
Airway Assessment

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Introduction

One of the recurring controversies in EMS, especially for advanced providers, revolves around the use of various airway management options, particularly intubation.

Regardless of skill or certification level, though, the ability to assess a patient's airway is a critical skill, whether in placing a basic airway adjunct or in making the decision to perform a surgical airway. Just as there are indications and contraindications to giving medications, there can be indications and contraindications for certain airway management tools. The goal of this article is to familiarize the EMS provider with some tools to recognize potential airway management indications and contraindications.

Scenario

The local communications center assigns the local fire department first

responders and the closest advanced life support ambulance to a high priority respiratory call. When firefighters arrive on scene, they find a 68-year-old male patient who presents with two-word dyspnea. The patient is obese (well over 300 pounds), wears dentures and has a heavy beard. As the lead firefighter/EMT auscultates the patient's lung sounds, he notes that the lung sounds are nearly silent in all fields. Another firefighter/EMT checks the patient's medications and finds an Albuterol nebulizer as well as an empty inhaler of Singulair. The patient's wife confirms that he has been diagnosed with chronic obstructive pulmonary disease (COPD). While waiting for the paramedic crew, the first responder crew begins a Albuterol nebulizer treatment with a nebulizer mask.

When the paramedic crew arrives, they receive a hand-off report from the engine company's EMTs and further

assess the patient, applying the LEMON and MOANS mnemonics to this patient. Based on the expected difficulties in managing the patient's airway, they decide to avoid intubating the patient if possible. They immediately replace the nebulizer mask with a continuous positive airway pressure (CPAP) device that they also connect to a nebulizer for Albuterol and Atrovent. After administering these treatments as well as an intramuscular injection of terbutaline, the patient is transported without further incident to a local hospital's emergency department for further treatment.

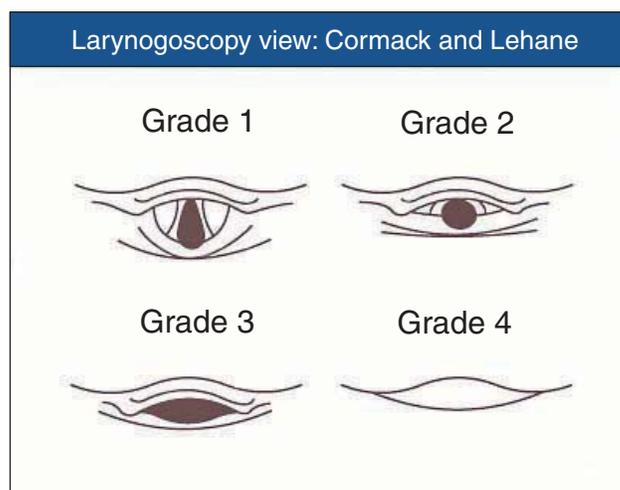
Deciding to manage the airway

The first step in assessing the airway is to determine whether the patient requires definitive airway control through use of a basic airway adjunct, supraglottic airway, endotracheal intubation or even a surgical airway. Current paramedic texts identify five indications for definitive airway control. These are: a non-patent airway, the inability to maintain a patent airway, failure to oxygenate, failure to ventilate or anticipated deterioration in the patient's status or the airway status.¹ These indicators may be assessed through examining the patient's appearance, auscultation with a stethoscope, pulse oximetry readings and/or waveform capnography.



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Another decision-making tool is the $PU \leq 92$ concept, first identified by British physician Dr. Andy Mason. Using the AVPU (A = Alert, V = Responds to voice, P = Responds to pain, U = Unresponsive) system, a patient with a "P" or "U" mental status and a oxygen saturation less-than or equal-to 92 percent requires immediate airway management.²



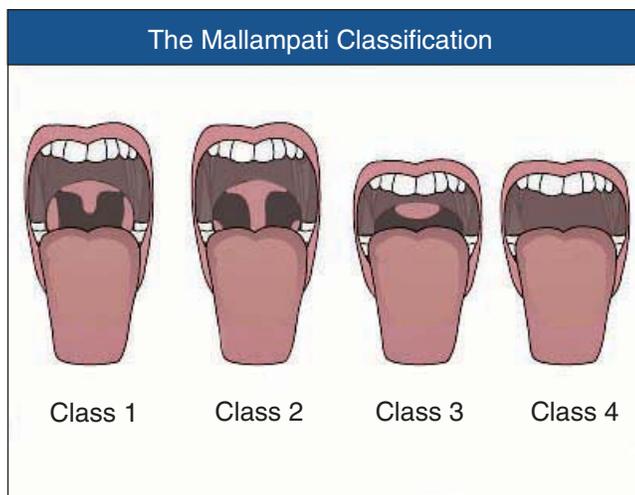
Visual assessment tools

Cormack-Lehane

The Cormack-Lehane scoring system is associated with the view of the oral anatomy from direct laryngoscopy. There are four grades of scoring in the Cormack-Lehane system: Grades 1-4. A Grade 1 view means that the entire glottic opening from the anterior to posterior commissure is visible. A Grade 2 view means that only the posterior portion of the glottis is visible. A Grade 3 view means that only the epiglottis is visible. A Grade 4 view means that only soft tissue is visible without any identifiable airway anatomy.³ Due to the scoring being associated with the view from a laryngoscope, this scoring system is most commonly used in an operating room or anesthesiology setting.

Mallampati

The Mallampati scoring system is similar to the Cormack-Lehane system except that, instead of evaluating the view from direct laryngoscopy, the view is evaluated and scored solely from the open mouth. A Class I Mallampati score means that the uvula, faucial pillars and the soft palate are visible. A Class II Mallampati score means that the faucial pillars and soft palate are visible. A Class III Mallampati score means that only the soft palate is visible. A Class IV Mallampati score means that only the hard palate is visible.⁴ When evaluating the patient's oral cavity for a Mallampati score, do not ask the patient to say "AHH," as this movement will depress the tongue and present a deceptively better view of the airway.



POGO

One other less commonly encountered scoring system is the POGO classification system. POGO is the acronym for "percentage of glottic opening." A score of zero means that none of the glottis can be visualized. A "perfect" score of 100 percent means that the vocal cords are completely visualized.⁵

Commonly used airway mnemonics

3-3-2 rule

The commonly used 3-3-2 rule provides for rapid identification of a patient with an "easy" airway to intubate and ventilate. The first "3" represents that one can place three fingers between the tip of the chin and the hyoid bone. The next "3" represents that three fingers can be placed between the upper and lower teeth when the mouth is fully opened. The number "2" represents that two fingers can be placed between the thyroid notch and the floor of the mouth.⁶ Because of the simplicity of the 3-3-2 rule and its easy applicability to identify a simple intubation, 3-3-2 is commonly used for EMS airway assessment.

LEMON

Perhaps the most familiar airway mnemonic, LEMON represents a synthesis of various airway assessment tools. "L" represents "look externally" for factors that may make for a difficult intubation such as a large tongue, thick neck or a beard that would create a difficult mask seal. "E" is short for evaluation of the 3-3-2 rule. "M" refers to the patient's Mallampati score. "O" refers to obstruction, particularly an anatomical obstruction. These obstructions may be indicated by a hoarse voice, stridor and/or difficult and/or painful swallowing. "N" represents neck mobility, particularly an inability to place the patient in the preferred "sniffing position" for intubation, limiting the potential alignment of airway structures and making oral access more difficult.⁷

The LEMON mnemonic sometimes is changed to LEMONS, where the "S" represents space, scene and skill. Space

and scene usually refer to confined spaces, limited access or limited lighting to the patient. Skill refers to the skill and comfort level of the EMS provider intubating the patient.⁸

Another intubation assessment option

6 Ds

While less common to many EMS providers, the six “Ds” represent another way to identify a potentially difficult airway for intubation. These are:

1. Distortion
2. Disproportion
3. Decreased thyromental distance
4. Decreased inter-incisor gap
5. Decreased range of motion
6. Dental overbite

Distortion covers a broad swath of alterations to the airway anatomy, whether caused by disease or trauma. Airway swelling, airway trauma, tumors, hematomas, scars, abscesses and arthritic changes to the neck may all represent different forms of distortion.

Disproportion relates to a disproportionately large tongue in comparison to the oral cavity. Disproportion is often observed in patients with Down’s Syndrome. In rare pediatric cases, disproportion is also associated with Pierre Robin sequence, identified by a very small lower jaw, cleft palate and a large tongue that tends to fall back and downwards (glossoptosis).

Decreased thyromental distance is less than three finger widths, or seven centimeters. Thyromental distance is measured from the distance of the tip of the chin to the superior aspect of the thyroid cartilage (i.e., the upper portion



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of the larynx).

Decreased inter-incisor gap leads to reduced mouth opening. This decreased gap can arise from long teeth or from decreased range of motion of the temporomandibular joints. Similar to the 3-3-2 rule, an inter-incisor gap less than two fingerbreadths identifies a potentially difficult airway. However, the 3-3-2 rule identifies three fingerbreadths as representing a potentially difficult airway.

Decreased range of motion in the atlanto-occipital joint, the temporomandibular joints, or the cervical spine may result in a difficult airway. The decreased range of motion may result from a short or thick neck, arthritis, diabetes or ankylosing spondylitis. To maximize the view of the vocal cords for endotracheal intubation, the patient is normally placed in the sniffing position, which requires extension of the atlanto-occipital joint and slight flexion of the cervical spine.

Dental overbite with a receding chin also represents another potential complicating factor for endotracheal intubation.⁹

Assessments for non-intubation circumstances

MOANS for BVM

Just like there are mnemonics for identifying difficult intubation situations, MOANS represents a mnemonic for patients who may be difficult to ventilate with a bag-valve mask. “M” represents mask seal, specifically factors that make for a difficult mask seal, such as a beard, blood or facial injuries. “O” represents obstruction or obesity. Obese and/or pregnant patients are often more difficult to ventilate due to the lack of visible landmarks on their anatomy as well as their excess tissue. “A” represents aged patients. Aged patients become more difficult to ventilate due to their physiological conditions that decrease compliance as well as their loss of muscle tone which may lead to upper airway collapse, obstructing gas flow. “N” represents no teeth. Patients without teeth or with dentures may well lack the necessary structure to support the tight mask seal for adequate bag valve mask ventilations. “S” represents stiff lungs or stiff chest, requiring additional ventilatory pressure. This need for additional ventilatory pressure would typically be associated with such diseases as COPD, pulmonary edema, congestive heart failure (CHF) or acute respiratory distress syndrome (ARDS). A patient with any of these conditions may be difficult to ventilate due to the increased pressures needed to adequately ventilate and oxygenate the patient.¹⁰

RODS

The RODS mnemonic is designed to be used with supraglottic airways, also known as rescue airways, such as the King tube, Combitube, or laryngeal mask airway (LMA). Supraglottic airways secure

the airway above the glottic opening, unlike an endotracheal tube, which passes through the glottis opening. “R” represents restricted mouth opening. Several of the supraglottic airways may require a relatively large mouth opening, particularly in comparison to an endotracheal tube. “O” represents an obstruction of the upper airway at or below the larynx. Such an obstruction will prevent the rescue airway from ventilating the patient. “D” represents distortion or disruption, typically associated with a deformity of the neck or a disruption to the airway structures caused by angioedema. Either a deformity or a distortion may prevent a seal for the supraglottic airway. “S” represents stiff lungs or spine. Patients with increased resistance in their airway (such as asthmatics) or decreases in pulmonary compliance (such as pulmonary edema) may be more difficult to ventilate effectively through a supraglottic airway.¹¹

SHORT

The SHORT mnemonic identifies potentially complicated or compromised patients for surgical airways. “S” identifies those patients with previous surgeries of the neck, which could alter or distort the anatomical structures involved with a surgical airway. “H” refers to hematoma or infection. Expanded necks from hematomas or infections such as Ludwig’s Angina make identification of neck landmark structures for a surgical airway difficult or impossible. “O” represents obese patients whose neck landmarks are difficult to identify or who have excess tissue on their necks complicating the placement of a surgical airway. “R” identifies patients who have received radiation therapy and “T” represents tumors. Patients in either of these

categories may have anatomical distortions complicating surgical airways.¹²

Pregnancy

The pregnant patient also has factors complicating airway management. Most notably, the increased weight and breast size may increase the likelihood of a Grade 3 or Grade 4 Cormack-Lehane view. Additionally, pregnant patients are typically tilted to the left side to prevent the fetus from resting on the inferior vena cava. A fetus resting on the inferior vena cava may cause decreased cardiac output and decreased venous return, causing severe hypotension that places both the mother and fetus at risk.

Conclusion

The decision to manage a patient's airway requires a thorough and complete assessment, as well as a comprehensive understanding of complications that indicate a difficult airway. Regardless of certification level, any EMS provider can assess a patient's airway and identify potential pitfalls that may lead to a difficult or failed airway. Consult with your medical director for more information on any of these assessment tools.

References

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**Town Hall Meetings
Scheduled March-May**



DSHS field staff will be available to provide updates and answer question from EMS providers and coordinators across the state.

**Locations and dates available at
www.dshs.state.tx.us/emstraumasystems/townhall.shtm**