HEAD INJURY (TRAUMATIC BRAIN INJURY)

ALL PROVIDERS / EMT

- ❑ Focused history and physical exam
- ❑ Cardiac monitor, CO2, and Pulse Oximetry monitoring when available
- ❑ **Treatment Plan**
  - Maintain airway. Administer oxygen to maintain SaO2 90-94%.
  - Consider spinal motion restrictions per the ***Spinal Motion Restriction Guideline***
  - Elevate head 30 degrees.
  - Monitor the level of consciousness during the transport
  - **Severe TBI** (GCS <8 or AVPU "P" or "U"):
    - Adult: Consider endotracheal intubation for airway protection (Paramedic only)
    - Pediatrics: Continue effective BVM. Utilize airway adjuncts, if needed to ensure adequate chest rise, ventilation, and oxygenation.
    - **Do not hyperventilate** unless patient shows signs of herniation: unilateral pupillary dilation or posturing. In this case, increase respiratory rate by ~10% above normal target respiratory rate (see Mild Hyperventilation Guide). Target ETCO2: 30-35 mmHg.

Mild Hyperventilation Guide for Signs of Herniation

Age	Normal Ventilation Rate	Mild Hyperventilation Rate
Neonate	40	44
Infant	30	33
Child	20	22
Adult	10	12

  - Open skull fractures should be covered with dry sterile dressings. Do not apply pressure unless needed to stop severe hemorrhage.
- ❑ **Key Considerations**
  - TBI may be painful. However, excessive pain medications can cloud serial neurological assessments. Pain medications should generally be avoided in a patient with altered mental status after TBI. If pain is severe, give small doses only until pain is manageable.
  - Patients with TBI may be confused or combative. Consider physical/chemical restraints if needed to protect patient or personnel.
  - Loss of memory, prolonged confusion or altered mental status associated with trauma may indicate a significant head injury.
  - Avoid hypoxia (SaO2 should be 90-94%).
  - Avoid over tightening of cervical collar (if placed) as this can cause increased intracranial pressure
  - Do not allow the patient to be hypotensive. Try to keep adult SBP >110 using the ***Shock and Fluid Therapy Guideline.***
  - Pediatric lowest acceptable systolic blood pressures are birth to 1 month = 60mmHg, 1 month to 1 year = 70mmHg, 1 year to 10 years is = 70mmHg + (age x 2) and over 10 years = 90mmHg.

ADULT

AEMT

- ❑ Advanced airway, vascular access, and fluid therapy
- ❑ Check blood pressure every 5-10 minutes.
- ❑ Follow the Traumatic Brain Injury pressure management under the ***Shock and Fluid Therapy Guideline***.

PARAMEDIC

- ❑ **Persistent hypotension unresponsive to fluids:**
- ❑ **Epinephrine 2–10 mcg/min** IV/IO infusion for hypoperfusion. Titrate to maintain a SBP >100 mmHg
- ❑ **Push Dose Epinephrine 10mcg** as needed to maintain a SBP >100 mmHg after fluid bolus
- ❑ **Norepinephrine** initial dose: **0.05 – 1 mcg/kg/min** IV/IO for hypoperfusion. Titrate to maintain a SBP > 100 mmHg. For patients in refractory shock: 8-30 mcg/minute

PEDIATRIC (<15 years)
NOTE: Pediatric weight based dosing should not exceed Adult dosing.

AEMT

- ❑ Advanced airway, vascular access, and fluid therapy
- ❑ Check blood pressure every 5-10 minutes.
- ❑ Initiate NS 20ml/kg IV/IO for hypotension OR if unable to obtain blood pressure
- ❑ If hypotensive patient shows no improvement with initial treatment, may repeat NS 20 ml/kg IV/IO up to a total of 60 ml/kg

PARAMEDIC

- ❑ **Persistent hypotension unresponsive to fluids:**

- ✆ **Epinephrine 0.1–1 mcg/kg/min** IV/IO infusion for hypoperfusion. Titrate to maintain a SBP >70 + (age in years x 2) mmHg
- ✆ **Push Dose Epinephrine 1mcg/kg** as needed to maintain a SBP>70 + (age in years x 2) mmHg after fluid bolus
- ✆ **Norepinephrine** initial dose: **0.05 - 0.1 mcg/kg/min**, titrate to max of 2 mcg/kg/min to maintain SBP >70 + (age in years x 2) mmHg