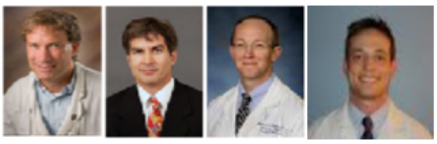
critical care perspectives in emergency medicine



The Physiologically Difficult Airway

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Key Article

Kornas, et al. Evaluation and management of the physiologically difficult airway: consensus recommendations from Society for Airway Management. Anesth Analg. 2021; 395-405.

Background

- Intubation is the 3rd most common procedure performed in US hospitals
- Intubation is a high-risk procedure with critical complications, including hypotension and cardiac arrest.
- Physiologic derangements predominantly drive these risks with intubation – limit the ability to preoxygenate, maintain oxygenation during intubation, and tolerate transition to PPV. Effect of induction agents also contribute to the risk.
- The Special Projects Committee of the Society for Airway Management developed the following list of recommendations to improve the safety of physiologically difficult airway management.

Hypoxemia

- Preoxygenation
    - Hypoxemic respiratory failure is the inability to maintain adequate arterial oxygenation.
        - Most commonly due to shunt and V/Q mismatch
        - Patients at high risk for rapid desaturation because of reduced FRC, V/Q mismatch, and shunt
        - Increased risk of arrhythmia, hemodynamic instability, and cardiac arrest
        - Desaturation may be the biggest risk factor for cardiac arrest
        - Reduced FRC, atelectasis, alveolar filling, shunt, and increased dead space contribute to difficulty with preoxygenation
    - Up to 70% of intubations are complicated by desaturation
    - Endpoints of maximal preoxygenation and denitrogenation are ETO2 of approximately 90% and ETN2 concentration of 5%
    - Methods – NRM at 15 L/min, NRM at flush rate, BVM with PEEP valve, HFNC, NIPPV
    - Apneic oxygenation – proven effective in prolonging safe apnea time

        - Use of capnography cannula is discouraged – does not achieve adequate apneic oxygenation given it only allows for O2 flow rates of 0-6 LPM
    - NIPPV – unloads respiratory muscles and recruits atelectatic alveoli; derecruitment is possible when removing NIPPV prior to intubation
    - HFNC – might be effective in patients with shunt physiology; decreases RR, reducing WOB, and improving thoracoabdominal synchrony; produces varying amounts of positive pharyngeal pressure
- Recommendations
    - All patients should be maximally preoxygenated before intubation
    - Use high-flow O2 for at least 3 min or 8 VC breaths
    - Apneic oxygenation can be performed with standard NC at 15 LPM or HFNC at 40-70 LPM
    - Consider HFNC for those that can't tolerate a tight-fitting mask
    - If the patient has significant shunt, perform preoxygenation with PEEP using NIPPV or BMV with PEEP valve
    - Consider inhaled pulmonary vasodilators
    - Awake intubation to maintain spontaneous respiration should be strongly considered for refractory hypoxemia
    - Preoxygenate in the upright position when possible
    - Ramped positioning should be performed when possible
    - If DSI is used, be ready for emergent intubation because dissociative dose can be unreliable
        - Use small dose of ketamine (10-20 mg) or dexmedetomidine to avoid apnea

Hypotension

- As few as 10 min of peri-intubation hypotension can lead to poor outcomes in high-risk patients
- No consensus definition for peri-intubation hypotension
- Incidence varies from 0-44%
- Risk factors include low MAP, pre-intubation shock index, acute respiratory failure, advanced age, and chronic renal failure
- Cardiac arrest complicates about 0.4% of all encounters
- Assessing volume status, increasing systemic filling pressures, and determining fluid responsiveness in peri-intubation patients with high shock indices may decrease risk of peri-intubation cardiac arrest.
- Also, propofol and benzo's have sympatholytic effects that lead to myocardial depression and decreased vascular tone.
- Induction agent reductions to as low as 10% of standard is reasonable in patients with shock or a high SI
- Ketamine is also associated with laryngospasm, increased airway secretions, myocardial depression that can lead to ischemia and cardiac arrest.
- Recommendations

- Patients should have IV access for sufficient fluid resus before intubation
- Screen patients for high risk of hemodynamic collapse; SI > 0.7
- Fluid-responsive and fluid-tolerant patients should be resuscitated before intubation
- Vasopressor infusion should be started before intubation in patients that are not volume responsive or fluid tolerant
- Can use PDPs when infusions are not available
- Consider diluted epi as PDP in patients with depressed myocardial function
- Use hemodynamically neutral induction agents

Special Circumstances

- RV Failure
  - Screen patients for significant RV dysfunction before intubation given risk of decompensation with transition to PPV
  - When RV dysfunction is present, patients should be evaluated for RV systolic function, and fluid/vasopressor tolerance
  - Fluid and vasopressor tolerant patients should be resuscitated accordingly
  - Pre-intubation diuresis should be considered in patients with RV volume overload
  - Hypercapnia should be avoided
  - MAP should be augmented to maintain coronary perfusion pressure; in patients with PAH, a higher MAP should be targeted
  - Ventilation strategy after intubation should include a low mean airway pressure and a higher PEEP to avoid atelectasis
- Metabolic Acidosis
  - Patients at high risk of decompensation
  - Patients with high minute ventilation should be considered for awake intubation to maintain spontaneous respirations.
  - Consider a spontaneous breathing mode after intubation in patients with very high minute ventilation.
- Neurologically Injured Patients
  - Maintain eucapnia before, during, and after intubation
  - Use a hemodynamically neutral induction agent
  - Patients should be positioned in a 30 degree upright, when possible
  - Limit PEEP to promote cerebral venous drainage