoid inadvertent extubation or endobronchial intubation

Suggestions for airway access:
- “Sniffing” position
- Chin lift or jaw thrust (for obstruction by tongue or foreign material)
- Use oral airway with bag and mask
- Orotracheal intubation preferred — following preoxygenation, sedation, and paralytics
- Needle cricothyrotomy is preferable to tracheostomy

2. Circulation

Hypovolemia causes tachycardia and peripheral vasocostriction before hypotension
- Hemorrhage or hypovolemia makes surgical consultation essential
- Be alert for shock caused by gradual or internal blood loss

Physiologic Guidelines
- Normal blood volume = 80 ml/kg
- Hypotension: Loss of 25% of blood volume
- Blood pressure and heart rates are age-related

Special Considerations

- Administer oxygen to all injured children
- Hyperventilate for CNS injury. Ideal pCO₂ = 30 torr
- Consider NG tube to relieve gastric distention

Maintain adequate urine output:
- Infant: 0.5−1 ml/kg/hr
- Child: 1−1.5 ml/kg/hr
- Adolescent: 0.5−1 ml/kg/hr

Monitor all vital signs closely:
- Complete a neurologic examination. Calculate Glasgow Coma Scale for all patients, and obtain neurosurgical consultation if indicated.
- Infuse mannitol (0.5−1.0 gr/kg over 20 min) for rapid CNS deterioration or lateralizing signs (in consultation with a trauma surgeon or neurosurgical consultant)
- Be alert to ongoing, occult bleeding, and incomplete volume resuscitation

Figure 4 lists equipment necessary for pediatric resuscitation

The publication is designed to offer information suitable for use by an appropriately trained physician.

The information provided is not intended to be comprehensive or to offer a defined standard of care.

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Figure 1. Pediatric Trauma Score

<table>
<thead>
<tr>
<th>PTS</th>
<th>History</th>
<th>Injury</th>
<th>Evaluation</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>+2</td>
<td>&gt;80 kg</td>
<td>Normal</td>
<td>Minor</td>
<td>Closed Fractures</td>
</tr>
<tr>
<td>+1</td>
<td>50-80 kg</td>
<td>Maintained</td>
<td>Minor</td>
<td>Closed Fractures</td>
</tr>
<tr>
<td>+1</td>
<td>&lt;50 kg</td>
<td>Unmaintained</td>
<td>Minor</td>
<td>Closed Fractures</td>
</tr>
</tbody>
</table>

The PTS is an anatomic and physiologic scoring system useful for triage and prediction of severity of injury. PTS: 8 = no mortality; PTS: 8 = 30% mortality.

Figure 2. Respiratory Rates By Age

Figure 3A. Resuscitation From Hypovolemia

<table>
<thead>
<tr>
<th>Hemodynamics</th>
<th>Hemodynamics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stable</td>
<td>Unstable</td>
</tr>
<tr>
<td>Further evaluation</td>
<td>Observation Operation</td>
</tr>
<tr>
<td>10 ml/kg P-RBCs</td>
<td>Stable Unstable</td>
</tr>
<tr>
<td>Further evaluation</td>
<td>Observation Operation</td>
</tr>
</tbody>
</table>

Figure 3B. Heart Rate By Age

Figure 3C. Blood Pressure By Age

Figure 4. Equipment

Airway/Breathing

<table>
<thead>
<tr>
<th>O₂ Mask</th>
<th>Oral Airways</th>
<th>Bag Valve Mask</th>
<th>Laryngoscope Blade</th>
<th>ET Tube</th>
<th>Stylet</th>
<th>BP Suction</th>
<th>IV Catheter</th>
<th>NG Tubes</th>
<th>Chest Tubes</th>
<th>Urinary Catheter</th>
<th>Cervical Collar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premature</td>
<td>Premature</td>
<td>Infant</td>
<td>Infant</td>
<td>0−Straight</td>
<td>3.5−5.5</td>
<td>Uncuffed</td>
<td>6F</td>
<td>6F</td>
<td>Premature</td>
<td>22−24 Catheter</td>
<td>12F</td>
</tr>
<tr>
<td>Newborn</td>
<td>Newborn</td>
<td>Infant: Small</td>
<td>Infant</td>
<td>1−Straight</td>
<td>3.5−5.5</td>
<td>Uncuffed</td>
<td>6F</td>
<td>6F</td>
<td>Infant: Small</td>
<td>22−24 Catheter</td>
<td>12F</td>
</tr>
<tr>
<td>&lt;1−12 mos.</td>
<td>Neonate</td>
<td>Small</td>
<td>Small</td>
<td>1−Straight</td>
<td>4.0−5.5</td>
<td>Uncuffed</td>
<td>10F</td>
<td>10F</td>
<td>Infant: Small</td>
<td>22−24 Catheter</td>
<td>12F</td>
</tr>
<tr>
<td>1−3 yrs.</td>
<td>Neonate</td>
<td>Small</td>
<td>Small</td>
<td>1−Straight</td>
<td>4.0−5.5</td>
<td>Uncuffed</td>
<td>10F</td>
<td>10F</td>
<td>Child</td>
<td>20−22 Catheter</td>
<td>12F</td>
</tr>
<tr>
<td>4−7 yrs.</td>
<td>Neonate</td>
<td>Medium</td>
<td>Medium</td>
<td>2−Straight or Curved</td>
<td>5.0−5.5</td>
<td>Uncuffed</td>
<td>14F</td>
<td>14F</td>
<td>Child</td>
<td>20−22 Catheter</td>
<td>12F</td>
</tr>
<tr>
<td>8−10 yrs.</td>
<td>Neonate</td>
<td>Adult</td>
<td>Adult</td>
<td>2−Straight or Curved</td>
<td>5.5−6.5</td>
<td>Uncuffed</td>
<td>14F</td>
<td>14F</td>
<td>Child</td>
<td>20−22 Catheter</td>
<td>12F</td>
</tr>
<tr>
<td>11−15 yrs.</td>
<td>Neonate</td>
<td>Adult</td>
<td>Adult</td>
<td>2−Straight or Curved</td>
<td>5.5−6.5</td>
<td>Uncuffed</td>
<td>14F</td>
<td>14F</td>
<td>Child</td>
<td>20−22 Catheter</td>
<td>12F</td>
</tr>
</tbody>
</table>

Circulation

Supplemental Equipment

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