



Head Trauma

History

- Time of injury
- Mechanism (blunt vs. penetrating)
- Loss of consciousness
- Bleeding
- Past medical history
- Medications
- Evidence for multi-trauma

Signs and Symptoms

- Pain, swelling, bleeding
- Altered mental status
- Unconscious
- Respiratory distress/ failure
- Vomiting
- Major traumatic mechanism of injury
- Seizure

Differential

- Skull fracture
- Brain injury (Concussion, Contusion, Hemorrhage)
- Epidural hematoma
- Subdural hematoma
- Subarachnoid hemorrhage
- Spinal injury
- Abuse

Prevent hypoxia, hypotension, and hyperventilation

A single episode of hypoxia, hypotension, and hyperventilation increases mortality

Age Appropriate Airway Protocol(s) AR 1, 2, 3, 5, 6 <i>if indicated</i>	
	Obtain and Record GCS
	All patients
	Titrate target SpO2 100%
	Monitor HR, BP and O2 every 3-5 minutes
Blood Glucose Analysis Procedure	
B	Maintain EtCO2 35 – 45 mmHg
A	IV or IO Access - UP 6 <i>if indicated</i>
P	Cardiac Monitor
Altered Mental Status - UP 4 <i>if indicated</i>	
Multiple Trauma - TB 6 <i>if indicated</i>	
Age Appropriate Hypotension/ Shock - AM 5/ PM 3 <i>if indicated</i>	
Seizure - UP 13 <i>if indicated</i>	
Spinal Motion Restriction Protocol TB 8 Procedure WTP 2 <i>if indicated</i>	
Pain Control - UP 11 <i>if indicated</i>	
Monitor and Reassess	

Hyperventilation:
Hyperventilation is **NOT** recommended in patients who require BVM, BIAD, or ETT.

Maintain ventilation rate to target EtCO2 of 35 – 45 mmHg
See Pearls

Age Specific Blood Pressure indicating possible shock

Age 0 – 28 days: SBP < 60
Ages ≥ 1 month: SBP < 70
Age 1 – 9: SBP < 70 + (2x Age)

Ages 10 – 64: SBP < 90
Ages ≥ 65: SBP < 110

All ages Shock Index:
 $SI = HR \div SBP$

Use Shock Index, Pediatric Adjusted (SIPA) for children <12 (see pearls)

Rapid Transport to appropriate destination using
Trauma and Burn:
EMS Triage and Destination Plan

Notify Destination or Contact Medical Control



Head Trauma

Eye Opening Response	Verbal Response	Motor Response
4 = Spontaneous	5 = Oriented	6 = Obeys commands
3 = To verbal stimuli	4 = Confused	5 = Localizes pain
2 = To pain	3 = Inappropriate words	4 = Withdraws from pain
1 = None	2 = Incoherent	3 = Flexion to pain or decorticate
	1 = None	2 = Extension to pain or decerebrate
		1 = None

Age	HR	SBP	SIPA cutoff value
1–3 years	70–110	90–110	1.2
4–6 years	65–110	90–110	1.2
7–12 years	60–100	100–120	1.0
> 12 years	55–90	100–135	0.9

SIPA, shock index, pediatric age-adjusted; HR, heart rate; SBP, systolic blood pressure.

Pearls

- **Recommended Exam: Mental Status, HEENT, Heart, Lungs, Abdomen, Extremities, Back, Neuro**
- **Hypoxia:**
 - Single episode of hypoxia can worsen head injury and double mortality.
 - Titrate SpO₂ as close to 100% as possible.
- **Hyperventilation in head injury requiring advanced airway:**
 - Hyperventilation lowers CO₂ and causes vasoconstriction leading to increased intracranial pressure (ICP).
 - Hyperventilation is not recommended and can worsen the brain injury.
 - In patients requiring BVM, BIAD, or endotracheal tube, titrate ventilation rate to EtCO₂ between 35 - 45 mmHg.
 - Recommended ventilation rates with advanced airways:**
 - Infant/ Toddler: 25 breaths / minute
 - Children: 20 Breaths / minute
 - Adolescents/ Adults: 10 – 12 Breaths / minute
- **Hypotension:**
 - Episodes of hypotension can worsen head injury and increase mortality:
 - In adults, minimal SBP is at least 90 - 100 mmHg.
 - In pediatrics, minimal SBP is at least $> 70 + (2 \times \text{the age in years})$.
 - Usually indicates shock unrelated to the head injury and should be aggressively treated, otherwise limit fluid administration.
- **GCS**
 - Key performance measure used in the EMS Acute Trauma Care Toolkit.
 - Serial assessments of GCS with ongoing assessments should be performed.
- Do not place in Trendelenburg position as this may increase ICP and worsen blood pressure.
- Poorly fitted cervical collars may also increase ICP when applied too tightly.
- In areas with short transport times, Drug Assisted Airway protocol is not recommended for patients who are spontaneously breathing and who have oxygen saturations of $\geq 90\%$ with supplemental oxygen including BIAD/ BVM.
- Increased intracranial pressure (ICP) may cause hypertension and bradycardia (Cushing's Response).
- Consider Restraints if necessary for patient's and/ or personnel's protection per the Restraints: Physical Procedure USP 5.
- **Concussions:**
 - Traumatic brain injuries involving any of a number of symptoms including confusion, loss of consciousness, vomiting, or headache.
 - Any prolonged confusion or mental status abnormality which does not return to normal within 15 minutes or any documented loss of consciousness should be evaluated by a physician ASAP.
 - EMS Providers should not make return-to-play decisions when evaluating an athlete with suspected concussion.**
 - This is outside the scope of practice.**