Bottom Line Recommendations: Summary of Pediatric Emergency Care Information for Healthcare Providers

Pediatric Multisystem Trauma

Trauma is the leading cause of morbidity and mortality in children.[1] Children have unique injury patterns and substantial differences in their response to trauma when compared with adults; special consideration is required when assessing and managing pediatric trauma. For acute management of a pediatric trauma patient, refer to TREKK's Pediatric Multisystem Trauma Algorithm.

Pediatric Injury Characteristics

ANATOMICAL

- Small body mass with large surface area results in increased heat loss and greater external force per body unit area.
- Proportionally larger and less protected solid organs increase chance of intra-abdominal injury (IAI).
- Pliable ribcage/mobile mediastinum leads to major thoracic injury without obvious external signs of trauma.
- Larger head-to-body ratio results in a higher proportion of head injuries and age-related differences in cervical spine injury patterns.

PHYSIOLOGICAL

- Higher metabolic rate leads to increased oxygen and glucose demands, respiratory rate and insensible fluid losses.
- Compensated shock is prevalent and often unrecognized as circulating blood volumes can be very small and blood pressure remains normal until rapid decompensation and cardiac arrest.

DEVELOPMENTAL

- Normal curiosity in young children and increased risk-taking amongst adolescents increases risk of injury.
- Children are often fearful during trauma assessments. Providers may have difficulty with communication and examination, especially in young, preverbal children.

Considerations for Pediatric Primary Survey[2]

CATASTROPHIC EXTERNAL HEMORRHAGE

- Control bleeding by direct pressure, wound closure with staples as needed, or use of tourniquets for extremity hemorrhage not responsive to pressure.

AIRWAY WITH SPINAL MOTION RESTRICTION

- Have pediatric airway equipment available (1/2 size bigger and smaller for age).
- Manual in-line stabilization or blocks/sandbags with tape across forehead are better than an ill-fitting cervical collar.

BREATHING

- Bag mask ventilation (BVM) with the provision of good mask fit, continuous positive airway pressure and ventilation is a key skill for managing pediatric trauma, and often more valuable than tracheal intubation.
- Children have short tracheas and are often intubated too deeply. Endotracheal tubes are easily dislodged in transport. Secure equipment well. Minimize flexion/extension of neck.
- Internal thoracic injury can occur without external or radiological signs of chest wall trauma.
- Children desaturate quickly. Use modified rapid sequence/drug-assisted intubation protocols and/or apneic oxygenation to avoid hypoxia.
- Insert NG/OG tube to improve respiratory status by relieving abdominal distention that impairs breathing. Avoid NG tube in patients with facial injuries or significant head trauma.

CIRCULATION

- Beware of tachycardia and signs of peripheral vasoconstriction (delayed capillary refill, cool extremities, thready peripheral pulses) as early signs of shock. **DO NOT wait for hypotension**. Compensated shock can quickly lead to rapid decompensation/cardiac arrest.
- Place intraosseous (IO) lines early if no IV access after 2 attempts or immediately in traumatic arrest/peri-arrest. Consider proximal humeral IOs in hemodynamically unstable patients, especially if concern for IAI, pelvic fracture or hemorrhage.
- **If compensated shock**, minimize crystalloid (only give 10-20 mL/kg IV warmed isotonic fluids (NS or RL) rapid bolus), then warmed uncrossmatched PRBCs 10-20 mL/kg IV.
- **If active bleeding/hypotension**, transfuse uncrossmatched PRBCs 10-20 mL/kg STAT.[2] Repeat prn. If ongoing need for blood after 20 mL/kg PRBCs, activate local massive hemorrhage protocol if available, and arrange transport ASAP.
- If child requires transfusion and within 3 hours of injury, consider administering tranexamic acid.
- If hemodynamically unstable, use eFAST to identify potentially reversible causes (e.g., pericardial effusion, pneumo/hemothorax, abdominal free fluid).
- **Hemorrhage control is critical** and should be addressed immediately. Direct pressure, tourniquets, pelvic binders, and splinting long bones should be rapidly completed.

DISABILITY

- Use the Pediatric Glasgow Coma Scale to assess/describe mental status. AVPU can also be used as a baseline assessment.
- Assess pupil size, symmetry, and reactivity. Assess power in all extremities.
- Check blood glucose if decreased LOC and in infants/young children to rule out hypoglycemia.
- Treat pain (with analgesia and non-pharmacologic measures) and distress (with family presence, distraction techniques, and calm person at head of bed). Refer to TREKK's Pain Treatment Bottom Line Recommendations.

EXPOSURE

- Document temperature and keep warm using warm blankets, overhead heaters, forced air warmers (e.g., Bair Hugger®) and warmed intravenous fluids (+/- PRBCs).
- Ensure full exposure and careful examination including anogenital region.

FAMILY PRESENCE

- Option for family presence is **standard of care** in Pediatric Trauma Centers across North America to reduce patient/caregiver stress and enhance communication without compromising medical care or team dynamics.
- Have a dedicated support person remain with family if they choose to be present for the resuscitation.
- Assess the family's preference, the availability of a support person, and the potential for exposure to invasive/distressing medical interventions. Serially reassess whether this option remains appropriate/desirable.

Diagnostic Imaging

IMAGING PRIOR TO TRANSPORT

- **AP Chest x-ray:** Obtain in all patients.
- **Cervical spine x-ray**: No. If unable to clinically clear, defer imaging and maintain spinal motion restriction for transport.
- **Pelvic x-ray**: Obtain if concern for pelvic fracture, signs of abdominal trauma, femur fracture, hematuria OR hemodynamic instability.
- **CT Imaging**: Should not delay transport; usually best to allow Pediatric Trauma Center to perform CT imaging.

UTILITY OF EXTENDED FOCUSED ASSESSMENT WITH SONOGRAPHY IN TRAUMA (eFAST)

- eFAST scans have limited sensitivity. May potentially impact management if positive but **are not adequate to rule out** IAI. If concern for clinically important IAI, abdominal CT scan is necessary and best obtained at Pediatric Trauma Centre.
- Use of eFAST in combination with clinical factors (e.g., physical exam, laboratory tests, and serial assessments) increases sensitivity. Future pediatric trauma guidelines may incorporate this clinical strategy.
- eFAST evaluation with an adequately trained user is sensitive for detecting pneumo- and/or hemothorax.

Transport Considerations

- Refer to TREKK's Pediatric Multisystem Trauma Checklist.
- Life-threatening injuries identified and addressed.
- Early communication with receiving Pediatric Trauma Center.
- Airway controlled & equipment well-secured.
- IV or IO access in place and secured.
- Ongoing analgesia, sedation +/- paralysis plan as needed.
- Depending on mode of transport (land/air), discuss need for chest tube placement for pneumothorax prior to transport with Transport Team.
- Communicate key clinical information including patient status, weight (can be estimated with Broselow tape), age, identified injuries, interventions performed, and estimated time of arrival.
- Splint fractures, administer antibiotics and tetanus prophylaxis for open fractures as indicated.
- Gastric tubes & urinary catheters secured as needed.
- Imaging, lab results & paperwork available to Transport Team.

Scan or click the QR code to learn more and to see a full list of references and development team members

The Children's Hospital Foundation of Manitoba