

**Trauma Center Practice Management Guideline**  
*Iowa Methodist Medical Center — Des Moines*

<i>Severe Traumatic Brain Injury Guideline</i>	
<b>PEDIATRIC Practice Management Guideline</b>	<b>Effective: 01/2020</b>
<b>Contact: Trauma Center Medical Director</b>	<b>Last Reviewed: 01/2021</b>

**Purpose**

Standardize comprehensive care of the patient with severe traumatic brain injury

**TBI Injury Care Goals**

1. Prevent **Hypoxia, Hypocarbica or Hypercarbica, Hyperthermia, Hyperglycemia, Hypoglycemia, and Hypotension**
  - a. SpO<sub>2</sub> > **92%**
  - b. pCO<sub>2</sub> **35-40** (40-45 pCO<sub>2</sub> may be acceptable when using venous samples)
  - c. Normothermia: **36-37.5** degrees Celsius: use antipyretics and cooling blanket to treat hyperthermia, avoid shivering
  - d. Blood glucose **80-180mg/dL**, avoiding hypoglycemia
    - If BG >200mg/dL begin insulin infusion and titrate to <180 mg/dL
  - e. Blood pressure: administer **isotonic fluid** and/or **Call Attending** to start **vasopressors**
    - Mean arterial pressure

<b>Age</b>	<b>MAP</b>
0-2	≥50
3-5	≥55
6-8	≥60
>8	≥65

2. Prevent increased metabolic demand
  - a. Sedation
    - Provide adequate sedation (PICU sedation protocol may not be appropriate for patients with GCS < 8)
    - Neuromuscular blockade as appropriate
  - b. Treat active seizures; Seizure prophylaxis may be indicated for a defined period  
 The decision for anti-epileptic medication should be made in consultation with neurosurgery Please see Pediatric Critical Care Traumatic Brain Injury Focused Order Set:
    - Levetiracetam (KEPPRA) is the preferred medication, loading dose 30 mg/kg IV for 15 minutes, followed by 10 mg/kg IV every 12 hours

- Fosphenytoin (CEREBRYX) is an alternative medication, 20 mg PE/kg IV load for 30 minutes, followed by 5 mg PE/kg/day IV every 12 hours
  - Treat active seizures with: Lorazepam or Midazolam, followed by Fosphenytoin
  - Video EEG is appropriate for questionable seizures, intractable seizures and pentobarbital coma
3. Do not administer steroids
  4. Keep head midline, avoid tight cervical collar or circumferential ETT tie
  5. Elevate HOB 30°, reverse Trendelenburg if spine is not cleared
  6. Repeat CT head within 24 hours of admission and as required for clinical deterioration
  7. Establish arterial line, BP monitoring
  8. Central venous catheter, CVP monitoring
    - a. Maintain euvolemia, CVP 5-10
      - Resuscitate to euvolemia with isotonic fluid (normal saline or lactated ringers)
  9. Nutritional support: enteral nutrition should be initiated as soon as it is safe to do so
    - a. Avoid agitation and intracranial hypertension with placement of feeding tube
    - b. Initiate early enteral nutrition support (suggested within 72 hours of injury)
    - c. Goal is full enteral nutrition in under 7 days

### **Intracranial Hypertension Management**

1. Treat ICP  $\geq 20$ mmHg
  - a. **Goal  $< 20$ mmHg**
    - Hypertonic Saline (3%) **2-5 mL/kg infusion over 10-15 minutes** through a central line for ICP  $> 20$ mmHg; may be followed by a **continuous infusion 0.1-1 mL/kg/hr**
    - Mannitol **0.25-1 gram/kg**
    - Goal **Serum Sodium 150-160; Serum Osmolality  $\leq 360$**
    - Cerebral Perfusion Pressure (CPP=MAP-ICP)

Age	CPP
0-5	$\geq 40$
6-8	$\geq 50$
$> 8$	$\geq 60$

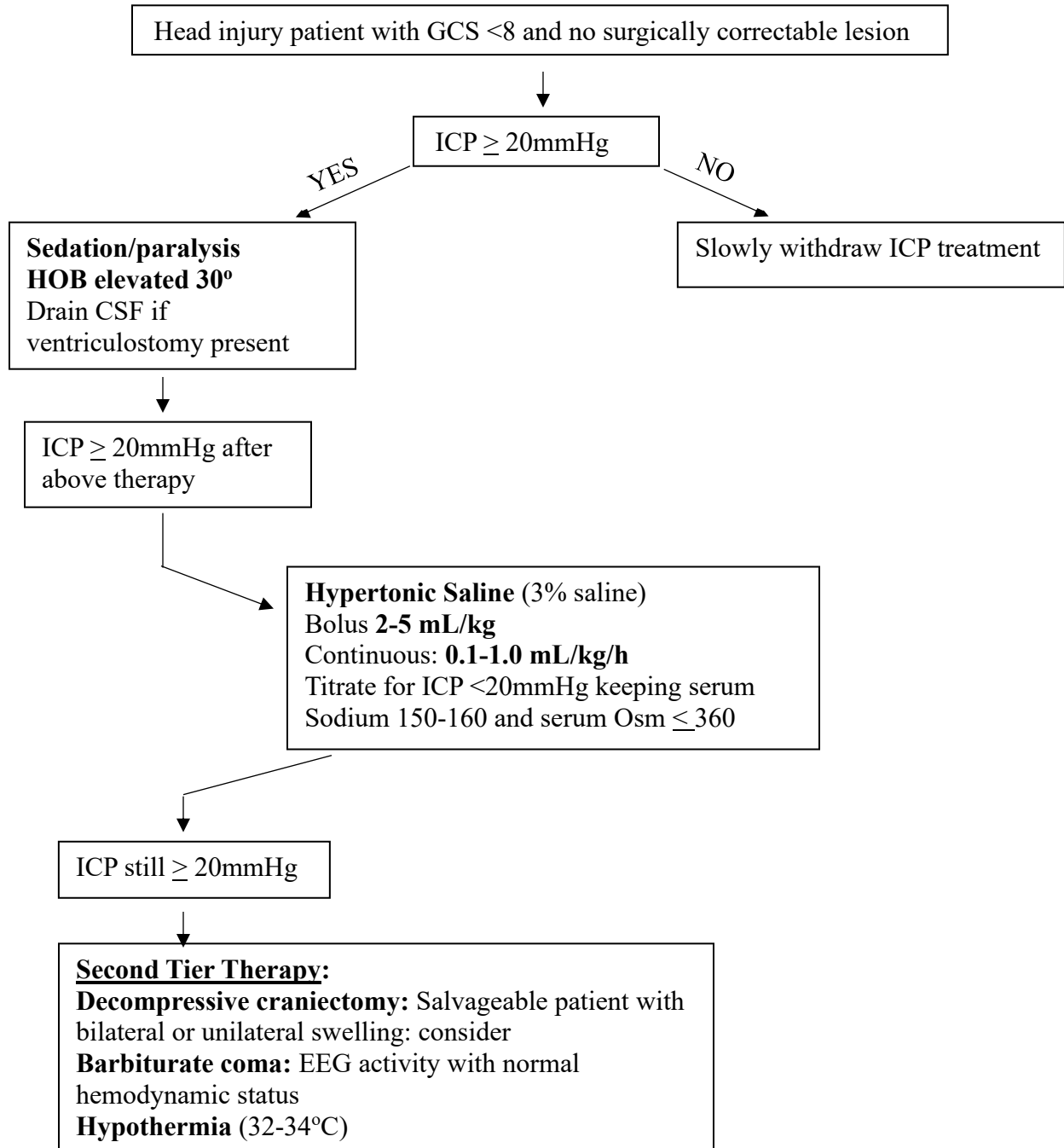
### **Acute Signs of Herniation:**

1. Unilateral or bilateral dilated unresponsive pupils, bradycardia, hypertension (increased systolic BP above diastolic producing a wide pulse pressure), abnormal breathing pattern.
2. Pediatric patients often do not have the classic Cushing triad; may have hypotension, tachycardia or no physiologic signs of herniation.

**Call Neurosurgery and Attending immediately.** Recommendation may be mild hyperventilation (pCO<sub>2</sub> 30-35), hypertonic saline bolus, Mannitol (0.25-1gm/kg) and stat imaging.

Management of patients with decompressive craniectomies should be done in conjunction with neurosurgery. This includes ordering the appropriate helmet with orthotics when it is warranted for each patient.

### Treatment of Elevated Intracranial Pressure



**Related References:**

Kochanek, P.M., Tasker, R. C., Carney, N., Totten, A.M., Adelson, P.D., Selden, N. R.,...Grant, G.A. (2019). Guidelines for the management of pediatric severe traumatic brain injury: update of the brain trauma foundation guidelines. *Pediatric Critical Care Medicine*. 20(3S). S1-S82.