REGION 11 CHICAGO EMS SYSTEM PROTOCOL	Title: Head Injury – BLS/ALS
	Section: Trauma
	Approved: EMS Medical Directors Consortium
	Effective: July 10, 2024

HEAD INJURY – BLS/ALS

I. PATIENT CARE GOALS

1. Limit disability and mortality from head injury by minimizing secondary brain injury through

    a. Promoting adequate oxygenation and pre-oxygenating to protect against unanticipated deterioration
    b. Promoting good cerebral perfusion and avoid hypotension
    c. Preventing hypocapnia (by avoiding hyperventilation and overventilation)

II. PATIENT PRESENTATION

A. INCLUSION CRITERIA

1. Adult or pediatric patient with blunt or penetrating head injury – loss of consciousness or amnesia not required.

III. PATIENT MANAGEMENT

A. Assessment

1. Maintain cervical stabilization (see Spinal Care Protocol).

2. Primary survey per the General Trauma Management Protocol.

3. Monitoring:

    a. Continuous pulse oximetry.
    b. Frequent systolic and diastolic blood pressure measurement.
    c. Initial neurologic status assessment and reassessment with any change in mentation.
    d. Moderate/severe head injury: Apply continuous waveform ETCO2 if available.

4. Secondary survey pertinent to isolated head injury:

    a. Head: Gently palpate skull to evaluate for depressed or open skull fracture.
    b. Eyes:
        i. Evaluate pupil size and reaction to light to establish baseline;
        ii. Reassess pupils if decrease in mentation.
    c. Nose/Mouth/Ears: Evaluate for blood/fluid drainage.
    d. Face: Evaluate for bony stability.
    e. Neck: Palpate for cervical spine tenderness or deformity.
    f. Neurologic:

i. Perform neurologic status assessment (GCS or AVPU)
ii. Evaluate for focal neurologic deficit: motor and sensory.

5. Head injury severity guideline:

   a. Mild: GCS 13-15 / AVPU = (A)
   b. Moderate: GCS 9-12 / AVPU = (V)
   c. Severe: GCS 3-8 / AVPU = (P) or (U)

B. Treatment and Interventions

1. Airway:

   a. Administer oxygen as needed to maintain an oxygen saturation of > 94%.
   b. If patient unable to maintain airway, consider oral airway (nasal airway should not be used with significant facial injury).
   c. BVM (bag-valve-mask) ventilation if oxygen administration or non-rebreather (NRB) is inadequate to maintain oxygenation or ventilation.
   d. Place supraglottic airway or perform endotracheal intubation if BVM ventilation is ineffective in maintaining oxygenation or if airway management is required.

2. Breathing:

   a. For patients with a moderate or/severe head injury who are unable to maintain their airway or are hypoxic despite basic airway interventions, initiate BVM ventilation.
   b. Supraglottic airway placement or endotracheal intubation should only be performed if BVM ventilation is inadequate to maintain adequate oxygenation.
   c. Do not hyperventilate patients: Maintain all patients in ETCO2 range of 35–45 mmHg.

3. Circulation:

   a. Wound care:
      i. Control bleeding with direct pressure if no suspected open skull injury.
      ii. Moist sterile dressing to any potential open skull wound.
      iii. Cover an injured eye with moist saline dressing and eye shield if available to protect from further injury.
   b. Moderate/severe closed head injury:
      i. Blood pressure: Avoid hypotension and administer fluid bolus as indicated.
         - Adult: Target systolic blood pressure 110-120 mmHg. Hypotension should be avoided to maintain cerebral perfusion
         - Pediatric: Maintain systolic blood pressure:
           a. Less than 1 month: Greater than 60 mmHg
           b. 1-12 months: Greater than 70 mmHg

c. 1-10 y/o: Greater than 70 + 2x age in years

c. Mild closed head injury:
   i. Administer IV fluid boluses to maintain systolic blood pressure above threshold to maintain cerebral perfusion.
   ii. Do not wait until after the patient is already hypotensive—prevent hypotension.

d. Do not delay transport to initiate IV access.

4. Disability:

   a. Evaluate for other causes of altered mental status - check blood glucose.
   b. Spinal assessment and management, per Spinal Care Protocol.
   c. Perform and trend neurologic status assessment (GCS or AVPU scale):
      i. Early signs of deterioration:
         - Confusion
         - Agitation
         - Drowsiness
         - Vomiting
         - Severe headache
      ii. Monitor for signs of herniation
   d. Severe head injury – Elevate head of bed 30 degrees.

5. Transport according to Region 11 Trauma Field Triage Criteria:

   a. Preferential transport to Level 1 Trauma Center:
      i. GCS 3-13, P (pain) or U (unresponsive) on AVPU scale;
      ii. Penetrating head trauma;
      iii. Open or depressed skull fracture.

C. Patient Safety Considerations

1. Do not hyperventilate patients: Maintain all patients in ETCO2 range of 35–45 mmHg.

2. Assume concomitant cervical spine injury in patients with moderate/severe head injury.

3. **Geriatric Consideration**: Elderly patients with ankylosing spondylitis or severe kyphosis should be padded and immobilized in a position of comfort and may not tolerate a cervical collar.

4. **Pediatric Consideration**: Children have disproportionately larger heads. When securing pediatric patients to the stretcher with spinal motion restriction (SMR), the body should be elevated approximately 1–2 cm to accommodate the larger head size and avoid neck flexion when flat.

IV. NOTES/EDUCATIONAL PEARLS

A. Key Considerations

1. Hypoxia, hypotension, hyperventilation are especially dangerous in severe head injury patients.

2. Important that providers be specifically trained in accurate neurologic status assessment.

3. If endotracheal intubation or supraglottic airways are used, continuous waveform capnography is required to document proper tube placement and assure proper ventilation rate.

4. Herniation is difficult to diagnose in the prehospital setting. Hyperventilation results in vasoconstriction which further decreases blood flow to the brain and worsens the secondary brain injury.

B. Pertinent Assessment Findings

1. Neurologic status assessment findings

2. Pupils

3. Trauma findings on physical exam