

### TREATMENT:

- A. Treat per Universal Patient Care.
- B. Patient evaluation should include best GCS to help categorize injury severity.
  1. Mild injury GCS of 13-15
  2. Moderate GCS 9-12
  3. Severe GCS  $\leq 8$
- C. Avoid hypoxia at all times. Place a non-rebreather facemask on **ALL** patients with potential TBI.
- D. Prevent hypotension (Goal SBP  $> 100$ ).
  1. Initiate a bolus of normal saline or lactated ringers.
  2. Continue fluid boluses to maintain the systolic blood pressure  $>100$  mmHg.
- E. If patient is unable to maintain airway, consider oral airway (nasal airways should not be used in the presence of significant facial injury or possible basal skull fracture).
- F. Place an advanced airway (oral endotracheal intubation, supraglottic device, surgical airway) if BVM ventilation ineffective in maintaining oxygenation or if airway is continually compromised. Nasal intubation should not be attempted.
- G. If the patient has an airway placed (oral or advanced), carefully manage ventilations in order to minimize hyperventilation.
  1. Monitor ETCO<sub>2</sub> with goal of ETCO<sub>2</sub> of 40 mmHg.
  2. If available, use a pressure-controlled bag (PCB) and ventilation rate timer (VRT).
  3. If a transport ventilator is available, begin with the following settings:
    - i. Tidal volume of 7ml/kg,
    - ii. Rate of 10 BPM. Adjust rate to keep ETCO<sub>2</sub> within target range
- H. If there are signs of herniation, then **MILD** hyperventilation to an ETCO<sub>2</sub> of 35 mmHg may be performed. Signs of herniation include:
  1. Blown pupil
  2. Posturing
- I. Consider and treat reversible causes of altered mental status including hypoxia, hypoglycemia, and overdose.

### PEDIATRIC PATIENTS:

- A. Manage hypoxia. Place a non-rebreather facemask in **ALL** patients with potential TBI.
- B. Manage blood pressure. Avoid hypotension.
  - a. Initiate a 20ml/kg bolus of normal saline or lactated ringers.
  - b. Continue fluid boluses to maintain SBP goals:
    - i. Infants/children age  $< 10$ : 70 mmHg + (age X 2).
    - ii. Children age  $\geq 10$ : 100 mmHg (same as adults)
- C. If patient unable to maintain airway, consider oral airway (nasal airways should not be used in the presence of significant facial injury or possible basal skull fracture).
- D. Place an advanced airway (oral endotracheal intubation, supraglottic device, surgical airway) if BVM ventilation ineffective in maintaining oxygenation or if airway is continually compromised. Nasal intubation should not be attempted.
- E. If an airway is placed (oral or advanced), then carefully manage ventilations in order to minimize hyperventilation.
  - a. Monitor ETCO<sub>2</sub> on all patients with goal of ETCO<sub>2</sub> of 40 mmHg.
  - b. If available, use a pressure-controlled bag (PCB) and ventilation rate timer (VRT).
  - c. If a transport ventilator is available, set a tidal volume of 7ml/kg. Adjust rate to keep ETCO<sub>2</sub> within target range.

- d. Pediatric ventilatory rates:
  - i. Infants: (age 0-24 months): 25 breaths per minute (bpm);
  - ii. Children: (age 2-14): 20 bpm;
  - iii. > 15 years: 10 bpm (same as adults).
- F. If there are signs of herniation, then MILD hyperventilation to an ETCO<sub>2</sub> of 35 mmHg may be performed. Signs of herniation include:
  - a. Blown pupil
  - b. Posturing

### NOTES & PRECAUTIONS:

- A. The main goal is to avoid the three H's that increase mortality:
  - a. Avoid hypoxia
  - b. Avoid hyperventilation
  - c. Avoid hypotension
- B. A single episode of hypoxia is independently associated with DOUBLING of the mortality rate.
- C. Hyperventilation is independently associated with a mortality rate that is between TWO and SIX times higher.
- D. Inadvertent hyperventilation happens reliably if not meticulously prevented by proper external means.
- E. A single episode of hypotension is independently associated with DOUBLING of the mortality rate and persistent hypotension is independently associated with a mortality rate that is eight times higher.