

PRACTICE GUIDELINE

Effective Date: 10-6-05

Manual Reference: **Deaconess Trauma Services**

TITLE: TRAUMATIC BRAIN INJURY GUIDELINE

- I. **OBJECTIVE:** To provide practice management guidelines for traumatic brain injury patients based upon the National Brain Trauma Foundation Guidelines.
1. Early diagnosis and management of severe traumatic brain injury.
 2. Prevent causes of secondary brain injury during resuscitation (hypoxia, hypovolemia, hypocarbia, anemia, hyperthermia, hypo/hyperglycemia.)
 3. To rapidly identify and treat mass lesions.
 4. Indications for ICP/ CPP monitoring and management of intracranial hypertension (ICH.)

DEFINITIONS:

- Mild head injury: Glasgow Coma Scale* (GCS) score 13-15
- Moderate head injury: GCS 9-12
- Severe head injury: GCS 3-8

*After adequate cardiopulmonary resuscitation.

GUIDELINES:

- A. Initial management (see flowchart.)
1. Primary and secondary survey as outlined in resuscitation section above.
 2. Establish level of consciousness and any focal neurologic deficits.
 3. Airway:
 - a. Intubate all unconscious patients (GCS < 8) to secure airway. Use sedation and short acting neuromuscular blockade if necessary.
 - b. Maintain cervical spine immobilization in all unconscious or symptomatic (neck pain or tenderness) patients.
 4. Breathing: Oxygenation and ventilation.
 - a. Administer high flow oxygen to all patients with suspected head injury.
 - b. Monitor oxygen saturation.
 - i. Avoid hypoxia (SaO₂<90% or PaO₂<60 mmHg.)
 - c. Ventilation.
 - i. Avoid hyperventilation; unless signs of herniation are present (see below.)
 - ii. Maintain PaCO₂ 35-40 mmHg.
 5. Circulation:
 - a. Prehospital: avoid SBP<90 mmHg.
 - b. Resuscitate to goal of mean arterial pressure (MAP)>90 mmHg to maintain a presumptive cerebral perfusion pressure (CPP)>60 mmHg.
 - c. Fluids: infuse 0.9% NaCl and/or blood.
 6. Recognize and treat herniation syndromes.

- a. Signs:
 - i. Pupils: Anisocoria (asymmetric,) irregular, or sluggish reaction, progressing to fixed, dilated, nonreactive.
 - ii. Motor: hemiparesis, decerebrate posturing, Babinski reflex.
 - iii. Progressive neurologic deterioration, not attributable to extracranial causes.
 - b. Emergency treatment of herniation:
 - i. Hyperventilation.
 - ii. Mannitol, if not hypotensive.
 - c. In the absence of a herniation syndrome, do not initiate treatment for intracranial hypertension, until CT scan is done or ICP monitor inserted.
7. Manage all wounds in a sterile manner.
 8. Indications for head CT scan (without IV contrast):
 - a. Unconscious.
 - b. History of loss of consciousness.
 - c. Focal neurologic deficits.
 - d. Post-traumatic seizure.
 - e. Decreasing level of consciousness.
 - f. Penetrating injury.
 - g. Skull fracture.
 9. Indications for neurosurgery consultation:
 - a. Moderate or severe head injury: GCS<13.
 - b. Post-traumatic seizure.
 - c. Unequal pupils.
 - d. Neurologic deficit.
 - e. Abnormal head CT scan:
 - i. Hematoma.
 - ii. Contusion.
 - iii. Edema.
 - iv. Compressed basal cisterns.
 - v. Fracture.
- B. Intracranial pressure (ICP) and cerebral perfusion pressure (CPP) monitoring.
1. Need for ICP/CPP monitoring will be determined by the neurosurgery service. General indications:
 - a. Severe head injury (GCS 3-8 after resuscitation and considering presence of paralytics and sedatives) + abnormal CT scan.
 - b. Inability to monitor neuro exam: prolonged sedation or anesthesia.
 2. Brain Trauma Foundation provides Level III evidence for placement of ICP monitoring device in the following patient type:
 - a. Severe head injury + normal CT scan and at least 2 of the following 3:
 - i. Age>40.
 - ii. Unilateral or bilateral posturing.
 - iii. SBP<90 mmHg.
 3. Technique:
 - a. ICP: Parenchymal ICP monitoring catheter (Camino) or ventricular catheter.

- b. CPP: Arterial line needed for continuous monitoring
 - i. $CPP = \text{mean arterial pressure(MAP)} - ICP$

C. ICP/CPP treatment (see flowchart.)

1. Parameters:
 - a. Normal ICP = 0-10 mmHg.
 - b. Treatment threshold > 20-25 mmHg.
 - c. Goal CPP = 60-70 mmHg.
2. Mannitol.
 - a. Initial evaluation: Use mannitol without ICP monitoring *only if* signs of herniation or progressive neurologic deterioration, not attributable to extracranial causes, are present.
 - b. For treatment of intracranial hypertension:
 - i. Effective doses range from 0.25-1 gram/kg, given by intermittent bolus infusion Q 4-6 hrs.
 - ii. Euvolemia must be maintained. Foley mandatory. CVP monitor recommended.
 - iii. Monitor serum osmolality. Do not exceed 320 mOsm/kg.
3. Barbiturates.
 - a. High dose barbiturates may be considered for hemodynamically stable, salvageable, severe head injury patients with intracranial hypertension refractory to maximal medical and surgical therapy.
4. Steroids.
 - a. Steroids should not be used in patients with severe head injury.

D. Early post-traumatic seizure prophylaxis (7 days):

1. Phenytoin(Dilantin) should be considered in the following patients:
 - a. Glasgow coma scale score < 10.
 - b. Cortical contusion.
 - c. Depressed skull fracture.
 - d. Subdural hematoma.
 - e. Epidural hematoma.
 - f. Temporal lobe contusions.
 - g. Penetrating head wound.
 - h. Seizure within 24 hrs. of injury.
2. Therapy should be considered for 7 days.

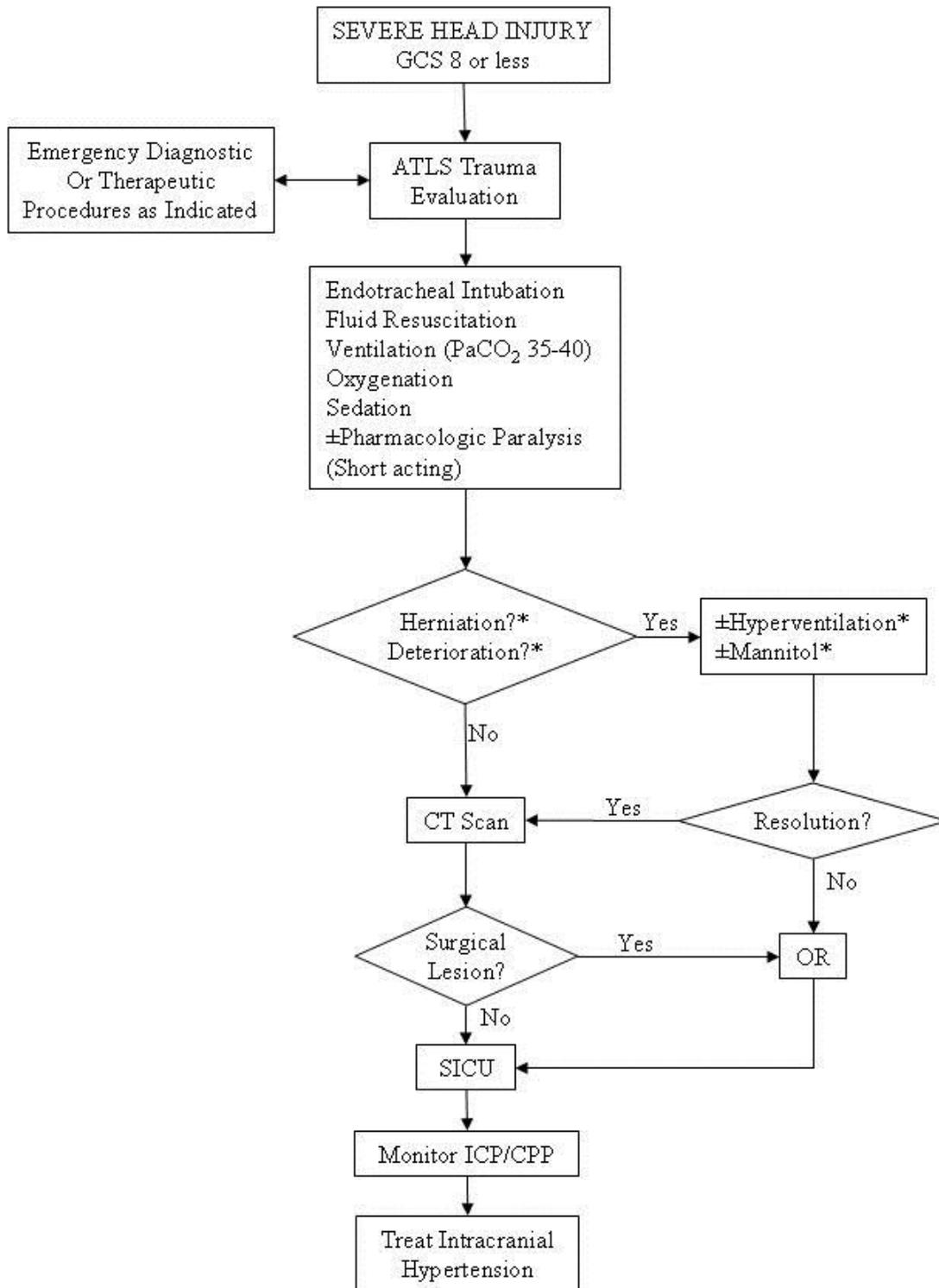
E. Nutritional support.

1. Enteral feeds should be instituted within 72 hours of injury.
2. Consult Dietician for feeding recommendations

References:

1. Brain Trauma Foundation, Inc. Guidelines for the Management of Severe Traumatic Brain Injury. 2007. <http://www.braintrauma.org> (accessed 7/10/2012)

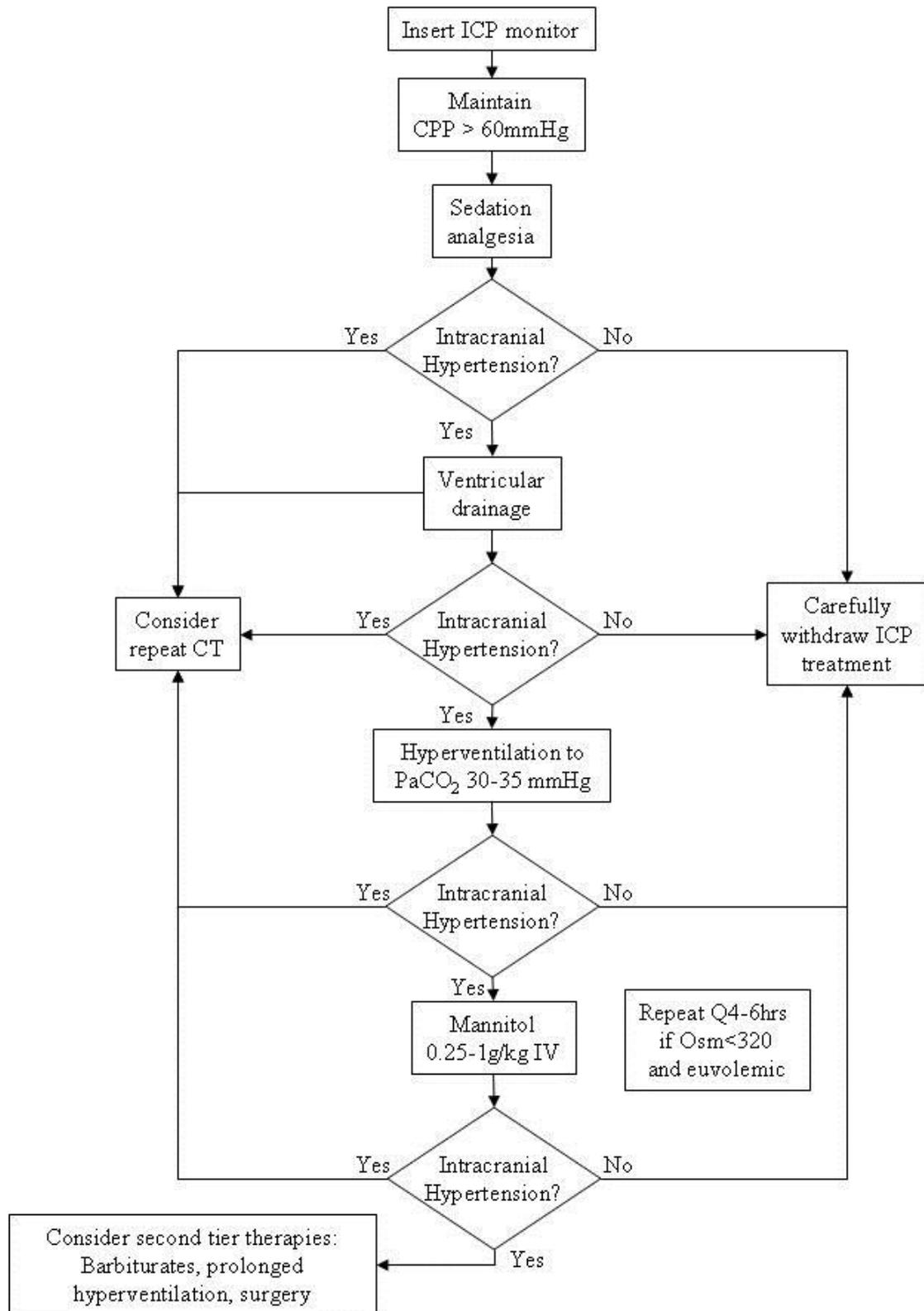
INITIAL MANAGEMENT



*Only with signs of herniation or progressive neurologic deterioration not attributable to extracranial cause

Adapted from: Brain Trauma Foundation, Inc. Guidelines for the management of severe traumatic brain injury. 1998. p.26.

TREATMENT OF INTRACRANIAL HYPERTENSION



Adapted from: Brain Trauma Foundation, Inc. Guidelines for the management of severe traumatic brain injury. 1998. p141