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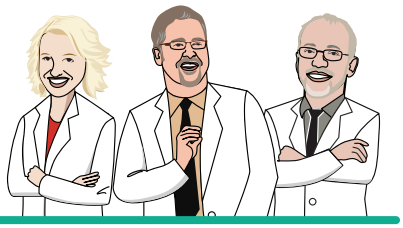

Continous Core Content

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C3 – AIRWAY BASICS – PART 1: PREPARATION AND POSITIONING

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* *Drug doses are a guide only, always check a second source and follow local practice guidelines*

Take Home Points:

- **Advanced airway management in emergency settings is different than elective endotracheal intubation in the operating room for many reasons.**
- **In rapid sequence intubation (RSI), patients are paralyzed simultaneously with their sedation to facilitate intubation.**
- **RSI increases the likelihood of a successful intubation and decreases the risk of aspiration during intubation.**
- **The decision to intubate and the timing of intubation can be difficult; in general, it is better to anticipate respiratory failure and intervene early than be forced into intubating the patient during an arrest or near-arrest scenario.**
- **Positioning is very important for airway patency and ventilation; a semi-upright position prior to intubation is helpful, aligning the patient's ear canals with the sternal notch on a plane perpendicular to the bed provides for the best alignment for visualization of the vocal cords.**

Background

This month on C3, we will start our examination of a topic that lies at the very foundation of emergency care: airway management. We will cover the basics of airway management and rapid sequence intubation in two parts (this month and next month) and then revisit the airway a few months from now for some more advanced airway scenarios including cricothyrotomy, airway rescue devices, awake intubation, delayed sequence intubation, fiberoptic intubation, and pediatric intubation.

The Emergency Airway

Traditionally, the airway was the domain of the anesthesiologist. In the years before emergency medicine became an established specialty, most of the research, teaching (and dogma) in airway management came from the operating room. Although we learned a lot from our colleagues and their years of experience, emergency physicians have developed our own approaches and curriculum around airway management that make sense for our uncontrolled, chaotic environment. In the ED, we often do not have the benefit of knowing a patient's full medical history before we intubate them. Patients are not usually fasting prior to their ED visit. Many patients are unable to cooperate with a simple bedside assessment of their airway. And, unlike in the operating room, we cannot "cancel" a case if we have concerns about a difficult airway.

Rapid Sequence Intubation (RSI)

- Rapid sequence intubation (RSI) performed in the emergency department is derived from an anesthesiology technique known as rapid sequence induction, used to induce anesthesia in patients with a full stomach (i.e., that have not fasted prior to the intubation) at high risk for aspiration.
- In the operating room, patients are often sedated and induced into anesthesia before the airway is secured. If these patients require ventilation to maintain or improve their oxygenation, ventilation can be delivered with a bag-valve-mask (BVM) device.
- In contrast, BVM ventilation of a sedated, unfasted (e.g. emergency) patient can result in the aspiration of gastric contents into the airway; a common, life-threatening complication of endotracheal intubation.
- RSI prevents aspiration and facilitates endotracheal intubation by inducing paralysis rapidly, simultaneously with sedation, obviating the need to deliver BVM ventilation.
- RSI is not necessary (nor appropriate) in patients who require intubation during cardiac arrest

The Decision To Intubate

- The decision to perform endotracheal intubation can be straightforward in some cases, but it can also be a difficult, with disagreements among staff about timing and techniques.
- In general, the indications for endotracheal intubation include:
  - Patient unable to ventilate
  - Patient unable to oxygenate
  - Patient unable to protect airway
- All three criteria are judged clinically and with simple bedside parameters, such as pulse oximetry and respiratory rate monitoring
- Other reasons for intubation
  - Cardiac arrest
  - Emergent procedures that may compromise the airway (e.g., endoscopy)
  - Facilitation of further evaluation (e.g., imaging) in a patient with multiple painful traumatic injuries or who is dangerously confused and combative
  - Intubation allows for a level of analgesia and sedation in critically ill patients that would not be possible without securing the airway.
- In patients who are deteriorating rapidly, intubation is best performed early when it is more likely to be controlled and uncomplicated

The “P”s Of RSI

- Various mnemonics have been used to help us complete the complex task of RSI; we will use a modified version of the most common: The “P”s of RSI
  - Preparation
  - Positioning
  - Pre-oxygenation

- Paralysis with induction
- Placement with proof
- Post-intubation management

Preparation

- Preparation includes not only ensuring that the necessary equipment and drugs are ready but it is also a cognitive step that includes:
  - the decision to intubate itself and its timing
  - defining a back-up plan
  - pre-intubation resuscitation
- Pre-intubation resuscitation
  - Critically ill patients (e.g., hypotensive, hypoxic and acidotic) are vulnerable and prone to cardiac arrest in the peri-intubation period
  - Hemodynamic resuscitation prior to intubation can mitigate this risk
    - Have good vascular access
    - Fill the tank (volume resuscitation)
    - Oxygenate well
  - Expect blood pressure to drop during RSI
    - Be ready to manage that, including the possible use of pressors
    - Sedative doses should be reduced by half in hypotensive patients (but a full paralytic dose)
  - *EM:RAP 2017 February -National Lecture Series – Intubating the Hypotensive, Acidotic Patient*
- Airway Assessment
  - Prior to administration of a paralytic, we must be confident that we will be able to safely manage the airway
  - This requires an assessment of the following 3 questions:
    - Can I bag this patient? (e.g., ventilate with BVM)
    - Can I tube this patient? (e.g., are there signs of a difficult intubation?)
    - Do I have a back-up plan? (e.g., specialized tools, a surgical airway)
  - If we do not feel confident of 2 out of 3 of the above, consideration of an awake intubation or other alternative to paralysis should be considered
- The LEMON mnemonic was designed to predict a difficult intubation, although it can be less helpful and relevant in the ED environment
  - Look - look externally for signs the airway may be difficult
    - Difficult to bag - facial hair, obesity
    - Difficult to intubate - obesity, cervical -collar or need for immobilization, limited neck mobility, any type of facial or oropharyngeal swelling
  - Evaluate using the 3-3-2 rule

        - Mouth opening is 3 fingerbreadths
        - Thyromental distance (tip of chin to thyroid cartilage) is 3 fingerbreadths
        - Floor of mandible to thyroid notch is 2 fingerbreadths
    - Mallampati score
        - A predictor of difficult intubations based on what structures are visible in the oropharynx
        - Classes I-IV (simplified description)
            - I - soft palate, faucial pillars (the two arches - glossopalatine anteriorly and pharyngopalatine posteriorly), and uvula
            - II - tip of uvula is blocked by tongue
            - III - only the soft palate
            - IV - soft palate not visualized
    - Obstruction/obesity
    - Neck mobility
    - Assessing Mallampati score, thyromental distance, and neck mobility is often not possible in the ED
- Equipment (check your own equipment at the start of each shift)
    - Oropharyngeal and nasopharyngeal airways
    - BVM connected to oxygen and a PEEP valve
        - A PEEP valve maintains the pressure in the lung, without it all the pressure is lost in between bagged breaths
    - Laryngoscope
        - Check the battery
            - The battery is in the handle, the bulb is in the blade
            - Is the bulb bright enough? Swap the handle or the battery. Do not settle for mediocre equipment.
        - Multiple blade sizes in curved and straight
            - Curved = Macintosh
            - Straight = Miller
        - Most common adult blade size is 3 or 4
    - Endotracheal tubes
        - Have various sizes available
        - Most common adult sized tube is 7.5 to 8.0 (cuffed)
        - Check the cuff for leaks with 10 cc syringe
        - Place stylet in tube, straight to cuff with 30° bend
            - Straight to cuff means that you do not bend the styleted tube until the cuff
            - This allows you to keep the tube low and out of your visual field until the tip is at the cords
            - Bend angles of 25-35° are most effective
            - The slight bend helps turn the anterior angle to get up to the vocal cords
            - Too much bend will obstruct your view and cause the tip of the tube to snag on the tracheal rings;it can also cause airway injury

- 3 oxygen adapters (“trees”) preferred
  - 1 for the non-rebreather mask (used for pre-oxygenation)
  - 1 for the nasal cannula (which you will leave on during the intubation for apneic oxygenation)
  - 1 for the BVM
  - If you don’t have 3 then you can swap the non-rebreather mask with the nasal cannula once you are about to take a look at the airway
- 2 suctions
  - In case one fails or there is a lot of fluid in the airway
- Bougie
  - Can either intubate first pass with the bougie or use it as a backup device
  - Why is the bougie helpful?
    - It has a coude tip with a 30° bend
    - The coude tip should point upwards and help you make that sometimes difficult anterior turn towards the cords
    - Once the bougie is passed the cords the ET tube is threaded over the bougie, initially by an assistant, while the operator maintains the laryngoscope in the airway to facilitate tube passage
    - A recent study showed increased first pass success when using the bougie
    - *EM:RAP 2018 October - Airway Corner - Evidence for the Bougie*
    - Commentary by Reuben Strayer
      EM:RAP 2016 February - Bougie Every Intubation
- Capnometry devices
  - Used to help confirm proper tube placement in the trachea
  - Colorimetric device
    - Indicator changes from purple to yellow in the presence of acid (e.g., CO_2)
    - It may take 5-7 bagged breaths to clear out the CO_2 that accumulated during the intubation attempt
    - The indicator will also turn yellow (false positive) if in contact with acidic vomitus
  - Capnography
    - End tidal CO_2 detector connected to the monitor
    - Waveform and numerical value
    - Should be a square waveform with each horizontal plateau representing exhalation
- Stethoscope
  - Listen for breath sounds over each side and confirm none over the stomach
  - Not foolproof but important, especially if the tube is in the right main stem, in which case capnography will not help
- Tube securing device
  - Tape, tie, or specialized devices
- Ventilator

    - Don't need this immediately (ok to use BVM temporarily)
    - A respiratory therapist can be very helpful if available
- Access and Monitoring
  - IV access
    - Need reliable IV access, preferably 2 lines
    - IO access is ok for intubation meds
  - Monitoring
    - Patient should be on a cardiac monitor with pulse oximetry and end-tidal CO2 monitoring, if available
- Medications
  - You need to have the following: an Induction agent (e.g., sedative), a paralytic (neuromuscular blockade) and a post-intubation sedation plan
  - Standard ACLS medications should be immediately available
  - More specifics on medications will be given in Chapter 5

Positioning

- Keep the patient upright as long as possible
  - Lying supine worsens upper airway obstruction from the tongue and soft tissues
  - It also causes atelectasis of the posterior lungs worsening oxygenation and ventilation
  - *EM:RAP 2018 January - Position of Death*
  - A 20° incline is much more effective for preoxygenation and prolonging safe apnea time when compared to the supine position
- Proper positioning improves our view for intubation and increases success
  - Favorable operator position
    - The operator should be comfortable and have good visualization of the airway
    - Patient's face should be approximately at height of your xiphoid
    - Slide patient up to the head of the bed
  - The three axes alignment theory and the "sniffing" position
    - Aligning the oral, pharyngeal, and laryngeal axes is thought to be key to good visualization of the vocal cords by direct laryngoscopy
    - The sniffing position (imagine that the patient is smelling a flower) is meant to achieve this alignment
    - The neck is flexed 35° and the head is extended 15°
    - Regardless of the age or size of the patient, the way to do this is by placing them in ear to sternal notch position; the ear canal should be in a horizontal plane with their sternal notch
    - Head elevation can easily be achieved with a couple of towels under the occiput
    - Babies often need a towel roll under their shoulders because their heads are larger proportionally to their bodies compared to adults
    - Obese adults may need a "ramp"

- A stack of towels/blankets forming a ramp from the shoulders up to the neck and head in order to get the ear in line with the sternal notch
- This is not the same thing as propping the gurney up to semi recumbent
- Ramping is still controversial and there is some data that ramping non-obese adults is not as good as the standard position

- *EM:RAP 2017 October - Paper Chase 1 – Sniffing or Ramping*
- *EMA 2018 April -Abstract 30 - Ramped Position Vs. Sniffing Position During Endotracheal Intubation*

References

Arora S, Menchine M. Paper chase 1 - sniffing or ramping? Emergency Medicine Reviews and Perspectives. October 1, 2017. *https://www.emrap.org/episode/emaswadron/paperchase1.* Accessed December 28, 2018.

Arora S, Menchine M. Paper chase 1 - Intubation <2 Years of Age. December 1, 2014. *https://www.emrap.org/episode/december2014/paperchase1.* Accessed December 28, 2018.

Bair AE, Caravelli R, Tyler K, et al. Feasibility of the preoperative Mallampati airway assessment in emergency department patients. The Journal of emergency medicine. 2010 Jun 1;38(5):677-80. *PMID: 19297115*

Bannister F, Macbeth R. Direct laryngoscopy and tracheal intubation. The Lancet. 1944 Nov 18;244(6325):651-4.

Baude D, Driver B. The Airway Corner - Evidence for the Bougie. Emergency Medicine Reviews and Perspectives. October 1, 2018. *https://www.emrap.org/episode/emrap20181/theairwaycorner.* Accessed December 28, 2018.

Caro D. Induction agents for rapid sequence intubation in adults outside the operating room. UptoDate. Updated November 2018. *https://www.uptodate.com/contents/induction-agents-for-rapid-sequence-intubation-in-adults-outside-the-operating-room#H13.* Accessed December 28, 2018.

Cormack RS, Lehane J. Difficult tracheal intubation in obstetrics. Anaesthesia. 1984 Nov;39(11):1105-11.

Driver BE, Prekker ME, Klein LR, et al. Effect of use of a bougie vs endotracheal tube and stylet on first-attempt intubation success among patients with difficult airways undergoing emergency intubation: A randomized clinical trial. Jama. 2018 Jun 5; 319(21):2179-89. *PMID: 29800096*

Driver BE, Reardon RF. Respiratory Procedures. In: Roberts and Hedges' Clinical Procedures in Emergency Medicine and Acute Care, 7th ed. Philadelphia, PA. Elsevier, Inc; 2019:39-141.

El-Orbany M, Woehlck H, Salem MR. Head and neck position for direct laryngoscopy. Anesthesia & Analgesia. 2011 Jul 1; 113(1):103-9.

Farkas J. The gag reflex shouldn't be tested in living patients. EMCRIT.com/PulmCrit. July 4, 2017. *http://emcrit.org/pulmcrit/gag-reflex/*. Accessed January 9, 2019. *PMID: 21596871*

Levitan RM, Kinkle WC. Pocket Guide to Intubation, 2nd ed. Airway Cam Technologies. 2007.

Levitan RM, Pisaturo JT, Kinkle WC, et al. Stylet bend angles and tracheal tube passage using a straight-to-cuff shape. Academic emergency medicine. 2006 Dec;13(12):1255-8. *PMID: 17079788*

Lim KS, Hew YC, Lau HK, et al. Bulbar signs in normal population. Canadian Journal of Neurological Sciences. 2009 Jan; 36(1):60-4. *DOI:10.1017/S0317167100006326*

Mallampati SR, Gatt SP, Gugino LD, et al. A clinical sign to predict difficult tracheal intubation; a prospective study. Canadian Anaesthetists' Society Journal. 1985 Jul 1;32(4):429-34. *PMID: 4027773*

Modified Mallampati Classification. MDCalc.com. *https://www.mdcalc.com/modified-mallampati-classification#evidence*. Accessed December 27, 2018.

Nickson C. Capnography and CO_2 Detectors. Life in the Fast Lane. Updated May 24, 2016. *https://lifeinthefastlane.com/ccc/capnography/*. Accessed December 28, 2018.

Nickson C. Rapid Sequence Intubation. Life in the Fast Lane. Updated May 17, 2016. *https://lifeinthefastlane.com/ccc/rapid-sequence-intubation/*. Accessed December 28, 2018.

Nørskov AK, Rosenstock CV, Wetterslev J, et al. Diagnostic accuracy of anaesthesiologists' prediction of difficult airway management in daily clinical practice: a cohort study of 188 064 patients registered in the Danish Anaesthesia Database. Anaesthesia. 2015 Mar;70(3):272-81. *PMID: 25511370*

Rahiman SN, Keane M. The "ear-sternal notch" line—how should you lie?. Anesthesia & Analgesia. 2017 Dec 1;125(6):2162-4. *PMID: 28922232*

Ramkumar V, Umesh G, Philip FA. Preoxygenation with 20° head-up tilt provides longer duration of non-hypoxic apnea than conventional preoxygenation in non-obese healthy adults. Journal of anesthesia. 2011 Apr 1;25(2):189-94. *PMID: 21293885*

Smith M, Al Zarad M. Towards evidence based emergency medicine: best BETs from the Manchester Royal Infirmary. Nebulised ipratropium bromide and bronchiolitis. Journal of accident & emergency medicine. 1999 Nov;16(6):443. *PMID: 10572820*

Swaminathan A, Le Cong M. Medical Myths - Cricoid Pressure. Emergency Medicine Reviews and Perspectives. April 1, 2015. *https://www.emrap.org/episode/april2015/medicalmyths*. Accessed December 28, 2018.

Weingart SD, Levitan RM. Preoxygenation and prevention of desaturation during emergency airway management. Annals of emergency medicine. 2012 Mar 1;59(3):165-75. *PMID: 22050948*

Weingart S. EMCrit Podcast 21 – A Bad Sedation Package Leaves your Patient Trapped in a Nightmare. EMCrit Blog. Published on February 26, 2010. Accessed on December 29th 2018. Available at [*http://emcrit.org/emcrit/post-intubation-sedation/*].

Yentis SM, Lee DJ. Evaluation of an improved scoring system for the grading of direct laryngoscopy. Anaesthesia. 1998 Nov;53(11):1041-4. *PMID: 10023271*