Pediatric Traumatic Brain Injury Protocol

Time zero

1. Assess, treat, stabilize **Airway – Breathing – Circulation** *(See Assessment and Standard Care for all Patients protocols).*
2. Perform and record **neurologic exams** at least **every 15 minutes**
    A. Level of consciousness
    B. Glasgow Coma Scale
    C. Pupil equality, size and reactivity.
3. Secure airway with ETT if: *(see "Endotracheal intubation, oral")*
    A. Persistent SpO2 < 94% despite optimal non- invasive oxygen supplementation
    B. Hypercarbia or $EtCO_2$ > 45 mmHg
    C. GCS < 8 or motor GCS < 2
    D. Pupil dysfunction (asymmetric or non- reactive) or disconjugate gaze altered from baseline
    E. Loss of gag reflex
    F. Any clinical signs of herniation: Cushings= systemic hypertension + bradycardia and irregular respirations
    G. Decorticate or decerebrate posturing

Respiratory

Check **respiratory rate** and patterns continuously.

A. Goal SpO2 > 94%

Note: One instance of hypoxia has significant negative impact on outcome. Continuously ensure adequate oxygenation.

B. Goal **EtCO2 35-45 mm Hg**.

C. Ventilation strategy for the intubated patient aimed at minimizing mean airway pressure, maximizing oxygenation and maintaining PCo2 within normal limits

Cardiovascular

Maintain BP/CPP

A. Age <1, MAP > 60
B. Age 1-8 yrs, MAP > 70
C. Age ≥8, MAP > 80
D. IF MAP < goal, **push NS 20 mL/kg. Repeat X 1 as needed for MAP < goal**
E. Consider **dopamine** (5-10 mcg/kg/min), or **norepinephrine** (0.05-0.1 mcg/kg/min) if concern for spinal shock

Note: One instance of hypotension has significant negative impact on outcome. Treat hypotension aggressively **DO NOT** treat with anti-hypertensives without consulting with receiving MD

F. Consider PRBC administration if Hgb < 8

Neurologic

1. IF **↓LOC, pupillary changes, ↓HR, ↑BP**
    A. Via ventilator or BVM: ↑RR to EtCO2 25-30mm Hg for ≤5 min.
    B. 3% NaCl (6 mL/kg) or Mannitol (0.5 gm/kg)
2. IF **seizure activity** present,
    A. Midazolam 0.1 mg/kg or lorazepam 0.1 mg/kg
    B. Fosphenytoin or phenytoin 20 mg/kg
3. If intubated, **maintain sedation and analgesia** and consider paralytic
    A. Fentanyl 1 mcg/kg or morphine 0.1 mg/kg
    B. Midazolam 0.1 mg/kg
    C. **Avoid** propofol due to risk of hypotension
    D. Vecuronium 0.1 mg/kg or rocuronium 1 mg/kg

Fluids and electrolytes

1. Check blood **glucose**
    A. If >150 mg/dl do not give dextrose-containing fluids. Use NS as maintenance
    B. If <80 mg/dl give D10W at 5 mL/kg slow push over 10 min, then use D5NS as maintenance
    C. If glucose has been treated, repeat fingerstick glucose checks q 15 minutes throughout transport
2. Check **Na**
    A. If Na < 135 AND 3% NaCl available, give 3% NaCl 6 mL/kg over 60 min. *(see 3% NaCl protocol)*

Maintenance

1. Position patient
    A. **Elevate** patient's head **10-30°** if practical.
    B. Maintain head in **midline**.
    C. Cervical collar
2. Maintain **temperature** 35-37^{o}C. Do NOT warm aggressively
    A. Acetaminophen 15 mg/kg ng or pr
    B. Continuous temperature monitoring is indicated
    C. **Avoid hyperthermia**
3. Protect affected body parts from injury.

Glasgow Coma Scale

Eye opening	
Spontaneous	4
To speech	3
To pain	2
No response	1

Verbal response	
Oriented	5
Confused	4
Inappropriate	3
Moans	2
No response	1

Motor response	
Follows commands	6
Localizes pain	5
Withdraws to pain	4
Decorticate flexion	3
Decerebrate extension	2
No response	1

Table 2. Pediatric Glasgow Coma Scale For Pre-verbal Children.

Eye opening	
Spontaneous	4
To speech	3
To pain	2
No response	1
Verbal response	
Coos, babbles	5
Irritable cry	4
Cries to pain	3
Moans to pain	2
No response	1
Motor response	
Follows commands	6
Localizes pain	5
Withdraws to pain	4
Decorticate flexion	3
Decerebrate extension	2
No response	1