SEVERE TRAUMATIC BRAIN INJURY
Unconfounded GCG ≤8

Spine precautions
- HOB 30 degrees (if thoracolumbar spine cleared); or
- Reverse Trendelenburg 30 degrees (if full spine precautions)

Airway & c-spine
- Protect airway
- Spine precautions

Indication for intubation?
- GCS <8 or motor score <6; or
- Concomittant hypoxemic respiratory failure; or
- Absent cough or gag; or
- Agitation prohibiting CT scanning?

Yes → **Intubation**
- Avoid hypotension (SBP >100 mmHg), hypoxemia (O_2 sat >92%)
- Suggested induction agent: Ketamine 0.5–1.0 mg/kg IV
- Suggested paralytic agent: Rocuronium 1–1.2 mg/kg IV

No

Breathing
- Ventilate to **$PaCO_2$ 35–40 mmHg**
- Oxygenate to **PaO_2 100–150 mmHg**
- PEEP 5–12 cm H_2O

Circulation
- Central or Intraosseous line & Arterial line
- **MAP >80 mmHg** using *norepinephrine infusion* (0–20 mcg/min or 0–0.3 mcg/kg/min)
- **SBP <160- mmHg** using *Labetalol* and/or *Hydralazine*

Central line
Avoid prolonged Trendelenburg positioning while placing central line for concerns of increased cranial pressure (ICP). Consider femoral central line.

MAP goal >80 mmHg
1st vasopressor: Noreprenephrine 0–20 mcg/min, or 0–0.3 mcg/kg/min

SBP goal <160 mmHg
- *Labetolol* 5–15 mg IV every 15 min prn (avoid for heart rate <60 beats per min)
- *Hydralazine* 5–15 mg IV every 15 min prn

CT scan
- Non-contrast CT head
- Consider CT angio (arch to COW) and CT c-spine
- Consider chest/abdomen/pelvic CT for other injuries as indicated

Coagulopathy treatment
Administer plasma, platelets and cryoprecipitate as necessary to achieve:
INR <1.5, PTT <40,
Platelets >100, Fibrinogen >1.0

Warfarin (Coumadin) prescribed? → Yes → Administer *prothrombin complex concentrate* (Octaplex/Beriplex)

Disability
Document best neurologic examination (pupil size & reactivity, GCS, best motor examination)

Drugs
Sedation **after** neurologic examination (*Propofol* 0–80 mcg/kg/min IV infusion)

Overt signs of pain? (grimace, tachycardia, hypertension) → Yes → Consider analgesia: Fentanyl 0–75 mcg/hour IV infusion

- Depressed skull fracture; or
- Penetrating trauma; or
- Witnessed seizure; or
- Temporal lobe contusion?

→ Yes →

Seizure Prophylaxis
- *Phenytoin* 20 mg/kg IV load (round to closest 50 mg) and then 5 mg/kg/d IV (round to closest 50 mg) divided every 8 hours x 7 days
- *Leviteracetam* 1000 mg enteral every 12 hours

Exposure
- Use antipyretics (acetaminophen) & external cooling devices (cooling blanket) to achieve core temperature goal: **36.0–37.5 °C**
- If hypothermic on admission (temp <35 °C) then maintain temperature 35–36 °C

Labs
- Goal: **Na 140–150 mEq/L**
- Goal: **hemoglobin ≥90 g/dL**

If serum sodium <140 mEq/L then consider 3–5 mL/kg 3% Hypertonic Saline IV bolus followed by hypertonic saline 3% infusion (1–2 mL/kg/h IV infusion)

Limit blood draws and transfuse RBC for Hb <90 g/dL

Herniation
If herniation syndrome (unilateral or bilateral pupils become fixed and dilated):
- *3% Hypertonic saline* (3–5 mL/kg IV bolus): Repeat dose in 2–4 hours.
- *Mannitol* (20% 1 g/kg IV bolus)
- Mild hyperventilation — **$PaCO_2$ 25–30 mmHg**

Preferred agent with concomittant hemodynamic instability.

Legend
- Investigation
- Action
- Diagnosis
- Notes

Abbreviations
GCS — Glasgow Coma Scale
HOB — head of bed