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Opinion Article



# The Art of the ICU Intubation: Beyond the Airway

**Aaron Lim MD[1]* and Amanda Williams MD[2]**

[1,2]*Department of Anesthesiology, Virginia Commonwealth University Health System, USA*

***Corresponding author:** Aaron Lim, Department of Anesthesiology, Division of Cardiac Anesthesiology, Virginia Commonwealth University Health System, USA.

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## Introduction

As anesthesiologists we are commonly consulted for intubation in the ICU. These critically ill patients are at high risk of aspiration and have varying degrees of cardiovascular and respiratory insufficiency. While "intubation" is the reason for consult, placing the endotracheal tube should be the easiest part of the procedure in expert hands and maintaining stable hemodynamics should be prioritized. Thus, the true art in performing the ICU intubation lies in the preparation, induction, and post-intubation management of a patient unknown to you just minutes prior. Below are five recommendations highlighting the finer points of the seemingly simple yet complex procedure.

**Keywords:** ICU intubation; Hemodynamics; Airway management.

**Abbreviations:**

1.Operating Room (OR).

2.Intensive Care Unit (ICU).

## Discussion

### Quickly Learn Your Patient

Asking the consulting team for a "one-liner" for indication for intubation and relevant admission and medical history is the bare minimum. Lack of continuity of provider-patient relationship or new ICU admissions with rapid escalation of respiratory support are both commonplace so a quick chart biopsy by the consultant is always ideal. The information gained from a brief chart review is worth the few minutes it takes. Scan available objective data first (e.g., pertinent labs, chest x-ray, echocardiograms) then recent progress notes to identify acute illness and relevant comorbidities. This can all be done in 3 minutes or less and can be more informative and efficient than verbal inquiry.

### Use Video Laryngoscopy

While most of these patients will not have difficult airways, the prediction of such is made on history of previous intubations and bedside assessment, both of which may be limited in urgent intubations. Even so, the methods used to evaluate for a difficult airway are not highly sensitive or specific and unexpected difficult airways still occur [1]. Video laryngoscopy provides superior, albeit indirect, glottic visualization while minimizing the need for optimizing maneuvers which are difficult to achieve in an environment not designed for airway management [2]. However, the most important benefit over direct laryngoscopy is preventing esophageal intubation. With direct laryngoscopy, even the most skilled airway guru is capable of esophageal intubation and the pathway to its diagnosis after direct laryngoscopy is clumsy and devastating in itself. That is, hand-bagging the esophagus with expulsion of gastric contents into an unprotected airway while hypoxia acutely worsens and team members question whether the pulse oximetry reading is delayed, or end-tidal capnography is accurate. Finally, after conceding it is an esophageal intubation, the consultant must make the split-second decision whether to attempt mask-ventilation in the vomiting and deteriorating patient or immediately retry direct laryngoscopy under now far worse

conditions than the initial failed attempt. With video laryngoscopy, at the very least, you can avoid the described pathway as tracheal intubation will be witnessed by multiple providers.

**Include Vasopressor with Induction**

Post-intubation hypotension leading to cardiac arrest is a far too common yet avoidable occurrence in the ICU. These patients typically have some combination of acute respiratory failure, distributive shock state, myocardial dysfunction, catecholamine depletion, and unknown comorbidities. To facilitate intubation, they are given induction agents that blunt sympathetics, cause vasodilation, decrease stressed volume, and cease spontaneous respirations. Altogether this decreases cardiac output and blood pressure. Additionally, ICU patients are more sensitive to the effects of induction agents and require much smaller doses. Administration of norepinephrine or phenylephrine boluses before and during induction will help prevent post-induction hypotension and cardiac arrest. In some patient's additional vasopressor and perhaps an infusion will be needed post-intubation. Even in patients who might not require vasopressor, a small dose is unlikely to cause detrimental hypertension while providing a margin of safety. The inductionist who is leading the airway team should personally administer the medications. Most patients will warrant a rapid-sequence induction and intubation so the choice of agents, dose, and timing of administration must be efficient, dynamic, and precise – not a recipe that should be communicated to someone who might not be as facile with multiple syringes of different agents at once.

**Smoothly Transition from Negative Pressure to Positive Pressure Ventilation**

The transition from negative pressure ventilation to positive pressure ventilation results in decreased venous return and cardiac output. Healthy euvolemic patients requiring intubation for surgery are able to tolerate both induction and this transition because homeostatic mechanisms such as the baroreceptor reflex remain intact. In critically ill patients with varying degrees of hypovolemia and autonomic and cardiovascular derangements, this same transition can precipitate cardiac arrest and is further exacerbated by the common overdosing of induction medications. To help mitigate this risk, following intubation resist the urge to aggressively "bag up" the rapidly desaturating patient with large positive pressure breaths until the lagging pulse oximeter reverses course. Instead, ease into the transition to positive pressure ventilation so that preload is not as significantly and abruptly compromised. This can be safely performed over 30-60 seconds. Because endotracheal placement has already been confirmed with video laryngoscopy, the operator can focus on maintaining hemodynamics rather than frantically hyperventilating to improve hypoxia. Once stabilized, appropriate lung recruitment maneuvers can be performed, and ventilator settings optimized. Readily available end-tidal capnography serves the dual purpose of endotracheal confirmation and surrogate monitor for cardiac output post-intubation. Low end-tidal CO2 post-intubation should be considered low cardiac output until proven otherwise and hemodynamics quickly stabilized to prevent cardiac arrest. Should the patient require ACLS, the already in place capnograph ought to be used to guide adequacy of chest compressions and help identify return of spontaneous circulation.

**Continue Management and Medical Support Until Hemodynamic Stability is Achieved**

The inducing/intubating team should remain at bedside for the next 15-20 minutes for hemodynamic management or until the patient is stable enough to transition care back to the primary team. Recognizing the differences as well as similarities between ICU and OR intubations is vital in reducing harm and complications. Anesthesiologists would never induce, intubate and immediately turn over care to a surgical team or RN in the OR and this should not be practiced in the ICU with arguably more unstable and labile patients. While primary teams are capable of starting and managing vasopressor infusions, acute vasodilation from induction often requires transient intermittent boluses which are primarily administered by anesthesiologists. After initial hemodynamic recovery and establishment of adequate sedation and continuous vasopressor infusion, if necessary, it is appropriate to conclude the consultation.

## Conclusion

ICU intubation is a high-risk procedure fraught with hypoxemia, hypotension and consequent morbidity and mortality. The incidence of significant harm including brain injury and death are far higher in ICU than OR intubation and as such, all ICU intubations should be treated as difficult [1], if not for a concerning airway assessment, then for the limitations of the environment including lack of additional equipment and expert support staff. Heightened situational awareness is crucial to prevent cardiovascular and respiratory collapse. As experts of the airway, we have the ability to decrease the complication rate by eliminating esophageal intubation with video laryngoscopy and by prioritizing hemodynamic optimization.

## Conflict of Interest

None.

## Acknowledgement

None.

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