

# M05: Pediatrics - Trauma

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## Introduction

Trauma is the leading cause of death in children and is responsible for more deaths and potential years of life lost than all other causes combined. Blunt injury accounts for 90% of these trauma cases, with 10% attributable to penetrating injury. The recognition of hidden injuries and rapid stabilization and conveyance of critically injured patients are the foundations of trauma care in all patients, including children.

## Essentials

- In general, trauma patients cannot be stabilized in the out-of-hospital environment. They will continue to deteriorate until they receive definitive surgical care.
- Paramedics and EMRs/FRs should maintain a high index of suspicion when confronted with what appear to be minor injuries associated with a significant mechanism.
- Children are at higher risk for cervical spine injury because of their larger, heavier heads, and weakly developed spine and neck muscles.
- Early deaths in hospital are most commonly due to uncontrolled shock or head injury.
- Due to their relatively healthy cardiovascular systems, children are known to be able to compensate well for blood loss. Heart rate is a more useful guide to resuscitation than blood pressure.

## Additional Treatment Information

- The only interventions that should be carried out prior to conveyance are:
  - Identification and control of hemorrhage
  - Basic C-spine stabilization when required; C-spine stabilization should not delay ABC management and rapid conveyance of patients with head injury or shock
  - Airway management and ventilatory support
  - Relief of tension pneumothorax
  - Simple stabilization of long bone and pelvic fractures; use a pelvic binder for suspected open book fractures
- Except for very long conveyances, the value of an IV and fluids, even for a patient in moderate shock, is controversial and certainly does not warrant any delay.
- Radical deformities should be pulled gently to normal anatomical positioning for packaging.
- Flush grossly contaminated wounds with saline prior to applying a sterile dressing.
- If adequate airway protection and ventilatory support can be achieved through the use of a bag-valve mask and pharyngeal airway, consideration should be given to avoiding intubation in order to minimize delay at the scene.

## General Information

- Pediatric airway specific considerations:
  - Due to disproportion between size of cranium and midface, consider passive C-spine flexion with padding under the shoulders
  - Relatively large, soft tissues within the laryngopharynx
  - Funnel-shaped larynx, more cephalad, and anterior epiglottis
  - Short trachea
- Failure to ensure appropriate ventilation is the most common preventable cause of death in injured children; under-recognized and under-treated hypovolemic shock is the second.
- Opiates and/or Ketamine are the preferred choices of analgesia for the pediatric population. Nitrous oxide is less effective but can also be used due to license level, unless contraindications exist.
- Unlike adults, children rarely die from isolated pelvic fractures. If hemodynamic instability exists in what appears

to be an isolated pelvic fracture, look for other causes of blood loss.

- Most major pediatric intra-abdominal trauma is now managed non-operatively. Bleeding is usually self-limiting even with significant lacerations of the liver, spleen, or a kidney.
- Major trauma criteria define patients who clearly have a high risk of death. They include but are not limited to:
  - Pediatric Trauma Score  $\leq 8$
  - Altered level of consciousness, GCS  $\leq 13$ , or focal neurologic deficit
  - Respiratory distress – change in RR from normal
  - Change in HR from normal
  - Signs of hypo-perfusion – decrease in SBP by 5 mmHg from normal  $[80 + (2 \times \text{age})]$
  - Penetrating injury
  - Long bone fractures – 2 or more
  - Flail chest or open chest wound
  - Major amputation of extremity – proximal to wrist/ankle
  - Airway compromised with significant burns

## Interventions

### First Responder

- Assess wakefulness and perfusion
- Provide basic airway management and supplemental oxygen as required
  - [→ B01: Airway Management](#)
  - [→ A07: Oxygen Administration](#)
- Control life threatening bleeding
  - [→ D02: Bleeding](#)
- Cover open chest wounds with a three-sided occlusive dressing
- Apply spinal motion restriction as required

### Emergency Medical Responder – All FR interventions, plus:

- Provide supplemental oxygen to maintain  $\text{SpO}_2 \geq 94\%$ 
  - [→ A07: Oxygen Administration](#)
- Wound packing
  - [→ PR04: Wound Packing](#)
- Apply chest seal to open chest wounds
- Pelvic binding if patient is  $> 20$  kg (44 lbs)
  - [→ PR02: Pelvic Binders](#)
- Consider need for inhalational analgesia: [Nitrous Oxide](#)
- Facilitate conveyance with early hospital notification
- Consider intercept with additional resources

### Primary Care Paramedic – All FR and EMR interventions, plus:

- Consider vascular access (in patients  $\geq 12$  years of age)
  - [→ D03: Vascular Access](#)
- Consider need for analgesia
  - [→ E08: Pain Management](#)
- Correct blood glucose
  - [→ E01: Hypoglycemia and Hyperglycemia](#)
  - Assessment and correction of blood glucose level is mandatory for all patients with a head injury that presents with an altered level of consciousness (GCS  $< 15$ )

### Advanced Care Paramedic – All FR, EMR, and PCP interventions, plus:

- Consider vascular access
  - → [D03: Vascular Access](#)
  - → [PR12: Intraosseous Cannulation](#)
  - Target BP = values by age below:
    - < 28 days; > 60 mmHg
    - 1-12 months; > 70 mmHg
    - 1-10 years; > 70 mmHg + (2x age in years)
    - 10 years to adulthood; > 90 mmHg
  - [Tranexamic acid](#)
- Advanced airway management as required
  - → [PR18: Anesthesia Induction](#)
- Assess for tension pneumothorax
  - → [PR21: Needle Thoracentesis](#)

#### Critical Care Paramedic – All FR, EMR, PCP, and ACP interventions, plus:

- Advanced airway interventions
- Advanced diagnostics: US, CT, Angio, Xray
- Central IV access
- Blood products
  - [Call ETP prior to blood product](#)
- CBC, type & crossmatch, PT/PTT, electrolytes etc.

## Evidence Based Practice

Pediatric General Trauma Care

### Supportive

- [Fentanyl](#)
- [Ketamine](#)
- [Morphine](#)
- [C-Spine Clearance](#)
- [HEMS](#)
- [Mechanical Intraosseous Insertion](#)
- [Nitrous Oxide](#)
- [Optimal Trip Destination](#)
- [Shock Prediction Tool](#)
- [Blood transfusion](#)
- [Intubation with in-line stabilization](#)

### Neutral

- [BVM](#)
- [Cervical Collar](#)
- [Intubation](#)
- [Manual Intraosseous Insertion](#)
- [Sedation](#)
- [Spinal Precautions](#)

### Against

- [Long Spinal Immobilization Devices](#)

