B01: Airway Management

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Introduction

Airway management sits at the core of effective patient management in prehospital care. In the vast majority of cases, it is the first clinical decision to be made. All patients require a structured airway assessment during their initial evaluation, even those who are not obviously in distress.

The decision to intervene is predicated on a combination of factors. Although the patient's clinical status is the most obvious of these, consideration must be given to crew resource management, training, scopes of practice, and transport times. The interplay between these factors can be complex and daunting regardless of the experience of individual paramedics.

Airway intervention decisions can be broken down into three major categories, each of which carries with it a particular level of urgency. The first question revolves around whether there is a need to obtain or maintain an airway – this suggests there is an immediate problem that requires correction, whether that takes the form of a jaw thrust or a pharyngeal airway. The second question considers whether or not there is a problem with oxygenation or ventilation. These types of problems often require rapid intervention, either with supplemental oxygen or a bag-valve mask, or through the use of medications. The third question asks paramedics to consider what the anticipated clinical course is; if patient deterioration is expected, it may be advantageous to intervene earlier, when treatments are more likely to be effective and easier to implement, as opposed to later.

Essentials

- The goal of all airway management is effective and safe **oxygenation** and **ventilation**, regardless of modality or intervention strategy. Effective ventilation depends on sufficient tidal volume and respiratory rate; effective oxygenation depends on the fraction of inspired oxygen, the capacity for gas diffusion across the alveolar wall, the ability (and availability) of haemoglobin to transport oxygen throughout the body, and the propensity of oxygen to diffuse into tissues.
- Because end-organ and tissue perfusion depends on the ability of the body to transport oxygen in the blood, paramedics must ensure that patients have a blood pressure sufficient to support life. Volume replacement may be required before airway interventions can take place safely.
- A thorough and comprehensive respiratory assessment must be performed on all patients. Assessments of airway patency and adequacy of respiration should be performed concurrently with other elements of the primary survey.
- Intervention strategies should progress from simple strategies to more complex approaches, and must be based on an understanding of the patient's needs, rather than a technical imperative.
- If unable to ventilate in an apneic, unconscious patient, begin chest compressions regardless of the presence of a pulse and proceed as for an obstructed airway.

Additional Treatment Information

- The jaw thrust is the most effective manual maneuver to open an airway when the patient's own muscle tone is lost. In using a jaw thrust, the tongue and epiglottis are lifted away from the posterior oropharynx, maximizing the available space. Pharyngeal airways provide additional assistance at resolving these functional airway obstructions, but a jaw thrust will still need to be maintained even with the adjunct in place to ensure the best possible airway opening. There is no evidence to suggest that a nasopharyngeal airway is better or worse than an oropharyngeal airway; device selection should be based on the presence or absence of gag and airway reflexes.
- Effective bag-and-mask ventilation is a difficult skill to learn and maintain. Optimal bag-valve mask ventilation, for most cases, requires two operators: one to maintain a mask seal and provide a jaw thrust, the other to provide the bag. Lift the patient's face into the mask while providing ventilations. Exposure of the patient to visualize chest rise and fall is essential; deliver only enough volume to see chest rise, and avoid high tidal volumes.

- Critically ill patients can be supported by use of a nasal cannula with high oxygen flow rates in addition to a bag-valve mask (NODESAT or high-flow nasal cannula technique). The inclusion of a PEEP valve in this scenario provides for maximal oxygen delivery in the prehospital environment, and allows paramedics to assist ventilations if it becomes necessary.
- When applying CPAP, watch oxygen saturations carefully. Be prepared for a transient fall in oxygen saturation: this is the result of a change in the FiO_2 from a face mask to the CPAP device. Give the device time to work properly before making adjustments. Additional oxygen may become necessary if saturations remain low.

General Information

- A functional airway obstruction occurs when muscle tone in the upper airway is lost, and structures collapse under their own weight. The culprits are generally the tongue against the soft palate and the posterior oropharynx as well as the epiglottis. Functional airway obstructions should be suspected in all patients with an altered level of consciousness, and may present as snoring or stertorous respirations, asynchronous chest and abdominal movement, or irregular breathing patterns.
- Be aware of the development of pathological airway obstructions, from infectious diseases, trauma, medication reactions, or anaphylaxis. Options for managing pathological airway obstructions in the prehospital environment are limited -- epinephrine (and cricothyrotomy by advanced providers) is generally the only effective choice.
- Carefully consider the interplay between ventilation and oxygenation. Ventilation is the mass movement of gas between the lungs and the atmosphere; oxygenation is the diffusion of oxygen across the alveolar wall, the binding with hemoglobin for transport to other body tissues, and the subsequent release of that oxygen once it reaches its destination. Both are required to support life, and problems with one can affect the other, but paramedics should remember that they are distinct processes.
- Patients with ventilation deficits do not respond solely to supplemental oxygen. They may require bronchodilation (either with salbutamol or epinephrine, depending on the clinical scenario) or positive pressure ventilation by bag-valve mask. An inadequate respiratory rate, with or without a concurrent fall in tidal volume, requires immediate intervention.
- Hypoxia is the sign of an oxygenation problem. These patients may have adequate ventilation, but are unable to diffuse oxygen across their alveolar membranes (or transport oxygen in the blood). Supplemental oxygen is required in these cases.
- Continuous positive airway pressure (CPAP) masks are not ventilation devices. They are designed to improve the diffusion of oxygen across the alveolar membrane: they will not help patients who do not have an adequate respiratory rate or tidal volume. The specific FiO_2 produced by a CPAP mask is unknown due to the entrainment of ambient air required to generate the positive pressure – when using CPAP, carefully monitor oxygen saturations, and adjust flow rates as needed. It may be necessary to add oxygen via nasal cannula in critically ill patients.

Interventions

First Responder

- Assess patient and position for optimal access based on clinical need
- Provide supplemental oxygen as required to maintain $SpO_2 \geq 94\%$
  - → A07: Oxygen and Medication Administration
- Functional airway obstruction present:
  - Attempt placement of oropharyngeal airway
- Provide optimized bag-and-mask ventilation as necessary
- Monitor and providing ongoing care until paramedic arrival

Emergency Medical Responder – All FR interventions, plus:

- Functional airway obstruction present:
  - Airway reflexes intact: measure and insert a lubricated nasopharyngeal airway
  - → PR07: Nasopharyngeal Airway
- Airway reflexes absent: measure and insert oropharyngeal airway

- Consider higher level of care intercept where available

Primary Care Paramedic – All FR and EMR interventions, plus:

- Supraglottic airway devices may be used to support oxygenation and ventilation in accordance with AIME principles, following confirmation of the ability to ventilate the patient with a bag-valve mask and pharyngeal airway.
  - → PR08: Supraglottic Airway
- In non-cardiac arrest situations:
  - If SBP ≥ 90 mmHg, and unable to raise SpO_2 above 93%, consider use of PEEP
  - → PR10: Positive End Expiratory Pressure
- Consider use of CPAP (requires CliniCall consult; see individual CPGs for specific guidance)
  - → PR09: Continuous Positive Airway Pressure

Advanced Care Paramedic – All FR, EMR, and PCP interventions, plus:

- May consider supraglottic airway device for any obtunded patient
  - → PR08: Supraglottic Airway
- Options for invasive airway intervention, in conscious patients:
  - All patients not in cardiac arrest being intubated should receive sufficient volume resuscitation prior to intubation – 500 mL NS or as clinically appropriate
  - Consider awake intubation
    - → PR23: Awake Intubation
- Consider induction for intubation
  - → PR18: Anesthesia Induction
  - → PR15: Tracheal Tube Introducer
- Following 2 failed attempts at intubation, attempt placement of supraglottic airway device while preparing for surgical access.
  - → PR22: Surgical Airways

Critical Care Paramedic – All FR, EMR, PCP, and ACP interventions, plus:

- May consider rapid sequence intubation as required

Evidence Based Practice

Intubation

Alternative Rescue Airway Management

Medication for Airway Management

Airway Confirmation