Deep Extubation: Stop the Buck! *Can we land the plane safer?*

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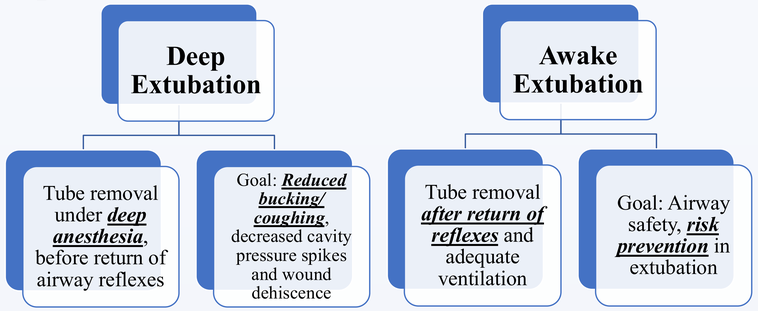
Deep Extubation vs Awake Extubation



When Should Deep Extubation Be Considered?

Neurosurgery & Ophthalmic Cases	Wound Dehiscence	Minimal Bronchospasm Risk	Smooth, Quiet Emergence	Tachycardia/ Hypertension Risk	Decreased Aerosol Transmission
Maintaining low ICP/ IOP	Decreased risk during surgery	Fasted patient, empty stomach	Decreased emergence agitation	Maintenance of stable vitals	Reduced viral spread during COVID-19

Current Guidelines on Deep Extubation

Lack of Standardized Guidelines:
- No unified or evidence-graded recommendations exist for deep extubation.[5]
- Most sources provide general principles (planning, oxygenation, readiness) rather than prescriptive criteria.[9]
- Practice patterns vary widely across regions and specialties.[11]

Unclear Patient Selection and Risk Thresholds:
- Studies describe "selected low-risk" patients as appropriate but fail to define clear inclusion or exclusion criteria.
- Reported complication rates are inconsistently measured, making it difficult to identify a standardized risk threshold for safe use.
- Recommendations limit use to an "experienced provider", but definition is vague and unclear.[12]

Inconsistent Use of Adjuncts and Monitoring:
- Techniques like THRIVE, SGA exchange, and pharmacologic agents are recommended inconsistently without protocol guidance on dosing or necessity.[3,8]
- Reflects reliance on individual provider judgment rather than formal guidelines[2,5]

Problems & Risks with Deep Extubation

	Post-Extubation Complications From Literature[4,10]					
	Laryngo-spasm	Airway Obstruction	Tachycardia (HR ≥100 BPM)	Hyper-tension (MAP ≥110 mmHg)	Emergence Delirium	Bucking/ Coughing*
Awake Extubation	✓	✓	✓ (7x Higher)	✓ (20% Higher)	✓	Common (50%)
Deep Extubation	✓	✓ (5x Higher)	✓	-	-	-

Note: A small check denotes a nonzero risk of a complication.
*Bucking and coughing are common drivers of wound dehiscence, intra-abdominal, intraocular, and intracranial pressure spikes.[10,12]
Aspiration is a risk in all patients, but is minimized by following pre-hospital fasting protocols and correct procedures by the anesthesiologist.

Risk Mitigation of Deep Extubation

- Staged use of an SGA and ET tube in situ (i.e. Bailey Maneuver) can decrease the risk of bucking up to 55% and significantly lessens the risk of airway obstructions, but these techniques interrupt ventilation and instructions are not defined.[15]
- Application of trans-nasal humidified rapid insufflation ventilatory exchange (THRIVE) in one trial demonstrated decreased incidence of hypertension and desaturation events.[8]
- Transitioning from sevoflurane to remifentanil peri-operatively and flumazenil post-operatively.[1]

Takeaways

- **Deep extubation carries risks** of aspiration and airway obstruction, but **avoids the hypertension, tachycardia, and bucking** common in awake extubation, making its benefits to certain procedures clear.
- **Further studies** and **guidelines** for deep extubation techniques are needed to mitigate post-extubation complications, particularly obstruction, and to optimize MAC, contraindications, and selection criteria.
- **Post-Extubation** complications in **deep extubation**, require physical interventions including **positive pressure ventilation or a chin lift ~2.5x as often**.[8]
- Deep and awake extubation produces distinct airway and respiratory complication profiles, without either being conclusively safer when performed by seasoned providers.[4]

Gaps in Deep Extubation Research?

- How does rate of reintubation following deep extubation impact operating room time, postoperative recovery duration, and time to full recovery?
- Can we create evidence based guidelines for deep extubation?
- Can improvements in techniques for deep extubation decrease obstruction risk, extubation failure, hospital mortality, and healthcare costs?
- Would more providers perform deep extubation if obstruction risk was minimized?
- Can a decision-making tool be created to make deep extubation safer?
- What devices or strategies exist for making deep extubation safer and accessible?

Designing a Future Study For Deep Extubation

Development and Validation of a Clinical Decision Algorithm for Safe Deep Extubation	*Deep Versus Awake Extubation With and Without Adjuncts in Adult Surgical Patients*	*Protocol for Risk Stratification and Post-Extubation Support to Reduce Airway Complications After Deep Extubation*
Background: Deep extubation can smooth emergence but raises airway risk. ASA guidelines stress individualized planning but lack clear criteria. An evidence-based tool is needed to guide safe patient selection.	**Background:** Deep extubation may limit coughing and hemodynamic swings but increases risk of airway obstruction and hypoxemia. Few data exist on standardized safety strategies.	**Background**: Deep extubation may smooth emergence but heightens obstruction risk. Using adjuncts (medication, devices, protocols) during deep extubation may reduce hypoxemia, though adult safety data remain limited.
Objective: Develop and validate a decision algorithm to identify when deep extubation is appropriate based on patient, airway, and procedural factors.	**Objective:** Assess whether a protocol using pre-extubation risk screening and noninvasive respiratory support lowers airway complications after deep extubation.	**Objective:** Compare safety of deep vs awake extubation, with or without adjunctive therapy, in adult elective surgery.
Hypothesis: A standardized algorithm will improve safety by reducing airway complications and optimizing patient selection.	**Hypothesis:** A structured protocol with risk assessment and post-extubation support will reduce airway events versus usual care.	**Hypothesis:** Deep extubation, especially with adjuncts, reduces hypoxemia and adverse events versus awake extubation.
Outcomes/Measures: Rate of peri-extubation airway events (desaturation, obstruction, laryngospasm), vitals monitoring, algorithm adherence, comfort scores, and 96-hr reintubation tracking.	**Outcomes/Measures:** Airway complications within 30 min, reintubation within 24 hr, respiratory support use, and hospital stay; patient data collected for analysis.	**Outcomes/Measures:** Desaturation (SpO_2 < 90%) during emergence and 30 min post-extubation. Continuous vitals, observer-recorded events, comfort scores, and 96-hr reintubation tracking.

References