Special Considerations for Mechanical Ventilation in the Neurosciences ICU

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Lecture Outline

• Appreciate the unique indications for mechanical ventilation and/or artificial airway
• Indications, Limitations, and Risks of hyperventilation and hypoventilation
• Positive End Expiratory Pressure
• “Weaning” from mechanical ventilation
Indications for Intubation?

- Rarely primary pulmonary pathology
- Cognition versus strength
- Artificial airway
Are ventilator settings equal for all units?

• Similar risk for organ dysfunction
• Risk of acute lung injury is multimodal
  – High tidal volumes
  – Sympathetic surge and SIRS response
  – Observational studies demonstrated routine use of 10cc/kg and increased RR culminating in 22% ALI at 2.8 days
Hyperventilation

• Increase CBF 3%/mmHg change PaCO2 in range 20-60

• **Leads to:** intracellular alkalosis, electrolyte disturbance, decrease perfusion heart lung liver gut muscle skin, coronary spasm, V/Q mismatch via bronchoconstriction and pulmonary artery vasodilation

• No level I evidence demonstrating improved clinical outcomes (in elevated ICP patients)

• No evidence to support hyperventilation outside of increased ICP

• Extreme hypocapnea can lead to ischemia
Recommendations Level 3

- Avoid hyperventilation in patients without increased ICP
- Most ideal of patient with increased ICP secondary to vasodilation
- Goal 30-35, possibly 28 if clinical picture is dire
- Bridging Therapy Only on the way to a more permanent solution

- Once initiated, commit to a careful wean
- Avoid rebound hypercapnea
  - Greater vasodilatory response to rise in CO2
  - High risk periods: post op, recent extubation, spontaneous breathing, narcotic exposure
Positive End Expiratory Pressure: How much is transmitted?

- PEEP effects both venous return from the head and to the heart
- Maintain euvolemic state rather than avoiding PEEP, with goal to maintain CPP
- Moderate PEEP in acute lung injury is beneficial, less is harmful
- Level 1 evidence supports PEEP up to 12 causing negligible increases in ICP
- Level 3 evidence supports up to 15
- Do what you must to maintain oxygenation
Wean to Extubate

• Higher VAP rates
• Fewer ventilator free days
• Weaning “protocols” largely inappropriate for our population
  – VC, Ve, Max Insp P, RSBI
  – GCS? Follow four commands
• Lungs are rarely the limiting factor
Apply General ICU SOC

- Timed sedation pause with spontaneous breathing trial (allow for extra time)
- Minimized sedation increases ventilator free days, and decreases delerium, PTSD, post hospital cognitive dysfunction, ICU days

Coplin et al AJRCCM 2000: “this study does not support delaying extubating patients when impaired neurologic status is the only concern prolonging intubation”