WVU Medicine Children's
CRITICAL CARE & TRAUMA CENTER

Practice Management Guideline
Moderate Traumatic Brain Injury (GCS 9-12)

Initial Management of all Moderate Traumatic Brain Injury (GCS 9-12)

1. Operative intervention for early removal of hematoma, loosely replacing bone flap as possible. Neurosurgery attending on-call responsible for all surgical decisions.
    - ICU admission for frequent neuro checks and close observation
    - Intubate for any concern of airway protection or change in mental status
2. Recommendations for Optimal Parameters for Brain Physiology
    - MAP ≥ 60 and < 85 mmHg for children < 2 y
    - MAP ≥ 68 and < 90 mmHg for children 2- <5 y
    - MAP ≥ 75 and < 95 mmHg for children ≥ 5 y
    - O_2 sat ≥ 94%
    - PaO_2 100-200 mmHg
3. Maintain normal PCO_2 38-40 mm Hg, (uncorrected for temp)
4. Maintain temp 36.5-37.5; consider placing rectal probe for continuous monitoring
5. If paralytics are needed for pulmonary issues, use Vecuronium 0.1 mg/kg, titrate to need for respiratory control. Ensure adequate sedation if paralytics used. Consider barbiturate for sedation and for neuroprotection if necessary.
6. **If unable to assess neurological condition, consider implementation of the Severe TBI protocol. Consult with Neurosurgery Attending On-Call.**
7. Maintain continuous EEG while child is paralyzed.
8. Check electrolytes q 6 hours X 48 hours; send urine electrolytes and osm if Na+ < 135 or > 148; check H/H qd X 2 days

Further Nuances and Points of Management

A. **NO** dextrose in the IV for 48 hours unless:
    - Children < 2 years – Serum glucose < 80 mg/dl and spilling ketones
    - Children ≥ 2 years – Serum glucose < 70 mg/dl and spilling ketones
    - Titrate insulin drip for serum glucose > 200 mg/dl

B. Hypovolemia is avoided by replacement of urine volume. Central venous pressure, daily weight, and I&Os, urine specific gravity, urine dipstick, and as needed urine lytes and osmolality to monitor adequate hydration. All patients should have a central venous line placed, subclavian if possible, and CVP kept 6-10 mmHg. Keep urine volumes >10cc/kg/d using normal saline with 20mEq/L KCl.

C. An antiepileptic drug (AED) may be administered particularly when there is a parenchymal contusion, with an initial loading dose on admission (i.e., Phenytoin or fosphenytoin- 15 mg/kg IV over 30 min) and a daily maintenance dose (i.e., Phenytoin or fosphenytoin - 5mg/kg/day IV divided q 12 hours; or Keppra 20 mg/kg/day IV divided q 12 hours. The use of Phenobarbital should be avoided except in infants. Children without large lesions may have the AED discontinued following discontinuation of ICP monitoring if no seizure activity noted. Children with large intraparenchymal (>2 cm) contusions/ lesions should be left on AED for 3 months. Weaning from the AED will depend on an EEG at that time.

D. In infants, it is often difficult to determine seizures since they are frequently subclinical. May require maximizing Fosphenytoin, the addition of Phenobarbital and other antiepileptics. Consider continuous EEG in all infants with minimal improvement of mental status.

E. Nutrition is begun within 48-72 hours of admission.