Chapter 84
Approach to Airway Management in the ICU

84.1 Introduction

Airway management is a critical component of intensive care medicine (ICU), where prompt and effective intervention can significantly reduce morbidity and mortality. Patients in the ICU often require airway support due to inadequate oxygenation and ventilation or to protect against aspiration. Managing the airway in critically ill patients presents unique challenges, frequently due to physiological derangements and anatomical complexities. A structured approach—incorporating thorough assessment, preparation, and execution—is essential to optimize outcomes. Multidisciplinary teamwork, with clear communication and designated roles, enhances the efficiency and safety of airway interventions [1, 2] [Ref: Algorithm 84.1].

84.2 Assess Need for Airway Intervention

The initial step is to determine the necessity for airway management. Key considerations include:

- Oxygenation and Ventilation: Assess oxygen saturation (SpO_2), respiratory rate, and effort. Hypoxia ($SpO_2 < 90\%$) or hypercapnia (elevated $PaCO_2$) may necessitate airway intervention.
- Signs of Airway Obstruction: Look for stridor, severe respiratory distress, use of accessory muscles, or altered mental status due to hypoventilation or hypoxia.
- Neurological Status: A Glasgow Coma Scale (GCS) score of less than 8 or absent airway protective reflexes indicates the need for intubation to secure the airway [3].

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84.3 Preoxygenation Techniques

Optimizing preoxygenation is crucial to increase safe apnea time during intubation:

- High-Flow Nasal Oxygen (HFNO): Delivers heated and humidified oxygen at high flow rates (up to 60 L/min), providing apneic oxygenation and improving oxygenation in hypoxic patients.
- Noninvasive Ventilation (NIV): Using continuous positive airway pressure (CPAP) or bilevel positive airway pressure (BiPAP) can enhance preoxygenation, especially in patients with shunt physiology.
- Positive End-Expiratory Pressure (PEEP): Applying PEEP via a tight-fitting mask or circuit maintains alveolar recruitment, improving oxygenation in patients with atelectasis or pulmonary edema [4, 5].

84.4 Assess Risk Using Updated Algorithms

Risk stratification guides the airway management plan:

- MACOCHA Score: Incorporates factors like Mallampati score, obstructive sleep apnea, reduced cervical mobility, limited mouth opening, coma, hypoxemia, and anesthetist's experience to predict difficult intubation in ICU patients.
- American Society of Anesthesiologists (ASA) 2022 Guidelines: Provide updated recommendations on difficult airway management, emphasizing the importance of planning for both anticipated and unanticipated difficulties [6].

84.5 Physiologically Difficult Airway Management

Managing the physiologically difficult airway requires consideration of the patient's hemodynamic status and oxygenation:

- Hemodynamic Stability: Hypotension increases the risk of peri-intubation cardiac arrest. Pre-intubation optimization with fluid resuscitation and vasopressors may be necessary.
- Oxygenation: Severe hypoxemia increases the risk of desaturation during intubation. Enhanced preoxygenation techniques and apneic oxygenation strategies are essential.
- Medication Selection: Choose induction agents that minimize cardiovascular depression (e.g., ketamine) [7, 8].

84.6 Multidisciplinary Teamwork

Effective airway management in the ICU relies on a coordinated team approach:

- Designated Roles: Assign specific tasks to team members (e.g., primary operator, assistant, medication administration, monitoring).
- Shared Mental Model: Ensure all team members understand the plan, potential complications, and backup strategies.
- Communication: Use closed-loop communication to confirm tasks and relay critical information.

84.7 Management Based on Risk Assessment

Low-Risk Airway (Score 0–1)

- Technique: Perform rapid sequence intubation (RSI) with a videolaryngoscope and stylet.

Moderate-Risk Airway (Score 2–3)

- Pre-procedure Optimization: Address hypotension or hypoxemia before intubation using fluids, vasopressors, NIV, HFNO, and PEEP.
- Technique: Use RSI with a videolaryngoscope and stylet, with adjunct devices readily available.
- Key Considerations: Monitor closely for difficulty during intubation; have backup devices and plans prepared.

High-Risk Airway (Score 4–5)

- Delayed Sequence Intubation (DSI): Use sedation (e.g., ketamine) to facilitate preoxygenation in agitated or hypoxic patients.
- Team Coordination: Involve the most experienced personnel; prepare all necessary equipment, including tools for front-of-neck access (FONA).
- Rescue Plan: Ensure availability of advanced airway devices and have a clear plan for failed intubation.

84.8 Rescue Oxygenation

In cases of failed intubation or difficulty maintaining oxygenation:

- Second-Generation Supraglottic Airway Devices: Utilize devices like the i-gel or laryngeal mask airway (LMA) Supreme, which provide better seal pressures and allow for gastric access compared to traditional supraglottic airways.

- Advantages: Improved ventilation, reduced risk of aspiration, and the possibility of intubation through the device.
- Reassessment: If ventilation remains inadequate, reassess technique and consider alternative approaches or equipment.

84.9 Recognize and manage a CICO Situation

A "Cannot Intubate, Cannot Oxygenate" scenario requires immediate action:

- Identification: Failed intubation after multiple attempts, inability to oxygenate with face mask or supraglottic device, and persistent hypoxia ($SpO_2 < 80\%$).
- Preparation: Early recognition and readiness to proceed to emergency front-of-neck access.

84.10 Perform Front-of-Neck Airway (FONA)

Scalpel-Bougie-Tube Technique

1. Identify the Cricothyroid Membrane:
   - Palpate between the thyroid cartilage and cricoid cartilage.
2. Stabilize the Larynx:
   - Use the nondominant hand to hold the larynx firmly.
3. Make a Horizontal Incision:
   - Use a scalpel to make a transverse incision through the skin and cricothyroid membrane.
4. Insert the Bougie:
   - Direct the bougie through the incision into the trachea.
5. Railroad the Endotracheal Tube:
   - Advance a size 6.0–7.0 mm ETT over the bougie into the trachea.
6. Confirm Placement:
   - Verify tube placement with capnography and auscultation.

- Rationale: This technique provides a rapid and reliable method to establish a definitive airway when conventional methods fail.

84.11 Post-Intubation Care

Proper management after intubation is essential to prevent complications:

- Confirm Tube Placement:
- Use waveform capnography as the gold standard.
- Auscultate bilateral breath sounds and observe chest rise.
- Secure the ETT:
- Ensure the tube is properly secured to prevent displacement.
- Ventilation Settings:
- Adjust ventilator settings based on arterial blood gases and the patient's condition.
- Recruitment Maneuvers:
- Perform as needed to improve oxygenation, especially in patients with atelectasis.
- Monitoring:
- Continuous monitoring of vital signs, oxygenation, and ventilation parameters.

84.12 Complication Management

Preventing and managing complications is crucial during airway management:

- Aspiration:
- Preoxygenate and consider rapid sequence induction to minimize risk.
- Use cricoid pressure if indicated (controversial and based on provider preference).
- Hypoxia:
- Employ effective preoxygenation strategies.
- Minimize apnea time during intubation attempts.
- Cardiovascular Collapse:
- Anticipate hemodynamic changes; prepare vasopressors.
- Use induction agents with minimal cardiovascular effects.

84.13 Regional Challenges and Solutions

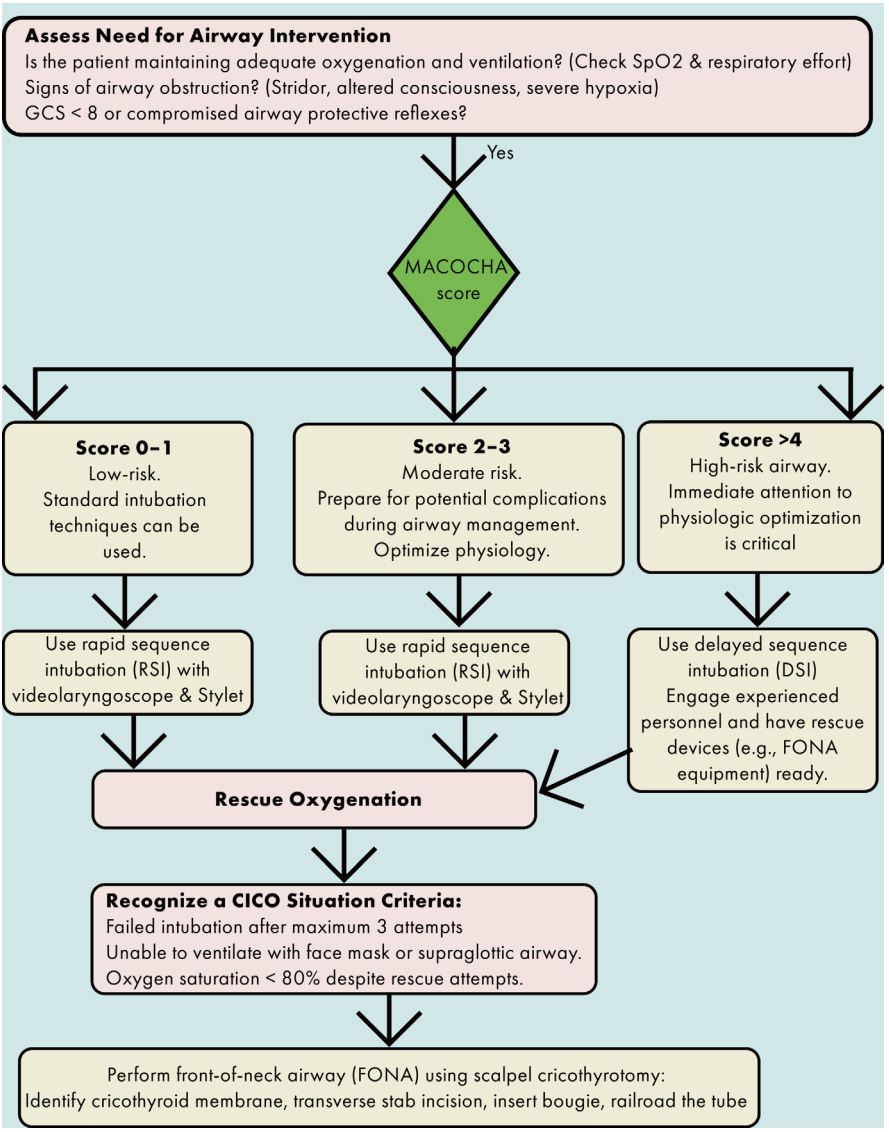
In resource-limited settings, adapt strategies to available resources:

- Equipment Limitations:
- Use available alternative devices, such as improvising with standard oxygen masks for preoxygenation.

84.14 Conclusion

A structured and systematic approach to airway management in the ICU is essential for patient safety and optimal outcomes. Incorporating thorough assessment, advanced preoxygenation techniques, and risk stratification allows for tailored strategies to address both anatomical and physiological challenges. Effective multidisciplinary teamwork and communication enhance the success of airway interventions. Staying updated with current guidelines and algorithms, along with regular training and preparedness, ensures that clinicians are equipped to handle both anticipated and unanticipated difficulties. In all settings, including resource-limited environments, adapting strategies to available resources and focusing on fundamental principles remain paramount.

Algorithm 84.1: Approach to airway management in the ICU



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