



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 ÷ 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 x 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 ≥ 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.