



Bag-Mask Ventilation prior to Endotracheal Intubation?

Guest: Dr. Ken Butler

Associate Professor of Emergency Medicine
Associate Program Director, Department of Emergency Medicine
University of Maryland School of Medicine, Baltimore, MD

Key Article

Casey JD, et al. Bag-mask ventilation during tracheal intubation of critically ill adults. *NEJM*. 2019; epub ahead of print.

Study Background

- More than 1.5 million undergo endotracheal intubation (ETI) each year in the US
- Up to 40% of ETIs in the ICU are complicated by hypoxemia - can lead to cardiac arrest, death
- RSI inherently involves a delay of 45-90 seconds between medication administration and initiation of laryngoscopy
- Unclear if providing positive pressure ventilation with BMV prevents hypoxemia during this interval

Objective

- Determine the effect of BMV on hypoxemia during tracheal intubation of critically ill adults

Study Details

- Multicenter, parallel-groups, unblinded, pragmatic, randomized trial comparing BMV with no ventilation during the interval between induction and laryngoscopy during tracheal intubation of critically ill adults
- 7 academic ICUs across the US
- Included
 - Adults \geq 18 years of age
 - Undergoing induction and tracheal intubation in the ICU
- Excluded
 - Pregnant
 - Incarcerated
 - Had immediate need for intubation that precluded randomization
- Randomization
 - 1:1
 - BMV
 - Provided by treating clinicians during the interval from induction until the initiation of laryngoscopy
 - PEEP valve to deliver 5-10 cm H₂O, oropharyngeal airway, two-handed seal, head-tilt/chin-lift maneuver
 - Ventilated at 10 breaths per minute
 - Smallest volume required to generate a visible chest rise

- No ventilation
 - BMV between induction and laryngoscopy not permitted
 - Except during after failed attempt at laryngoscopy and treatment for hypoxemia SpO₂ < 90%
- NIV not allowed in either group
- All methods of preoxygenation were allowed in either group before induction
- Apneic oxygenation not mandated but was allowed
- Primary Outcome
 - Lowest oxygen saturation observed during interval between induction and 2 min after tracheal intubation
- Secondary outcome
 - Incidence of severe hypoxemia (SpO₂ < 80%)
- Safety Outcome
 - Worst value for SpO₂, FiO₂, and PEEP between 6 and 24 hours after intubation
- Procedural Outcomes
 - Presence of new opacity on CXR within 48 hours
 - Operator-reported oropharyngeal or gastric aspiration

Results

- 401 patients
 - Median age 60 years
 - 50% had sepsis or septic shock
 - 60% had hypoxemic respiratory failure as indication for intubation
 - 199 assigned to BMV and 202 assigned to no ventilation
- Management Between Enrollment and Induction
 - Preoxygenation with BMV more common in BMV group
 - Preoxygenation with NIV or HFNC more common in no ventilation group
 - No difference in SpO₂ at time of induction
- Management between Induction and Intubation
 - 198 of 199 in BMV group got BMV
 - 5 patients in the no ventilation group got BMV
 - Time from induction to laryngoscopy in BMV group 98 seconds vs. 72 seconds in no ventilation group
 - 157 in the no ventilation group received supplemental oxygen between induction and laryngoscopy through NRB and NC
- Primary Outcome
 - Median lowest SpO₂ was 96% in BMV group and 93% in no ventilation group
 - Mean difference in lowest SpO₂ between BMV group and no ventilation group 4.7%
 - Prespecified analysis - difference between groups greater for patients with lower SpO₂ at induction
- Secondary Outcome
 - 10.9% of patients in the BMV group had an SpO₂ < 80% compared with 22.8% in the no ventilation group
- Additional Outcomes
 - Lower % of patients in the BMV group had SpO₂ < 90% (29.5%) compared to no ventilation group (40.1%)
 - No difference with regard to incidence of operator-reported aspiration or presence of new opacity on CXR in first 48 hours after intubation

Limitations

- No blinding
- Did not examine use of NIV during interval between induction and laryngoscopy
- Involved only ICU patients

Authors Take Home Point

- For every 9 critically ill adults undergoing tracheal intubation providing BMV between induction and laryngoscopy would prevent severe hypoxemia in 1 patient
- Patients receiving BMV had higher SpO₂ levels and lower rates of severe hypoxemia