

# Pediatric Multisystem Trauma Algorithm

## Recognition of Multisystem Trauma

- Significant mechanism with injuries and/or abnormal vital signs and/or ↓ GCS
- Prepare age-specific equipment, medications, resources
- Assemble team
- Prepare for immediate life threats:
  - Airway/respiratory compromise, tension pneumo/hemothorax (PTX/HTX), hemorrhagic shock, severe head injury

## EMS Transport

- Before handover and patient transfer, confirm: **patent airway, central pulse, no visible hemorrhage, disability (AVPU)**
- Use **ATMIST** for handover:
  - Age, Time of injury, Mechanism/severity, Injuries sustained, Signs/GCS, Treatments given

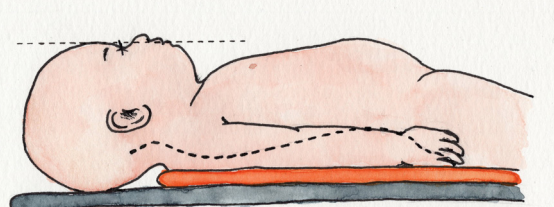
## Initial Management

- Cardiorespiratory monitoring; 100% O<sub>2</sub> by non-rebreather mask
- 2 large-bore antecubital IVs; IO access if 2 failed IV attempts
- Trauma labs (Type & Screen, CBC, lytes, LFTs, amylase/lipase, lactate, fibrinogen, INR/PTT)
- POCT glucose if ↓ LOC; if glucose ≤ 2.6 mmol/L, give D10W 5 mL/kg IV push; recheck glucose in 5 min

Alert Pediatric Referral Centre EARLY

Arrange Critical Care Transport

## Primary Survey: C-ABCDE

	Recognize	Assess for	Manage
<b>C</b>	<b>Catastrophic bleeding</b>	Life-threatening hemorrhage	<ul style="list-style-type: none"> <li>Apply direct pressure/compression bandage</li> <li>Tourniquet for extremity bleeding (note time applied)</li> </ul>
<b>A</b>	<b>Airway compromise</b>	Position/patency Need for protection	<ul style="list-style-type: none"> <li>Spinal motion restriction if indicated; expose neck to assess for neck injury/airway threat</li> <li>Jaw thrust to open; oral suction; oral airway (if obtunded)</li> <li>Early intubation with Manual In-Line Stabilization (MILS) if c-spine not cleared; plan for postintubation sedation needs</li> </ul>  <p>• Elevate thorax for infant/toddler</p>
<b>B</b>	<b>Respiratory failure</b>	Apnea/poor effort Signs of tension pneumothorax (PTX)	<ul style="list-style-type: none"> <li>Assist with BVM/prepare for drug-assisted intubation (See Drug Dosing Binder)</li> <li>Use POCUS to assess for PTX/HTX and/or pericardial tamponade</li> <li>Decompress chest: needle/finger thoracostomy, chest tube</li> <li>Consider chest tube insertion for any intubated patient with a pneumothorax</li> </ul>
<b>C</b>	<b>Hemorrhagic shock</b>	Cool skin, ↑HR, ↓cap refill <b>↓BP is a late sign of shock</b> Find bleeding source*: - Head/scalp - Chest/abdomen/pelvis - eFAST exam * Isolated femur # unlikely cause of shock in young kids	<ul style="list-style-type: none"> <li>Bind pelvis if hemodynamically unstable/known or potential pelvic fracture</li> <li>NS/RL up to 40 mL/kg IV rapid bolus, then warmed PRBCs 10-20 mL/kg IV as rapidly as possible; repeat PRN. Move sooner to PRBCs if poor/no response to fluids.</li> <li><b>If active bleeding/hypotension</b>, limit crystalloid and transfuse: uncrossmatched PRBCs (10-20 mL/kg, repeat PRN). <b>If ongoing need for blood</b>, activate massive transfusion protocol if available, and transport STAT.</li> <li>Consider giving tranexamic acid (TXA) as a load 15-30 mg/kg/dose (MAX 1000-2000 mg) IV over 10-20 minutes, then 5-10 mg/kg/hr IV infusion (MAX 125 mg/hr) for the lesser of 8 hours or until bleeding stops. Use higher end dosing range for more severe bleeds. <b>Do NOT give TXA if greater than 3 hours since injury.</b></li> </ul>
<b>D</b>	<b>Severe head injury</b>	- GCS less than or equal to 8 - Responds to pain only/ Unresponsive (AVPU)	<ul style="list-style-type: none"> <li>↑ head of bed 30°, head midline</li> <li>Drug assisted intubation with Manual In-Line Stabilization (MILS), maintain ETCO<sub>2</sub> 35-40 mm Hg</li> <li>Analgesia/sedation plan (see ongoing care box below)</li> <li>Contact Neurosurgery; consider seizure prophylaxis</li> </ul>
	<b>Impending herniation</b>	- Unilateral fixed and dilated pupil - Cushing's triad: - ↓HR, ↑BP, irregular respirations	<p>If impending herniation:</p> <ul style="list-style-type: none"> <li>3% NaCl 5 mL/kg/dose IV (MAX 250 mL/dose) over 10 minutes (repeat PRN) and/or mannitol 1 g/kg/dose (MAX 100 g) over 15 min</li> <li>Initiate <i>brief period</i> of hyperventilation until responsive pupil, normalized vital signs</li> </ul>
	<b>Neurogenic shock</b>	↓HR, ↓BP; Abnormal tone, ↓power	<p>Vasopressor infusion IV/IO to maintain BP:</p> <ul style="list-style-type: none"> <li>NOREpinephrine (initial 0.05 – 0.1 mcg/kg/min; titrate to effect in 0.02 mcg/kg/min increments; MAX 2 mcg/kg/min) or</li> <li>Phenylephrine (initial 0.1 – 0.5 mcg/kg/min; titrate to effect in 0.02 mcg/kg/min increments; MAX 2 mcg/kg/min)</li> </ul>
<b>E</b>	<b>Exposure</b>		<ul style="list-style-type: none"> <li>Maintain normothermia during assessment (warm blankets, forced-air warmer)</li> <li>Rectal examination only if concern for spinal cord injury</li> </ul>

## Pediatric Considerations/Ongoing Care

- Do not delay transport for CT**
- Treat pain:**
  - Fentanyl 1.5 mcg/kg/dose intranasal (MAX 100 mcg) or 1 mcg/kg/dose IV (MAX 50 mcg/dose) q1h PRN; ketamine (low dose: 0.15-0.3 mg/kg/dose IV); or if hemodynamically stable, can use morphine 0.1 mg/kg/dose (MAX 10 mg/dose) IV q2h PRN
  - Consider other strategies (distraction, etc.) in less severely injured patients (See TREKK Pain Recommendations for details)
  - Splint long bone fractures
- Sedate intubated patients (infusion):**
  - Fentanyl 1 mcg/kg/hr IV and (if needed) midazolam 50 mcg/kg/hr IV if hemodynamically stable
- Family presence** can help calm child, ease parental stress and enable more accurate assessments
- Antibiotics/tetanus prophylaxis for open fractures (See Drug Dosing Binder)
- Consider possibility of **suspected physical child maltreatment**

## CAUTION!

- Resuscitate before intubation
- Avoid hypoxia, hypotension and hyper/hypocarbica
- Do NOT rely on hypotension as marker of shock in kids
- If signs of shock: limit crystalloid and initiate blood early
- Prevent hypothermia

## Pediatric Referral Centre Discussion

- Review threats to life or limb
- Initiate transport
- Assess need for rapid head CT
- Review transport checklist (see trekk.ca)