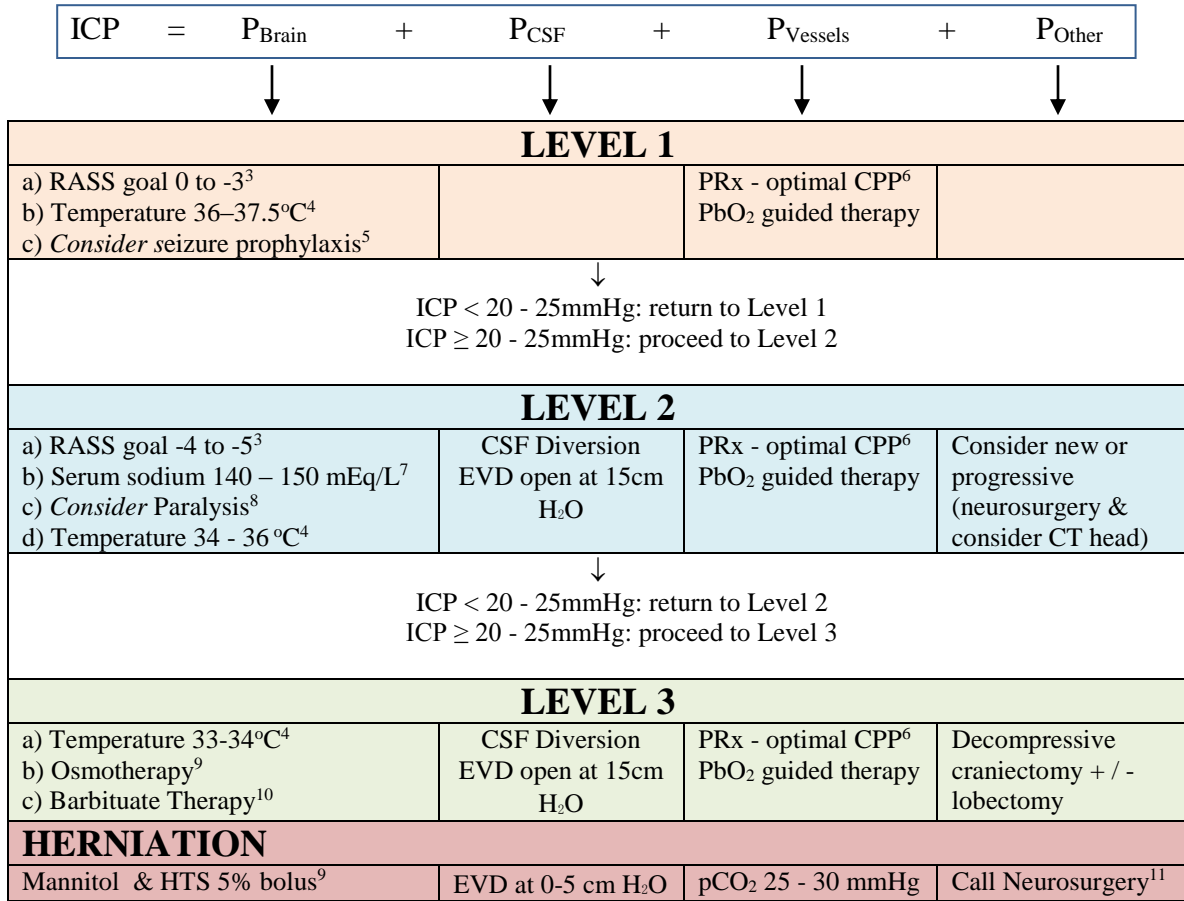


# Vancouver General Hospital ICU Traumatic Brain Injury - Multimodal Monitoring Protocol

Monitoring & Goals	General ICU Care	Contraindicated
<ul style="list-style-type: none"> <li>• SaO<sub>2</sub> ≥ 97%</li> <li>• Central venous and arterial catheter</li> <li>• ICP ≤ 20 - 25mmHg</li> <li>• Maintain CPP within +/- 5mmHg of CPP<sub>opt</sub> by PRx</li> <li>• Brain tissue oxygenation - P<sub>b</sub>O<sub>2</sub> &gt; 20 mmHg</li> <li>• Glucose : As per ICU Insulin protocol</li> <li>• Hemoglobin ≥ 90 d/L</li> <li>• Serum Na &gt; 140 mEq/L</li> </ul>	<ul style="list-style-type: none"> <li>• DVT Prophylaxis<sup>1</sup></li> <li>• GI Prophylaxis</li> <li>• Nutrition as per ICU protocol</li> <li>• HOB 30 °</li> <li>• Spine precautions<sup>2</sup></li> <li>• Neck neutral, no compression<sup>2</sup></li> <li>• CSF analysis q48h if EVD</li> </ul>	<ul style="list-style-type: none"> <li>• Glucocorticoids</li> <li>• Prophylactic Hyperventilation (pCO<sub>2</sub> &lt; 25 mmHg)</li> </ul>



### PbO<sub>2</sub> GUIDED THERAPY (Ensure correct position of catheters<sup>12</sup>)

PbO <sub>2</sub> < 20mmHg	
ICP ≥ 20 - 25mmHg	ICP < 20 - 25mmHg
1) Decrease ICP (as per protocol) 2) Titrate CPP to CPP <sub>opt</sub> as per PRx 3) Transfuse RBC for Hb > 90g/L	1) Titrate CPP to CPP <sub>opt</sub> as per PRx 2) Transfuse RBC for Hb > 90g/L 3) pCO <sub>2</sub> 40 - 45mmHg
If PbO <sub>2</sub> < 20mmHg despite above interventions, consider normobaric hyperoxia: Increase FiO <sub>2</sub> to target PaO <sub>2</sub> 100 - 200mmHg to titrate PbO <sub>2</sub> > 20mmHg	

# Vancouver General Hospital ICU

## Traumatic Brain Injury - Multimodal Monitoring Protocol

### Appendix 1.

#### <sup>1</sup> DVT Prophylaxis

Apply Sequential Compression Devices (unless lower extremity long bone trauma)  
Timing of Heparin or Low Molecular weight heparin to be discussed with Neurosurgery team

#### <sup>2</sup> Ensure C spine precautions – As guided by imaging and ICU attending

C – spine collar and endotracheal tube tie not constricting jugular venous flow  
Consider removing collar and maintain c-spine precautions with sandbags

#### <sup>3</sup> Sedation

Amnesia: Propofol 0-80mcg/kg/min infusion (implement ICU Propofol monitoring)  
*and / or* Midazolam 0-20 mg/hour infusion  
Analgesia: Fentanyl 0-200mcg/h *or or* Hydromorphone 0-2 mg/hour infusion

#### <sup>4</sup> Use of antipyretics (acetaminophen) & external cooling devices (Arctic Sun / cooling blanket)

#### <sup>5</sup> Phenytoin 18 mg/kg IV load (round to closest 50mg) and then 5mg/kg/d IV (round to closest 50mg) divided every 8 hours x 7 days

##### Indications:

Depressed skull fracture  
Penetrating trauma  
Witnessed seizure  
Concomitant epidural, subdural or intracerebral hematoma

#### <sup>6</sup> Pressure reactivity index - ICU attending to establish optimal cerebral perfusion pressure using ICM+ software. Patient CPP should be maintained within +/- 5mmHg of established target daily.

#### <sup>7</sup> If serum sodium < 140 mEq/L then 50 to 100ml 5% Hypertonic Saline IV bolus every 4-6 hours Change maintenance lines to Normal Saline, feeds with low free water (Resource 2.0) Consider Fludrocortisone 300mcg via NG daily

#### <sup>8</sup> Rocuronium 0.5 mg/kg IV every hour when necessary (prior to turns / suctioning / chest physiotherapy)

#### <sup>9</sup> Osmotherapy:

1<sup>st</sup> line: 5% hypertonic saline 50 to 100ml IV every 4-6hours for Na 150 to 155mEq/L  
2<sup>nd</sup> line: 20% mannitol 0.25g/kg IV bolus every 4-6 hours (keep serum osmolality < 320)

##### Herniation:

1<sup>st</sup> line: 5% hypertonic saline 150ml IV bolus  
2<sup>nd</sup> line: 20% mannitol 1g/kg IV bolus

#### <sup>10</sup> Pentobarbital 10mg/kg load then 1mg/kg/h infusion

Consider weaning other sedative infusions and neuromuscular paralysis

#### <sup>11</sup> Consider CT head and emergent operative intervention

#### <sup>12</sup> Positioning of Licox brain tissue oxygenation

Increase FiO<sub>2</sub> to 100% for 5 minutes, check for increase in PbO<sub>2</sub> in 2 minutes  
If PbO<sub>2</sub> increases within 2 minutes, then catheter in appropriate position  
If PbO<sub>2</sub> does not increase then contact MD for further assessment