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

**Tier 1**

Admit:
To PICU with safe hand off

Reassess:
History, Pt status

| | | | |
|---|---|---|---|
| Validate Neurosurgery consult | Optimal Positioning: Elevate HOB 30°, head midline | Labs: PT / INR, PTT, Fibrinogen, CBC, Na | Maintain endtidal $CO_2$: $paCO_2$ 35-45 mmHG |
| Foley catheter | Rectal probe: Maintain core temp 36-37° C | Seizure prophylaxis: Keppra 20 mg/kg/ dose Q 12 hrs | Cervical collar |

Within 6 hours, PICU and NSU to reassess GCS after adequate resuscitation and decrease in sedation

Care Team discussion on prognosis

Is injury survivable?
- No → Provide supportive care
- Yes

Insert A-line, Central line | Consults within 24 hours: Rehab, Neurology, Nutrition | HTS therapy may be used during resuscitative phase for suspected ICH before ICP monitor placed

GCS ≤ 8 by NSU, PICU?
- No → Continue to monitor, treat appropriately
- Yes

Coags within goal range?
- No → Correct blood coagulation
- Yes

**Coags Goal:**
INR ≤ 1.4
Platelets>100,000

Decision by NSU on type of ICP monitor

Insertion of ICP monitor

**CPP Goal:**
<6 years=45-55
≥6 years=50-60

Continuous EEG monitoring

ICP sustained ≥ 20 x 5 min
- No → Continue treatment, reassess previous actions
- Yes

Is CPP below target?
- No → Reassess patient: Pupil exam, HOB 30°, optimal positioning, temperature control, $CO_2$ target of 35 – 45 mm HG; Sedation and analgesia; Consider repeat CT scan
- Yes → Vasoactive agents to optimize CPP

ICP sustained ≥ 20 for 5 min and / or CPP goal below target
- No → Continue to monitor and treat
- Yes

**Tier 2**

**Additional Goals**:
Pulse Ox ≥ 95%
SBP (appropriate for age)
Hemoglobin ≥ 7 g/dl
Serum Na 145 - 160
Serum Osmolality < 360
Glucose 80–180 mg/dl

## Inclusion / Exclusion Critieria

Inclusion:
- Abnormal CT scan with hematomas, swelling, herniation, compressed basal cistern, or diffuse axonal injury AND either #1 or #2 below
  1. Traumatic brain injury (TBI) with GCS ≤ 8 (field, transport, or ED)
  2. TBI patient admitted with GCS > 8, with deterioration to GCS ≤ 8

Exclusion:
- Hypoxic ischemic injuries
- Patient that is deemed non-salvageable after discussion / agreement by clinical care team
- Infants with open fontanelles

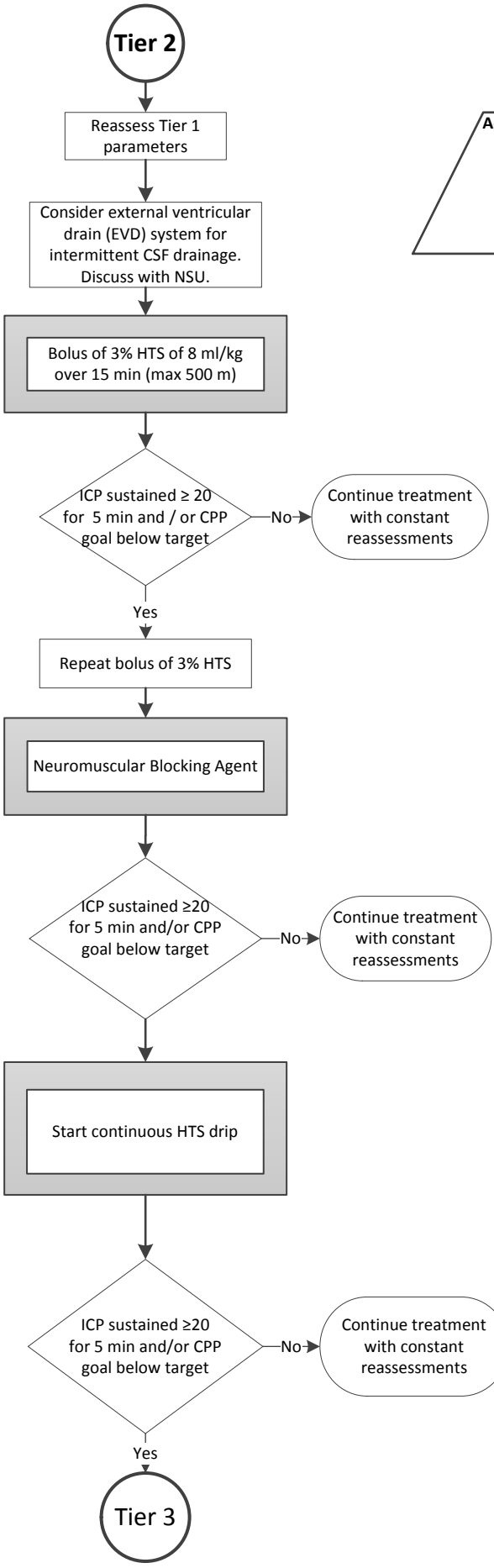
## Acute and Sustained Rise in ICP: Concern for impending Herniation

Indicators:
- Acute rise in ICP
- Pupil changes
- Bradycardia and hyptertension

Actions:
- Contact **Intensivist, Neurosurgeon and Trauma Surgeon**
- Hyperventilation (brief) to $CO_2$ level between 30-35 mmHg
- Add sedation / paralysis to treatment
- Give 3% HTS bolus at 8 ml/kg (max 500 ml) or Mannitol 0.25 gm-1 gm/kg
- Obtain I-Stat with electrolytes to assess sodium and $CO_2$

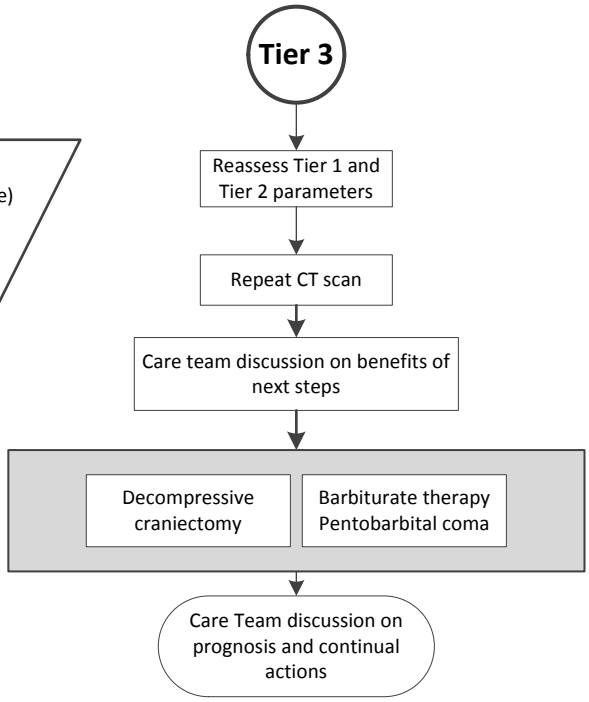
Final Approval: June 2016

## Tier 2: ICP Non Responsive to Tier 1 Therapy




**Additional Goals:**
- Pulse Ox ≥ 95%
- SBP(appropriate for age)
- Hemoglobin ≥ 7 g/dl
- Serum Na 145-160
- Serum Osmolality<360
- Glucose 80-180 mg/dl

## Tier 3: ICP Non Responsive to Tier 2 Therapy




**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, 8 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