

DIFFICULT AIRWAY MANAGEMENT NEW TRENDS AND CONTEMPORARY APPROACHES

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Keywords: difficult airway; videolaryngoscopy; awake tracheal intubation; high-flow nasal oxygen; airway ultrasound; emergency front-of-neck airway.

Background: Difficult airway management remains one of the most safety-critical areas in anesthesiology, emergency medicine, and critical care. Failure to establish oxygenation or tracheal intubation may rapidly cause severe hypoxemia, aspiration, hemodynamic instability, brain injury, or death. Practice has shifted from a device-centered model to structured, anticipatory, oxygenation-focused strategies emphasizing first-attempt success, fewer repeated attempts, early recognition of failure, and timely rescue. Guidelines also incorporate physiological risk, human factors, and procedural planning alongside anatomical assessment [1,7].

Objective: This narrative review summarizes contemporary trends and evidence-based approaches in difficult airway management, focusing on videolaryngoscopy, awake tracheal intubation, high-flow nasal oxygenation, supraglottic airway rescue, point-of-care airway ultrasonography, emergency front-of-neck airway access, and structured team-based algorithms.

Methods: International guidelines, systematic reviews, meta-analyses, and selected clinical studies were reviewed. Sources included the 2022 American Society of Anesthesiologists Practice Guidelines, Difficult Airway Society guidance on awake and unanticipated difficult tracheal intubation, and evidence concerning videolaryngoscopy, high-flow nasal oxygen, and airway ultrasonography [1-7].

Results and Discussion: Modern difficult airway management begins with risk stratification beyond prediction of difficult laryngoscopy. Evaluation should include anticipated difficulty with facemask ventilation, supraglottic airway placement, tracheal intubation, aspiration risk, rapid oxygen desaturation, physiological reserve, emergency invasive airway access, and available rescue resources [1,7]. Awake tracheal intubation should be considered when difficult intubation is anticipated with expected difficulty in ventilation, increased aspiration risk, inability to tolerate brief apnea, or difficulty with emergency airway rescue [1].

Awake intubation remains important in selected high-risk patients because preservation of spontaneous ventilation and airway tone provides an additional safety margin. Recommended practice includes adequate topical anesthesia, continuous supplemental oxygen, cautious sedation, limitation of attempts, and confirmation of tracheal placement using visualization and capnography [2].

Videolaryngoscopy is central to contemporary airway practice. Compared with direct laryngoscopy, randomized evidence demonstrates improved glottic visualization and higher first-attempt success, including in emergency and critical care settings [3,4]. However, visualization does not ensure successful tube delivery. Appropriate stylet configuration, positioning, device familiarity, and first-attempt preparation remain essential. Repeated laryngoscopy should be avoided because it increases trauma, bleeding, edema, and subsequent difficulty with ventilation [1,7].

An oxygenation-first strategy is fundamental. Preoxygenation should be optimized with appropriate positioning. High-flow nasal oxygen can prolong apnea tolerance and delay desaturation during airway instrumentation, but it does not provide effective alveolar ventilation, and carbon dioxide continues to accumulate during apnea [5].

The physiologically difficult airway has gained importance. Severe hypoxemia, hypotension, right ventricular dysfunction, and profound metabolic acidosis may precipitate peri-intubation deterioration despite an anatomically straightforward airway. Hemodynamic optimization, individualized preoxygenation, an appropriate induction strategy, and anticipation of cardiovascular collapse are integral to planning [7].

When intubation fails, second-generation supraglottic airway devices can provide rescue oxygenation and may facilitate subsequent intubation. Persistent failure to oxygenate despite optimized facemask and supraglottic ventilation constitutes a cannot-intubate, cannot-oxygenate emergency and requires prompt progression to emergency front-of-neck airway access rather than repeated unsuccessful attempts [7].

Point-of-care airway ultrasonography is an evolving adjunct that may assist in identifying the cricothyroid membrane, confirming tracheal tube position, and assessing selected predictors of difficult laryngoscopy. Its diagnostic performance is promising, but variability in techniques and thresholds limits standardization; it should therefore complement rather than replace clinical airway assessment [6].

Human factors are equally important. Modern algorithms emphasize explicit Plan A-B-C-D strategies, early expert assistance, closed-loop communication, cognitive aids, role allocation, limitation of attempts, and simulation-based training [7]. High-risk extubation also requires deliberate planning that considers the likelihood and consequences of failed reintubation [1].

Conclusion: Contemporary difficult airway management is a structured, oxygenation-centered, context-sensitive process. Practice has shifted from isolated prediction of difficult intubation toward anticipation of the entire airway and oxygenation pathway. First-attempt optimization, preserved oxygenation, timely rescue, physiological stabilization, and disciplined team-based escalation contribute to safer clinical airway management.

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