

# Guideline



## CCHMC Trauma Service Guidelines

Title: Severe Traumatic Brain Injury Guideline

Effective Date: 6/2019

Number: TR-29

Page: 1 of 4

### 1.0 SCOPE

- 1.1. Care of the Trauma Services patient at CCHMC.
- 1.2. This guideline provides the clinical guidance of care for any patient with a severe traumatic brain injury (TBI).

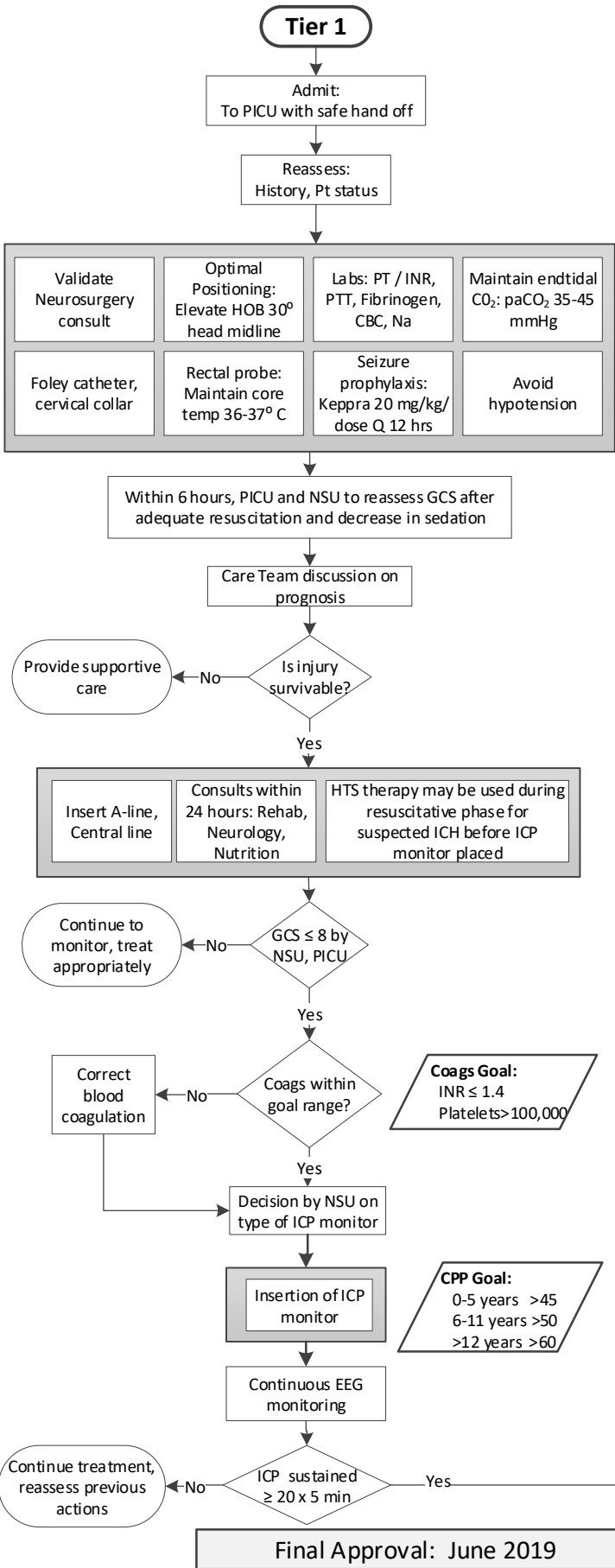
### 2.0 DEFINITIONS

- 2.1. **Severe Traumatic Brain Injury:** Inclusion Criteria:
  - 2.1.1. Abnormal CT scan with hematomas, swelling, herniation, compressed basal cistern, or diffuse axonal injury  
AND either #1 or #2 below
    - 2.1.1.1. Traumatic brain injury (TBI) with GCS  $\leq$  8 (field, transport, or ED)
    - 2.1.1.2. TBI patient admitted with GCS  $>$  8, with deterioration to GCS  $\leq$  8
- 2.2. Exclusion Criteria:
  - 2.2.1. Hypoxic ischemic injuries.
  - 2.2.2. Patient that is deemed non-salvageable after discussion / agreement by clinical care team
  - 2.2.3. Infants with open fontanelles

### 3.0 GUIDELINE

- 3.1. Complete primary and secondary survey per guidelines.
- 3.2. Refer to Severe TBI flow diagram next page

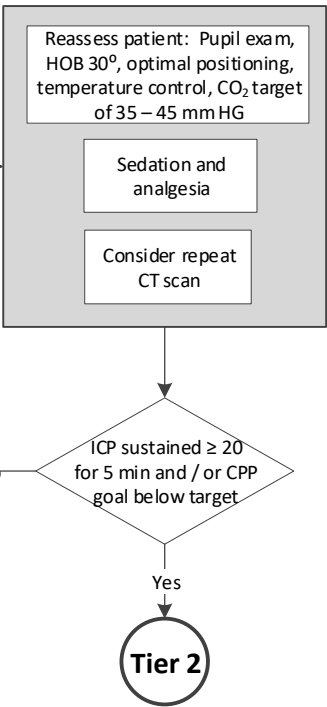
Severe Traumatic Brain Injury: Guideline for Management of ICH in PICU



Inclusion / Exclusion Criteria
<p><b>Inclusion:</b></p> <ul style="list-style-type: none"> <li>Abnormal CT scan with hematomas, swelling, herniation, compressed basal cistern, or diffuse axonal injury AND either #1 or #2 below                     <ol style="list-style-type: none"> <li>Traumatic brain injury (TBI) with GCS <math>\leq</math> 8 (field, transport, or ED)</li> <li>TBI patient admitted with GCS <math>&gt;</math> 8, with deterioration to GCS <math>\leq</math> 8</li> </ol> </li> </ul> <p><b>Exclusion:</b></p> <ul style="list-style-type: none"> <li>Hypoxic ischemic injuries</li> <li>Patient that is deemed non-salvageable after discussion / agreement by clinical care team</li> <li>Infants with open fontanelles</li> </ul>
<p style="text-align: center;"><b>Acute and Sustained Rise in ICP: Concern for impending Herniation</b></p> <p><b>Indicators:</b></p> <ul style="list-style-type: none"> <li>Acute rise in ICP</li> <li>Pupil changes</li> <li>Bradycardia and hypertension</li> </ul> <p><b>Actions:</b></p> <ul style="list-style-type: none"> <li>Contact <b>Intensivist, Neurosurgeon and Trauma Surgeon</b></li> <li>Hyperventilation (brief) to CO<sub>2</sub> level between 30-35 mmHg</li> <li>Add sedation / paralysis to treatment</li> <li>Give 3% HTS bolus at 4 ml/kg (max 500 ml) or Mannitol 0.25 gm-1 gm/kg</li> <li>Obtain I-Stat with electrolytes to assess sodium and CO<sub>2</sub></li> </ul>

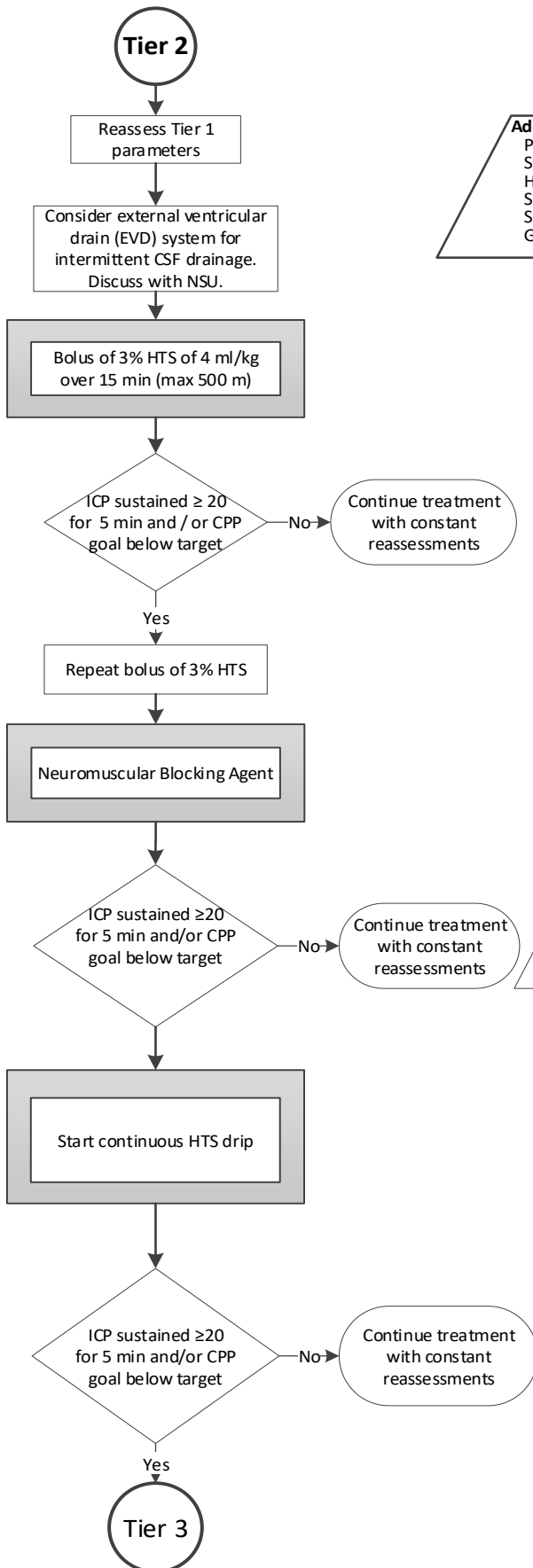
**Additional Goals:**

- Pulse Ox  $\geq$  92-99%
- SBP (appropriate for age)
- Hemoglobin  $\geq$  7 g/dl
- Serum Na 145 - 160
- Serum Osmolality  $<$  360
- Glucose 80-180 mg/dl

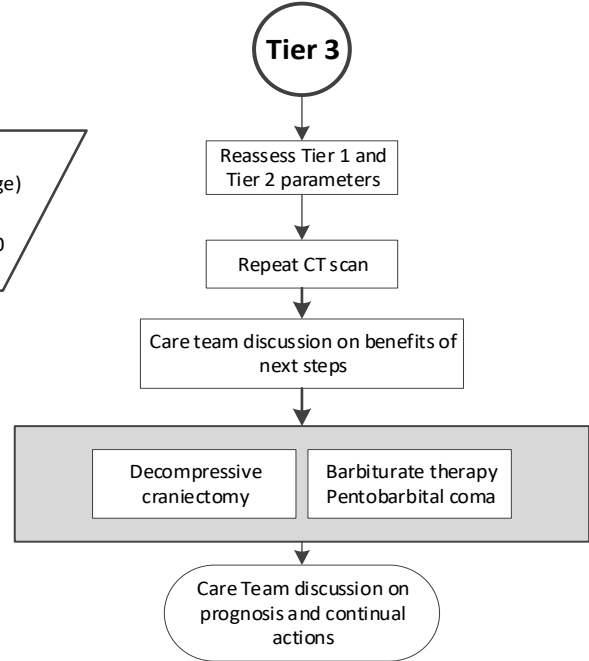


Tier 2: ICP Non Responsive to Tier 1 Therapy

Tier 3: ICP Non Responsive to Tier 2 Therapy



**Additional Goals:**  
 Pulse O<sub>2</sub> ≥ 92-99%  
 SBP (appropriate for age)  
 Hemoglobin ≥ 7 g/dl  
 Serum Na 145-160  
 Serum Osmolality < 360  
 Glucose 80-180 mg/dl



**Barbiturate Therapy**

- Pentobarbital loading dose: 5 mg/kg over 30-60 minutes
- Continuous drip 0.5–1 mg/kg/hr; titrate in increments of 0.5 mg/kg/hr for burst suppression (max dose = 5 mg/kg/hr)

**Hyperosmolar Therapy**

- 3% HTS bolus, 4 ml/kg over 15 minutes (max of 500 ml)
- Typical range of 3% HTS continuous infusion, 0.25–1 ml/kg/hr; titrate to keep ICP < 20 or Na level below 160
- Concentrate maintenance fluids where possible
- When treating with hyperosmolar therapy, serum sodium and serum osmolality should be assessed every 6 hours.
- Caution should be used if serum osmo exceeds 360 mEq/L
- Consider Mannitol, if osmo < 320; maintain osmo < 360

\* Based on Guidelines for the Management of Severe Traumatic Brain Injury 4<sup>th</sup> Edition

**4.0 REFERENCES**

- 4.1. Brain Trauma Foundation; American Association of Neurological Surgeons; Congress of Neurological Surgeons; Joint section of Neurotrauma and Critical Care, AANS/CNS, Bratton SL, Chestnut RM, Ghajar J, McConnell Hammond FF, Harris OA, Hartl R, Manley GT, Nemecek A, Newell DW, Rosenthal F, Schouten J, Shutter L, Timmons SD, Ullman JS, Videtta W, Wilberger JE, Wright DW. Guidelines for the Management of Severe Traumatic Brain Injury. 2007.
- 4.2. Kochanek, P. M., Tasker, R. C., Bell, M. J., Adelson, P. D., Carney, N., Vavilala, M. S., ... & Reuter-Rice, K. E. (2019). Management of Pediatric Severe Traumatic Brain Injury: 2019 Consensus and Guidelines-Based Algorithm for First and Second Tier Therapies. *Pediatric Critical Care Medicine*, 20(3), 269-279.

**5.0 APPROVALS**

All revisions of this guideline are approved by the Trauma Service Department. This guideline is reviewed every three years or sooner if deemed necessary. Policy authority for this document resides with the Trauma Service Department. This guideline is approved by the Trauma Services Manager and the Director of Trauma Services.

HISTORY	
<b>Original Date</b>	
07/2016	
<b>Revision Date</b>	
6/19	
<b>Review Date</b>	
06/18	