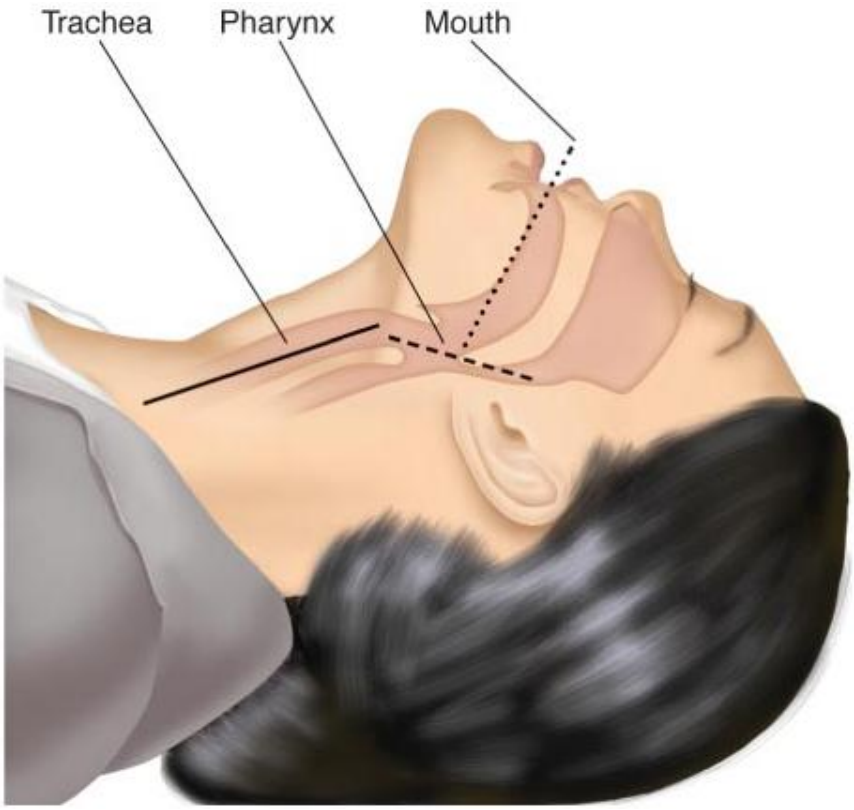
Pierce County EMS
Paramedic Airway Course



2nd Edition
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Paramedic Airway Management Course

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I. ACKNOWLEDGEMENTS

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- The Committee would also like to thank Teresa McCallion for her assistance in the creation and editing of the Paramedic Airway Management Course materials.

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Emergency airway management and ventilation involves a combination of technical skills, critical thinking and decision-making skills to optimize patient care.

II. COURSE PURPOSE & DESCRIPTION

Emergency airway management is an essential element of pre-hospital patient care. As such, competency should be measured by assessing the knowledge, skills and abilities of paramedics, not simply by counting the number of endotracheal tubes placed.

- The purpose of this eight-hour course is to optimize the knowledge, skills and abilities of experienced Pierce County paramedics in managing the airways, oxygenation and ventilation of EMS patients. Course participants, working in small groups, will practice technical skills and utilize critical decision-making skills in airway management scenarios. Written and practical evaluations will measure performance.

- At the end of this course, participants will be able to:
  - Perform an efficient, logical assessment of each patient's airway and ventilation status.
  - Demonstrate critical-thinking skills in assessing the best treatment options for patients who require emergency airway management
  - Identify signs or external markers of potential difficult airway management patients
  - Demonstrate effective ventilation of a patient utilizing a bag-valve-mask.
  - Demonstrate the ability to effectively and consistently manage the airway and ventilation of the patient, regardless of airway difficulty
  - Discuss the indications and contraindications for use of RSI and correctly demonstrate procedures for safely utilizing RSI
  - Identify and demonstrate actions necessary to maximize "first-pass success" in endotracheal intubation
  - Recognize when rescue airway techniques or devices are required to salvage a failed airway
  - Discuss and demonstrate "best practices" in emergency airway management for special patient populations, including trauma, pediatric, bariatric and pregnant patients

- This eight-hour course is designed to improve the paramedic's ability to provide essential life-saving airway and ventilation skills in a safe and effective manner.
- Paramedics must review the pre-course handouts and complete the course pre-test before the start of the class. Pre-test questions will be based upon information in the current Pierce County Protocol Book, associated AHA handbook, and pre-course handouts. Questions on the post-test will come from the same materials along with lecture and small group presentations provided during the course.
- Experienced paramedics (three or more years of paramedic experience) who are using this course to replace operating room rotations, will have to successfully complete the eight-hour primary training program once during each certification period, along with annual skills refresher programs during the other two years of an individual's recertification period.

*Anyone can learn how to intubate a patient, but learning how to make the critical decisions about **why** to intubate, **when** to intubate, and **the best way** to intubate a patient in a given situation, as well as evaluating whether the intubation is successful, is much more difficult.*

--Anonymous

III. BACKGROUND—EMS Airway Management: the Good, the Bad, and the Ugly

- Inadequate oxygenation and ventilation are primary contributors to preventable mortality in patients. Therefore, it would seem intuitive that timely, effective and decisive airway management by EMS providers would improve patient outcomes.
- Paramedics have been providing emergency airway management, including ET intubation, since the early 1970's. Originally, paramedics primarily intubated cardiac arrest patients. The number of misplaced endotracheal (ET) tubes was not carefully studied. However, with increasing use of ET intubation and RSI by many EMS systems to facilitate airway management in non-arrested patients, there has been increased concern over complication rates in EMS airway management. These complications include unrecognized esophageal intubations, inadvertent hyperventilation of patients, worsened hypoxia during intubation attempts, and lack of coronary artery perfusion during prolonged intubation attempts in cardiac arrest patients.
- Over the last decade there has been increasing controversy over the ability of paramedics to effectively use ET intubation and RSI to safely manage patient airways, oxygenation and ventilation. Additionally, most studies have failed to demonstrate any improvements in patient outcomes when they receive ET intubation in the field. A summary of several clinical studies is located in the appendices of this review manual.
    - Several studies have questioned the ability of paramedics to safely and effectively perform RSI in traumatic brain injury (TBI) patients. Airway control in head injured patients is essential to avoid the effects of secondary brain injury. However, studies in San Diego demonstrated worsening outcomes for these patients. Hypoxia and oxygen desaturation, which was unrecognized by the paramedics intubating these patients, may have been contributing factors.
    - The result of a large randomized study on pediatric intubation versus BVM ventilation by paramedics showed no survival benefit from pediatric intubation. One could interpret this as evidence that pediatric patients, who were clinically dead at the start of the call, were still dead at the end of the call, regardless of whether they received ventilation with a BVM or through an ET tube. However, the study also demonstrated extremely poor ET intubation success rates, and a large number of dislodged ET tubes.
    - The ability of paramedics to verify tube placement has also been challenged. In a review of 108 patients arriving at a regional trauma center in Florida, a study by Katz and Falk documented that 25% of the ET tubes were misplaced. Two-thirds of the tubes were unrecognized esophageal intubations, with the remainder ending up with supraglottic tube placement or right mainstem intubation. Two other studies in Maine and Indiana reported tube misplacement rates of 12% and 6%. It should be noted, that in a follow-up study by Falk, *when ETCO2 monitoring was added to the Florida system, the number of unrecognized misplaced ET tubes dropped to zero.*
- There may be multiple factors contributing to perceived problems of out-of-hospital endotracheal intubation and airway management.
    - *The EMS environment is often uncontrolled and stressful.* Decisions must be made quickly, often without complete information. This environment is "prone to error".
    - *Inadequate training and lack of experience*. ET intubation and RSI success has been tied to clinical experience and training. ER residents perform an average of 146 intubations during their residency. In contrast, most paramedic programs require fewer than a dozen ET intubations prior to student graduation. Anesthesiology residents perform an average of more than 90 intubations before they achieve ET success rates of greater than 95%. Opportunities for paramedics to gain significant amounts of additional ET intubation experience are very limited. One Pierce County agency reports that each paramedic averages only 1.8 ET intubations per year. This creates ongoing concerns over degradation of skills and critical decision-making abilities.
    - *Airway skills maintenance issues.* The advent of CPAP is decreasing the number of field intubations in many EMS systems. In addition, the American Heart Association has de-emphasized the importance of ET intubation in cardiac arrest management. In addition, many EMS systems have increased the number of ALS providers, diluting intubation opportunities for individual paramedics. At the same time, increased use of LMAs in operating rooms has decreased the number of ET intubation opportunities for paramedics assigned to ORs.

IV. ASSESSING THE NEED FOR EMERGENCY AIRWAY MANAGEMENT

Without an airway and effective oxygenation and ventilation, your patient will die. We hear this during initial EMT and paramedic training programs at the very start of our careers.

Emergency airway management is one of the most important skills we perform in the field. It is also one of the most complex and difficult tasks for paramedics to successfully perform. Critical-thinking and sound decision making abilities are as important in managing a patient's airway as the required technical skills.

Emergency airway management fits into risk management expert Gordon Graham's description of a "high-risk, low-frequency" event, in which there is little or no available discretionary time.

EMS management of airways and ventilation presents unique challenges when compared to airway management and intubation in the OR and ER. We work in uncontrolled environments, often with limited personnel and equipment, poor lighting and occasionally access issues for entrapped patients. Further, we have to assume that all EMS patients have full stomachs and present with a high risk of aspiration.

In the field, paramedics need to be able to quickly assess patients and their need for emergency airway management, oxygenation and ventilation. Our goal is to optimize patient outcomes using the most appropriate tools and techniques. Some patients may need ET intubation while others simply need BVM ventilation performed en route to a local hospital.

A. When does a patient need to be intubated?

1. Failure of airway maintenance or protection
   - If there is a need to manually open the airway; is there a need to secure it?
   - As a rule, we have been taught that patients who requires placement of an airway—especially an OPA—also require airway maintenance or protection with an ET tube or other airway.
   - But is this always true? ER physicians and paramedics are increasingly managing patients who are obtunded due to alcohol, valium, etc., with a simple NPA and positioning of patients on their side. Use your critical thinking skills to evaluate the patient's GCS, airway status, response to stimuli, and transport times, and *then* utilize your experience to help guide your decision.
   - A GCS score < 9 is a more reliable indicator of the need for intubation than absence of a gag reflex.
2. Failure of ventilation or oxygenation
   - Intubation is indicated if the patient can't be adequately ventilated, nor be adequately oxygenated despite the use of supplemental oxygen. Exceptions include patients with immediately reversible causes such as a heroin overdose who can be treated with Narcan.
3. Anticipated need based on clinical course of the patient
   - Consider early intubation if the patient's condition is predicted to deteriorate, despite his or her current ability to maintain and protect an airway, then early intubation should be considered. Cases would include inhalation burn injuries, airway soft-tissue injuries, trauma to the neck, anticipated progression of their injury or illness, or the emergent need to fly the patient to definitive care.

B. **Critical decision-making** skills need be utilized when assessing risk versus benefit before providing emergency airway management for a patient.

1. What is the patient's clinical presentation right now? How far are we from the ER? Do we need to intervene now, or can we use other techniques, such as BVM ventilation, while en route to the ER?
2. Can CPAP be used to treat a patient who can't adequately oxygenate or ventilate? If so, it presents fewer risks when compared to intubating a CHF or COPD patient.
3. Do we have the right tools and other trained providers on scene who can help?
4. Will use of RSI pharmacologic agents assist in the successful airway management of the patient?
5. Watch out for the "technological imperative"—just because we have a device or tool, does not mean that we have to use it.
6. Look for external markers for difficult airways—could this patient be a "Can't Intubate / Can't Ventilate" patient or will I be able to manage this patient with a BVM or alternative airway?
7. Once the decision is made that you need to secure the airway, be decisive and plan for success—never forget to have a "Plan B" in place.

V. EFFECTIVE USE OF THE BAG-VALVE MASK

Two-person BVM technique optimizes ventilation.

Mastery of the bag-valve mask (BVM) is crucial for EMS providers. It serves as the foundation for emergency airway management. Using the BVM to effectively ventilate a patient provides the time to move forward with endotracheal intubation or other airway procedures. It also provides immediate oxygenation and ventilation after a failed intubation attempt, preventing hypoxia. BVM ventilation is viewed by many rescuers as being mundane, and not very glamorous. However, using it effectively is extremely difficult.

A. The keys to BVM mastery include:

1. *Properly positioning the patient* for optimal ventilation, opening the airway, and using an OPA or NPA to provide an artificial airway. If no c-spine precautions are needed, elevate the patient's head so the opening of the ear is level with the sternal notch. Then use the head tilt and jaw thrust with the head in a sniffing position to displace the tongue and maximize the opening of the airway.
2. *Selecting the right bag and mask for the patient.*
3. *Obtaining the appropriate seal* by detaching the mask from the bag, using two hands to pull the sides of the mask out, and then sealing it over the face, while pulling the mandible up into the mask. Then reattach the bag and start ventilating the patient. Many rescuers push down on the mask, compromising mask seal and inadvertently closing the airway. Think about "lifting" the face *into* the mask. Draw the mandible and submandibular tissues up. The "E-C" technique of spreading fingers around the mask should be used to optimally seal the mask.
4. *Using two-person BVM ventilation* to effectively ventilate patients and minimize the risk of aspiration. The focus should be on upper airway patency, not on squeezing the bag harder, or pushing the mask down onto the face [Note: the use of cricoid pressure (Sellick Manuever) to prevent aspiration should be considered, but it's effectiveness is unproven. It's only benefit is in preventing passive regurgitation]
5. *Providing **slow, low pressure** ventilations for all non-cardiac arrest patients*. If the bag is squeezed to forcefully—exceeding more than 20 cm of pressure—it will overpower the gastric sphincter, leading to inflation of the stomach and increased risks of regurgitation and aspiration. New brands of BVMs use technology to assist our efforts. One BVM has a valve that limits the pressure delivered by rescuers, while another has a built-in pressure gauge dial that allow rescuers to focus on delivering ventilations at safe ventilation pressure levels.
6. *Providing just enough volume to observe visible chest rise*. For most patients, a volume of 5-6 cc/kg, or a total of 500 to 600 cc for an adult is sufficient. Providing more volume simply increases the risk of gastric insufflation and regurgitation. This is in stark contrast to past practices in which rescuers used various techniques and tried to squeeze every bit of volume out of a BVM.

B. BVM Ventilation of a Patient with Difficult Airway:

1. Almost everybody can be oxygenated and ventilated with a bag-valve-mask. In a large study of 53,041 elective anesthesia patients, 2.2% of patients were identified as difficult to ventilate, but only 0.2% were identified as impossible to ventilate with a BVM. *(Anesthiology 2009 Apr; 110:891)*
2. The first response to failure to intubate should always be to ventilate the patient with a BVM. The first response to failure of bag-valve mask ventilation is always ***better*** **BVM ventilation with two rescuers,** whenever possible.
3. Use of BVM ventilation is generally a temporizing measure for ventilating patients. When possible insert a Combitube or King-LT. They are simple to use, providing a better seal than a face mask, and minimizing gastric distention and aspiration.

VI. ENDOTRACHEAL INTUBATION—PREPARING FOR "FIRST PASS SUCCESS"

A. Importance of First Pass Success

Your first attempt at endotracheal intubation may be your best, or only, chance of intubating a patient. This course will continually stress the objective of achieving **"first pass success"** with ET intubation.

"To minimize aspiration risk associated with repeat bagging and the risk of hypoxia from prolonged laryngoscopy, first pass laryngoscopy success is critical with emergency RSI, particularly in unstable patients" (Levitan)

CLINICAL INSIGHT:

The significance of first pass success in protecting patients from complications of emergency airway management can not be overstated. A 2004 study by Mort, analyzed complications associated with 2,833 emergency airways. Hypoxemia associated with one to four ET intubation attempts increased as follows: 1 attempt—4.8%, 2 attempts—33.1%, 3 attempts—62%, and 4 attempts—85% of patients were hypoxemic. The incidence of aspiration increased from 0.3% with one ET intubation attempt to 13% with three or more attempts. Incidents of trauma to the airway, bradycardia and cardiac arrest climbed alarmingly with repeated attempts.

(Mort, TC. Emergency Tracheal Intubation: Complications associated with repeated laryngoscopic attempts. Anesth Analg. 2004; 99:607-13)

B. Assessing for the Potential Difficult Airway

Assessment and prediction of the "difficult airway" has limited value in the chaotic, time-critical EMS environment. Anesthesiologists routinely assess the patient's mouth, neck and jaw before elective intubations in the OR. But these tests depend upon the patient's cooperation, something usually lacking in patients we are trying to intubate in the field. (*Levitan*). Basic difficult airway screening tests can not be applied to two thirds of emergency patients. Even then clinical reports indicate that the sensitivity (positive predictive value) of such assessments is very poor.

Further, the purpose of conducting such an assessment is questionable in the EMS setting. OR staff may have time to consider alternatives for intubating a 160 kg male gall bladder surgery patient with a bull neck and short chin. If the same patient is shot four times in the chest, has blood in his airway and is agitated and hypoxic upon arrival of EMS, you need to secure the patient's airway with minimal delay. RSI may be the fastest and safest method, with a backup "Plan B" using an alternative or "rescue" airway such as a Combitube or King-LT airway.

Overestimation of the difficult airway may also delay critical interventions to secure the airway and ventilation.

What can we do in the field to help predict difficult airway patients? We can look in and around the mouth for "external" markers.

Markers for Difficult BVM Ventilation	Markers for Difficult ET Intubation
• Loss of teeth or dentures • Obesity • Snoring • Beard • Age > 55 • Abnormal facial structures • Face or neck trauma • Reactive airway disease	• Immobilized neck • Obesity • Short, thick neck • Receding mandible (chin) • Prominent incisors • Facial or neck trauma • Small mouth opening • Large tongue

C. Intubation techniques to assist with "First Pass Success"

The skill of the paramedic holding the laryngoscope is the single biggest factor in the success or failure of any intubation attempt. The skilled clinician will take the time to adequately prepare for intubation.

1. **Assess for difficult airway (as described above) by looking for external markers**
   - Reassess the patient's airway and ventilation status—do you need to act now, or should this wait and be done in the ER?
   - If possible difficult airway—consider "double set-up" of rescue airway and surgical airway.

2. **Properly position the patient** (and rescuers) to maximize success for BVM ventilation and intubation.
   - The goal is to position the patient's head in the sniffing position with the opening of the ear level with the patient's sternal notch. This improves the intubating sight-lines for most patients and helps with BVM ventilation.
   - Most patients will require at least 3 to 4 inches of elevation behind the back of the head. A folded sheet or blanket works great. However, morbidly obese patients may require substantial padding behind their head down to their mid-back, creating a "ramp" to bring them up to a semi-Fowlers position.

Head elevation is best achieved with folded towels positioned under the head and/or neck.

3. **Ensure that the patient's airway and ventilations are being adequately managed.**
   - Ensure that the upper airway is patent, utilizing an oral or nasal airway.
   - Use two person BVM ventilation whenever possible.
   - Ensure the correct RATE and DEPTH of ventilation—too much of a good thing is not a good thing at all.
     - Ventilate 10 to 12 times per minute—with 500-600 ml of air—typically one-third to one-half the volume of an adult BVM device—to see noticeable chest rise.
     - Ventilate SLOWLY—each breath should last two seconds to minimize gastric insufflation.

4. **Prepare your equipment for intubation:**
   - This is a team sport--get an "**airway partner"—**someone to assist with the procedure.
   - Check and prepare your equipment, including suction, stethoscope, laryngoscope and blades. *"Have everything ready and close at hand—otherwise it might as well be on Mars."*
   - Ensure that your waveform ETCO2 adapter is plugged in and working. (2nd choice is Easy-Cap.)
   - Use a stylet to shape ET tube into a "hockey stick" with a 25% to 35% angle at the distal cuff. This minimizes loss of vocal cord view while inserting ET tube from far right side of the mouth.
   - Set up an appropriate "Plan B "alternative "rescue" airway such as use of bougie or King LT.
   - Keep equipment, particularly the ET tube and blade clean to minimize risk of infection.

5. **Go slowly and smoothly to maximize your first pass success.**
   - Don't hurry your first attempt. See and identify the anatomical landmarks as you intubate.
   - There is no rush if your crew is adequately managing the patient's airway and maintaining good oxygenation with a jaw lift, OPA and BVM ventilation.

6. **As you insert your laryngoscope blade, have suction in your right hand.** This will slow things down, giving you a chance to clean up the airway, before handing off suction. At that point you can apply bimanual pressure (see below) or ask for the ET tube.

7. **Use External Larnygeal Manipulation (ELM),** also known as "bimanual pressure", as necessary to improve your view of the vocal cords.
   - Routine "Cricoid pressure" is not recommended for prevention of passive regurgitation and aspiration during intubation, and it appears to worsen views of the vocal cords in many patients.

- During ELM, once the laryngoscope blade is inserted, the person intubating uses his/her right hand to manipulate the cricoid membrane, and once the desired view of the cords and opening is obtained, the assistant takes over holding that pressure.
- ELM maximizes percent of glottic opening (POGO) visible during intubation when compared to use of cricoid pressure. One study reported a 57% increase in the POGO score with ELM.

8. **Use the Fish-Hook technique.**
   - Have your partner use fingers or thumb to pull down and out on the patient's right cheek retracting the corner of the mouth. This maximizes the "working" space in which to insert your ET tube.
   - Insert the ET tube from the far right so you don't block the vocal cords while passing the tube.

9. **Use SpO2 and heart rate as a guide for oxygenation.** Heart rate provides an evaluation of "central oximetry". Remember that SpO2 is slow to respond—it may be a minute behind actual arterial saturation levels.
   - If the SpO2 reading falls to 92%, it's likely that the patient has already crashed below 90%. Break-off the intubtion attempt and manually ventilate the patient.
   - Your partner should call out SpO2 levels and heart rates during the intubation attempt.

10. **If the first intubation attempt fails—*Do Something Different.***
    - Review what just happened—do you need another plan?
    - Try something different:
      - Adjust the patient's head
      - Try a different blade
      - Use an ET tube introducer (gum-elastic bougie) or King Vision device.

D. Common mistakes and problems with ET intubation:

1. Sliding the ET tube down flange of Miller or Mac blades—blocks view of cords and increases risk of esophageal intubation.
2. Worsening rates of hypoxia with repeated intubation attempts.
3. Risk of airway trauma, particularly with repeated intubation attempts.
4. Inadvertent hyperventilation of intubated patients—leading to worsening mortality in cardiac arrest and traumatic brain injury patients.

Placing the tube down the blade will obsure your view of the glottic opening.

E. How many ET intubation attempts should take place before we switch to a Plan B airway?

1. **Consider "Three Strikes and Out" Rule**
   - First paramedic makes two attempts at intubation.
   - If no success, the second paramedic on team makes one attempt, while first paramedic prepares alternative "Plan B" airway, such as a King Airway or Combitube.
   - If the second paramedic is unsuccessful after one attempt (3rd total attempt), the first paramedic attempts to insert the rescue airway device.

2. Chances of intubation success drop dramatically after the third attempt at ET intubation.

3. There will always be exceptions to the rule—i.e. another provider arrives with a different skills set, different equipment, etc.—but these cases should be well-documented on medical incident reports.

CLINICAL INSIGHT:
Remember patients don't die from failing to be intubated—they die from a failure of being adequately ventilated and oxygenated.

VII. RSI & ET INTUBATION

A. The primary purpose of RSI is to facilitate direct laryngoscopy by optimizing intubating conditions, creating better visualization of the vocal cords while minimizing the risk of aspiration and other complications.

B. RSI is not necessary in patients who are apneic and unresponsive, as with a cardiac arrest, or near-arrest patient. Many experts advise using RSI on virtually all patients except the "newly dead and nearly dead" to create optimal intubating conditions. However, some airway experts state that exceptions to this rule would include cases such as an alcohol and valium overdose patient who presents with a GCS of 3.

C. Determining whether the patient needs RSI is best determined by an overall assessment of the patient. Don't forget that the larynx is heavily innervated and laryngeal reflexes are among the last protective reflexes to go as a patient deteriorates. Don't test for a gag reflex, since it may induce vomiting. Unless apneic, consider use of full RSI. Even in patients with poor respiratory effort, agonal respirations, or patients accepting an OPA, the downside of using RSI and taking away *ineffective* respirations is minimal. The respiratory drive taken away was ineffective to begin with and paralysis will optimize chance of successful first pass intubation success, while minimizing chances of hypoxia and aspiration for the patient.

D. The significance of the decision to use RSI cannot be overstated. RSI takes away the patient's respiratory drive and abolishes all protective laryngeal reflexes. Once RSI is accomplished, you **must either successfully intubate the patient or ensure adequate oxygenation and ventilation with the use of an alternative rescue airway (i.e. King LT or Combitube) and/or BVM ventilation**

1. This must be accomplished while preventing complications such as an hypoxic event, which can dramatically increase mortality or aspiration.
2. We need to evaluate the risk vs. benefit for using RSI, recognizing that there is nothing "rapid" about RSI. It may take several minutes to accomplish. Are we better off transporting the patient to the ER?
3. Many of the "induction" or sedative agents used in RSI, such as midazolam, may lower blood pressures in already hemodynamically-compromised patients.

CLINICAL CONTROVERSY:
In a San Diego study, paramedics used RSI to facilitate intubation of severe head-injured patients (GCS<9). 54 patients were enrolled in the study. Oxygen desaturation occurred in 57% of the patients, and lasted an average of 160 seconds, with a median SpO2 desaturation of 22% from baseline. Marked bradycardia occurred in 19% of the patients. In a self-evaluation, the paramedics described RSI as easy in 84% (26 of 31 pts.) who suffered desaturation. *Dunford & Davis, et al, Ann Incidence of transient hypoxia and pulse rate reactivity during paramedic rapid sequence intubation. Emerg Med 2003; 42: 721-728.*

E. Does Sedation-Assisted Intubation work as effectively as RSI?

1. Various airway authors, such as Dr. Levitan Dr. Braude and Dr. Wall, warn that sedation-only intubation fails to provide adequate relaxation of patients, resulting in less than optimal views of the vocal cords, while increasing the risk of complications, such as vomiting, aspiration, and hypotension.
2. Using etomidate or midazolam by themselves may result in decreased respiratory effort or apnea, without enough sedation to relax the jaw to permit successful intubation. (See Bozeman et al study)
3. If you need RSI—maximize your success by using the combination of a sedative/hypnotic and a paralytic agent.

F. RSI Pharmacology: Sedation, Paralysis and Pretreatment Drugs

1. For ethical reasons, be sure to give the sedation agent first, followed by the paralyzing agent.
2. Etomidate is increasingly viewed by airway experts as the "sedation" agent of choice for use during intubation, particular in critically ill or injured patients.
    - Midazalom has a slower onset, and increased risks of hypotension, but can be used if etomidate is unavailable. Valium has an unreliable onset and is rarely used for initial RSI sedation.

- Etomidate causes temporary adrenal gland suppression, which can adversely impact sepsis patients in compensatory shock. However there is no evidence that the transient suppression is clinically significant. The advantages of its use still outweigh any concerns.
- Benzodiazepines, such as Versed and Valium ***can*** be effectively used after intubation for their sedative/hypnotic effects.

Comparison of Sedation/Induction Agents	
Etomidate	**Midazolam**
Advantages: • Rapid onset, short duration of action • Similar profile to that of succinylcholine • Limited hemodynamic impact • Cerebroprotective (decreases ICP) **Disadvantages:** • Can only be given once to facilitate intubation • Controversy over adrenal suppression (no significance shown with singe etomidate dose) **Dose:** 0.3 mg/kg IV push (20 mg IV) • Based on total body weight	Advantages: • Amnestic, brief acting • Anticonvulsant **Disadvantages:** • Slower onset of action—up to two full minutes • Can cause cardiovascular depression and drop the patient's blood pressure. **Dose:** 4-5 mg IV push for intubation • Dose may be lowered for critical patients • Post-intubation doses typically in 2 mg increments every 5 to 10 minutes

3. Choice of paralytic agents:

- Succinylcholine remains the paralytic of choice for EMS due to its rapid onset (45 seconds) and relatively brief duration of action (6 to 10 minutes)
- The recommended dose for succinylcholine in the 2012 Patient Care Protocols is 1.5 mg/kg IVP, which is calculated on total body weight, versus ideal body weight. It is hard to estimate weights on supine patients, so it is better to err on the high side of a higher dose to ensure adequate patient paralysis. Many authors suggest adding 20% to the estimated weight of the patient when calculating your dose of succinylcholine.
- Absolute contraindications for use of succinylcholine are relatively rare, but include:
  - A personal or family history of malignant hyperthermia
  - Patients at risk for SUX induced hyperkalemia:
    - Burns
    - Denervation conditions, such as spinal cord injuries or strokes, from approximately fifth day, post-event
    - Inherited myopathies, such as muscular dystrophy
- **Vecuronium,** which is a non-depolarizing paralyzing agent, can be used for initial RSI, at a dose of 0.1 mg/kg if succinycholine is contraindicated.
  - Recognize, however, that without the use of a "priming dose", it may take between 90 sec two minutes for full paralysis.
  - Most commonly, however, vecuronium is used for maintenance of post-intubation paralysis with the same dose of 0.1 mg/kg. **Remember—if you are administering vecuronium to a patient to maintain paralysis—you will probably need to provide additional sedation for the patient.**
- If available, **rocuronium,** which is another non-depolarizing agent, is preferable for use in initial RSI, at a dose of 1.0 m/kg IVP. It has a faster time to intubation level paralysis (60 seconds) and shorter duration of 40-60 minutes, versus vecuronium which can lasts 60 to 75 minutes.

CLINICAL INSIGHT:
Patients with chronic renal failure often present with CHF. These patients may have underlying hyperkalemia. If you have a renal failure patient who needs to be intubated with RSI, use your ECG to look for evidence of acute hyperkalemia (high T waves or prolonged QRS complexes). If the ECG is normal, it is safe to assume that succinylcholine is safe to use. *(Walls et. al.)*

4. What about the use of Pre-treatment agents to minimize the adverse effects of laryngoscopy and intubation for some patients?

    - Use of lidocaine is controversial. The evidence that lidocaine alone can blunt the hemodynamic response to intubation is inconclusive. The evidence supporting its use to minimize impact on increased ICP is more compelling. However, for lidocaine to work in this circumstance, it should be given 3 minutes before intubation, which limits its usefulness in the field. The 2012 Pierce County EMS Patient Care Protocols give lidocaine a "consider" recommendation for use with patients who have reactive airway and increased intra-cranial pressure.
    - Atropine use as a pre-treatment drug, to prevent succhinycholine-induced bradycardias for pediatric patients under age 8 is increasingly controversial. However, our 2012 Pierce County Protocols state that atropine shall be given as a pre-treatment drug at a dose of 0.02 mg/kg IV with a minimum dose of 0.1 mg.
    - The use of defasiculating doses of vecuronium to limit the increase in ICP caused by succhinylcholine is no longer recommended by Wall, et al. Studies have failed to demonstrate there is a significant increase in ICP caused by SUX use, and have also failed to show that a single dose of a non-depolarizing neuro-muscular blocking agent such as vecuronium will actually limit the increase in ICP during emergency RSI.

5. **Ensure that RSI patients are effectively pre-oxygenated.**
    - The goal is to maximize Sp02 levels, creating time for intubation to take place. In the operating room, RSI patients are seldom ventilated with a BVM because of the increased risk of aspiration. These patients are simply placed on high-flow oxygen for up to five minutes, or coached to take up to eight deep breaths to "wash out" the nitrogen in their lungs.
    - Unfortunately, most EMS patients need effective BVM ventilation to support their oxygenation.
    - With RSI, we need to ensure that we use proper technique, preferably with two-person BVM ventilation to avoid over-pressurizing the gastric sphincter and ventilating the stomach.
    - Two simple—but important—techniques can be used to prevent or delay desaturation:
        - First, reposition patients into a 20 degree heads-up position. This helps many patients ventilate more effectively, and can improve BVM ventilation. This is particularly critical for obese patients, geriatric patients, and others who may be particularly prone to desaturation.
        - Second, consider the use of "**apneic oxygenation"** for RSI patients to provide more time for the intubation procedure before oxygen levels desaturate.
            - This simple procedure, reported widely in the emergency medicine literature, can help prevent desaturation of at-risk patients, such as morbidly obese, geriatric and critical trauma patients.
            - Place a nasal cannula or your patient and hook it up to a second oxygen source (i.e. a first-responder airway bag or even a second wall outlet in a Medic unit) while continuing to BVM ventilate an unconscious patient, or deteriorating patient.
            - Set the nasal cannula at a flow rate of 5 to 15 L/minute. That is not a misprint. Sedated patients will not experience discomfort. O2 flows out of the prongs into the upper airway and the patient receives passive oxygenation, even without diaphragmatic movement. BVMs and non-rebreather masks will not provide the same effect for apneic patients.
            - The nasal cannula stays on the patient, flowing oxygen, without interfering with the intubation attempt(s).
        - In one study of morbidly obese patients, desaturation time was extended by 90 seconds.

CLINICAL INSIGHT:
The time to desaturate from a 90% SpO2 level to 0% is dramatically less than the time to desaturate from 100% down to 90%.

6. **If RSI is unsuccessful:**
   - Consider following "Three Strikes and Out" Rule.
   - If patient is desaturating, after a first or second ET intubation attempt, and BVM ventilation is not increasing the patient's oxygen saturation level, consider:
     - Immediate placement of a "Plan B" airway—don't keep making more intubation attempts.
     - Choices include placement of a King LT or Combitube
     - There may be occasions when after RSI is initiated, and the airway is visualized, that a clinical decision is made to immediately place a rescue airway, resulting in "RSA".
   - If a Plan B airway does not work, and better two-person BVM ventilation is not effective in maintaining oxygen saturation levels, the result is a critical "Can't intubate/Can't ventilate" situation, which may require placement of a surgical airway.

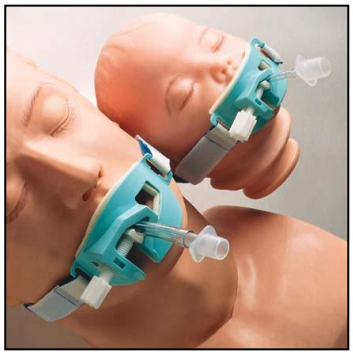
7. **Post Intubation RSI patient management:**
   - See below for general rules of securing and monitoring patients with advanced airways.
   - Monitor patient for post-RSI hypotension which occurs in many patients.
   - Ensure that patients receive adequate follow-up sedation, particularly if you administer a follow-up long-lasting paralytic agent such as vecuronium.
     - Etomidate is very short-lasting sedative/hypnotic agent, and can only be given once to patients.
     - Small doses of Versed, starting with 2 mg IV slowly every 5 to 10 minutes should be enough to maintain sedation. If necessary, increase dose, and document indications.
     - Note that the Versed is given IV push for induction, but IV slowly for post-intubation sedation to attempt to minimize possible hypotension in compromised patients.
   - If a long transport is necessary, consider use of a long-lasting paralytic, although some airway experts prefer that patients simply receive continued sedation, and avoid additional paralytics.

8. **Review the 7 Ps for RSI in the Pierce County EMS Patient Protocol book.**

Levitan's Skydiving Analogy & RSI: Managing risk in an inherently dangerous activity

1. **A redundancy of safety.** There is a primary chute (ET intubation) and a secondary chute (rescue ventilation with either a BVM, Combitube or King LT)
2. **A methodical pre-planned approach for deploying the primary chute**
   Skydivers use a specific series of steps to deploy a chute. We can use a planned series of steps and maneuvers to maximize intubation success.
3. **Use back-up chutes that are fast, simple and easy to deploy.**
   A skydiver has limited time to deploy a backup chute in an incredibly stressful situation. In the past RSI intubation failure, plus failure to adequately ventilate a patient with BVM resulted in initiation of cricothyrotomy. However, surgical airways typically take from 75 to 100 seconds or more to achieve. Use of supraglottic airways, such as King LT airways and Combitubes now provide a fast viable alternative, with ventilations typically achieved in less than 20 seconds.
4. **Attention to monitoring.** Skydivers pay attention to altimeters to help guide them on when to deploy their backup chutes. In RSI, pulse oximetry should dictate when efforts at intubation must be suspended and BVM or "Plan B" rescue ventilations initiated. SpO2 numbers below values of 90% fall precipitously. SpO2 readings from a distal extremity have a time lag of 60-90 seconds so it is important to closely monitor oxygen saturation levels. **Monitoring altitude (i.e. SpO2 levels) is also essential for determining when it is safe to jump out of the airplane in the first place.**
5. **Equipment vigilance**. Skydivers check their equipment and have an intimate knowledge and responsibility for the equipment upon which their lives depend. We must take the same responsibility for our patients' safety by ensuring that our equipment is checked, functional, and readily accessible.

VIII. CONFIRMING, SECURING & MONITORING AIRWAY PLACEMENT



Much of the controversy around paramedic endotracheal intubation and RSI has been generated by studies of unrecognized esophageal intubations and dislodged ET tubes. Most of these studies came from EMS systems where waveform capnography was not utilized as a device for confirming tube placement. Multiple studies show that reliance on clinical methods alone result in missed ET tube placements in 10-20% of patients.

A. Initial Confirmation of ET tube placement:

1. Confirmation devices:

- The "gold standard" for confirming ET tube placement in the field is wave-form capnography**.** Capnography, used universally in ORs, is an extremely accurate device for confirming tube placement. It even works well in low-perfusion, cardiac arrest patients—as long as there is some cellular metabolism. It can also be used on alternative airway devices.
- The colormetric (Easy Cap) device is only useful and accurate in perfusing patients, and should be considered a back-up confirmation device if waveform capnography is not available.
- The Esophageal Detection Device (EDD) is fairly accurate in confirming esophageal placement of ET tubes. However, if patients are obese or have been ventilated prior to ET intubation, accuracy suffers, and the EDDs will often "confirm" placement in the esophagus, when the ET tube is actually in the trachea. The EDD devThere are two types of EDDs, the syringe device and bulb device. According to Walls, the bulb EDD is more sensitive. If using the bulb, it is important to deflate the bulb *before* attaching it to the ET tube.

2. Clinical methods for confirming tube placement.

- Direct visualization of the tube passing through the vocal cords—can be unsatisfactory due to patient immobilization, blood/vomit in the airway, or the ET tube itself blocking sight of the cords.
- Bilateral breath sounds, and absent abdominal sounds, by auscultation—can be unreliable.
- Condensation or mist in the ET tube when ventilating the patient (which can occur with humidified fluids from the stomach)—*completely* unreliable.
- Bilateral chest rise—can be unreliable.

3. **Medics must use multiple methods for confirming tube placement,** including at least one confirmation device. All methods used to confirm placement must be documented on the medical incident report.

B. Securing the ET Tube and Alternative Airways:

1. Commercial ET tube holders are recommended for securing airways in adult and pediatric patients.
2. In small pediatric patients, taping the tube to the cheeks of the patient may be preferable.
3. Consider using a c-collar, head-bed and tape to secure the patient's head to a backboard and prevent head movement which can pull the tube out of the trachea, particularly in younger pediatric patients, where 1 cm of ET tube movement can be enough to dislodge the ET tube.
4. Disconnect the BVM from an ET tube when moving the patient in or out of a Medic unit or letting go of the BVM. Never let the BVM simply "drop" while connected to the ET tube, such as while a patient is being defibrillated, since it may dislodge the tube, even if a commercial tube holder is being utilized.

C. Provide continuous monitoring of ET tube placement with wave-form capnography, SpO2 and ECG monitoring in perfusing patients, reassessment of lung sounds, and other clinical methods.

CLINICAL INSIGHT:
With the availability of wave-form capnography on Pierce County ALS transport units, positive confirmation of ET tube placement and continuous monitoring should be the standard for patient care.

VIII. Alternative ("Rescue") Airways & Use of Optical and Video Intubation Devices

As discussed earlier, after each attempt to intubate a patient, rescuers should provide safe and effective BVM ventilation, when needed, to keep SpO2 levels above 92%.

When an attempt to intubate the patient has failed, the first action should be to go back to BVM ventilation of the patient. If there are problems with BVM ventilation, adjust technique, and provide better BVM ventilation, using the two-person technique, if not already in place. However, the BVM provides no protection from aspiration. Unless transport times are very short, rescuers should consider using an alternative device such as a King LT or Combitube airway to provide more effective ventilations and provide some protection from aspiration.

A. Use of Supraglottic ("Rescue") Airways:

1. Ventilation with a BVM can be challenging and it provides no airway protection from aspiration.
2. Advantages of supraglottic or extraglottic airways, such as the Combitube or King LT, include:
   - Ease of placement—blind insertion with high percentages of successful insertion and ventilation
   - Simplified training to maintain competency
   - Provision of some degree of protection from aspiration
3. Disadvantages:
   - Does not serve as a definitive airway
   - Can not insert devices if patients have a gag reflex
   - No small infant/toddler pediatric sizes available for Combitubes and King LT
   - Some operators have experienced difficulty in obtaining a good seal with the King LT when patients have vomited or have blood in their airway.

B. Use of Gum-Elastic Bougie Devices to Facilitate Intubation:

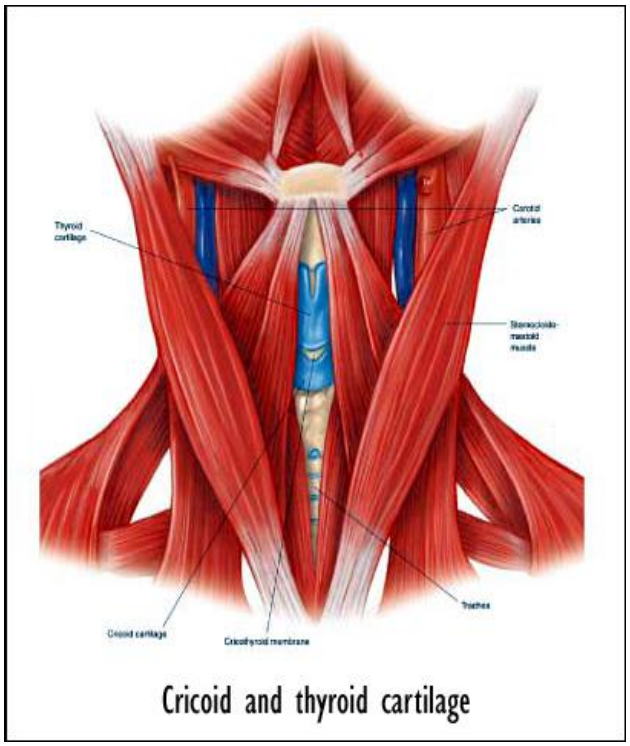
1. Devices are very useful for inserting ET tubes in patients in whom only the epiglottis or tip of the posterior cartilages are visible.
2. To use the bougie, an operator works to obtain the best view possible of the larynx using a laryngoscope blade while performing external laryngeal manipulation (ELM).
3. The paramedic then inserts the tip of the bougie down through the vocal cords, feeling the "clicks" of the bougie going over the cartilage rings of the trachea. Insert the bougie until resistance is felt.
4. An "airway partner" can then thread an ET tube over the bougie and slid down the tube until it enters the trachea, and the bougie is withdrawn.
5. Airway experts suggest that the laryngoscope blade be left in position while the tube is being inserted to help lift the tongue out of the way and to provide visual confirmation of the ET tube entering the glottis.

C. Use of Video and Optical Intubation Devices:

1. Video laryngoscopy is gaining increasing popularity as studies continue to demonstrate superiority of the technique over direct laryngoscopy.
   "Video laryngoscopy transforms intubation from a technique requiring direct line of sight from outside the patient's mouth to the glottis aperture to one in which the image is obtained by the video camera placed behind the tongue, requiring no direct line of sight" (Walls et al)
2. If available, video and optical intubation devices (i.e. Glidescope, King Vision and AirTraq) should be considered as a primary intubation device for the following categories of patients:
   - Cardiac arrest patients—decreased risk of splash exposures as rescuer kneels beside patient
   - Spinal immobilization patients—the video camera eliminates need to line up airway axes
   - Possible difficult airway patients—use of a video/optical device will improve view of glottic opening
3. The true role and capabilities of the devices in EMS remains to be determined. If adopted by an agency, significant training is required since technique and motor-muscle skills differ from traditional direct laryngoscopy.

CLINICAL INSIGHT:
Rescuers should ensure their proficiency in BVM ventilation and at least one alternative airway device as part of their personal "Plan B" emergency airway management algorithm.

IX. USE OF SURGICAL AIRWAYS



Cricoid and thyroid cartilage

With the widespread use of RSI, and the advent of supraglottic airways and video intubation devices, the number of surgical airways has dropped significantly.

Studies have failed to show any distinct advantages over use of an "open" surgical airways or use of Seldiinger-technique cricothyrotomies. What studies *have shown* is the need for frequent skills repetition to maintain proficiency in this seldom-used skill. One study said that at least six practice demonstrations in one or two sessions was necessary for motor-muscle memory.

Paramedics should become proficient in one surgical airway technique and keep practicing it.

This course teaches the "open surgical" technique because it requires the least amount of specialized equipment. If your department uses a specialized cricothyrotomy kit, you should practice with that device in addition to the training you will receive in the PAM course.

A. Indications for surgical airway use?
Generally limited to provider inability to intubate or ventilate the patient by any other means.

B. Contraindications for surgical airway use:
1. Penetrating neck trauma with expanding hematoma in the anterior neck is a relative contraindication.
2. Fractured larynx or other significant damage to the cricoid cartilage.

C. Relative contraindications:
1. Immediate complications include bleeding, subcutaneous emphysema, incorrect tube placement, esophageal perforation.
2. Delayed complications include vocal cord dysfunction, subglottic stenosis, tracheal edema, infection

D. Open scalpel technique for surgical airway:
1. Find landmarks with left hand
2. Make vertical incision 3 to 4 cm long.
3. Locate cricoid membrane and use scalpel to make a horizontal incision through the membrane and place a finger or gum bougie through hole to anchor position.
4. Carefully slide ET tube through hole, or over bougie into hole.
5. Inflate ET tube cuff, ventilate and confirm placement.
6. Cut tube to size and secure ET tube in position with ties.

E. Notes:
1. Surgical airways can be bloody. Wear gowns, gloves and face protection.
2. Don't worry about stopping the bleeding from the incisions until after the airway is placed and secured.

X. EMERGENCY AIRWAY MANAGEMENT IN SPECIAL POPULATIONS:

A. PEDIATRIC AIRWAY MANAGEMENT


Length-based resuscitation tape

1. General Overview:

- Challenges include increased stress of dealing with critically ill or injured children while trying to determining the correct age-related drug dosing, equipment requirements, and assessment of the anatomic variations in pediatric patients.
- These stresses and cognitive thought processes can distract from patient management and lead to increased pediatric treatment errors.
- While general principles of airway management in children and adults are the same, there are some differences that need to be considered, particularly in infants and toddlers.

2. Clinical Considerations:

- Anatomical and physiological differences in children:
  - The larynx is higher and more anterior in the neck (ELM is particularly useful in small kids)
  - Infants and small children tend to obstruct more easily due to small diameter of their airways.
  - The trachea is shorter (4 cm in infants) making it easier to place ET tube in mainstem bronchus or to accidentally extubate the pediatric patient
  - The size of the tongue is larger in proportion to the oral cavity, particularly in infants.
  - The epiglottis is relatively large and floppy in infants and small toddlers, which is why Miller straight blades are preferred since they directly lift the epiglottis out of the way.
- Oxygen consumption in small children is twice as high as for adults, resulting in smaller physiologic reserves, and the tendency to rapid oxygen desaturation when compared to adults.

3. BVM management of pediatric patients:

- BVMs used in pediatric airway management should have a “pop-off” valve that can be disabled, allowing higher ventilation pressures when required by narrowing of the pediatric airway.
- Always use an OPA when ventilating small kids with a BVM to help displace the large tongue.
- Children can generally be easily ventilated with a BVM, but gastric distention is common. Place a gastric tube after a pediatric patient is intubated.

4. ET Intubation, RSI and Rescue Airways:

- Use length-based tapes to select appropriate pediatric equipment and drug doses.
- In small children, there is a tendency to insert the ET tube too far, usually in the right mainstem. Use a length-based resuscitation tape or use the formula of 3 x the diameter of the tube = the number at the lips (i.e. a 4.0 mm tube x 3 = 12 cm at the lips).
- Accidental extubation occurs frequently with pediatric tubes, so consider using a c-collar and tape to immobilize a child’s head and keep the ET tube from being dislodged.
- Pediatric King LT airways are available and may be useful for toddlers and school age children.
- Needle cricothyrotomy is indicated for kids up to age 8 or 10. Connect a 14 ga IV catheter to a 5 or 10 ml syringe, at insert at the cricoid membrane, aspirating air to confirm placement. A 3.0 ET adapter is then attached to the 14 ga catheter, and attached to a BVM. It will be harder than normal to squeeze, but clinically significant hypercarbia takes up to an hour to develop.

B. GERIATRIC PATIENT AIRWAY MANAGEMENT

1. General Overview:

- Advanced age can impact critical airway decision-making in three areas:
  - Elderly patients have diminished respiratory reserves
  - Elderly patients have a high incidence of difficult airway resulting from poor mouth opening, missing teeth and reduced cervical range of motion.
  - Ethical considerations regarding patient wishes for advanced interventions.

2. **Clinical Considerations:**
   - Cormorbid illnesses (heart disease, COPD, CHF, etc.) generally result in worse patient outcome.
   - Hypoxic elderly patients desaturate quickly, therefore earlier intubation should be considered.
   - Elderly patients are more likely to have a "difficult airway" because of impairments causing decreased neck mobility and mouth opening. Look for difficult ET intubation and BVM airway markers such as: poor mouth opening, absent teeth or dentures, and kyphosis of the spine.
   - Remember to consider use of alternative devices such as CPAP.

3. **Tips and Techniques:**
   - Two-person BVM ventilation may be required due to difficulties getting mask seals.
   - Well-fitting dentures should be left in place during BVM ventilation and then removed for intubation
   - Pre-oxygenation is crucial—place patient (if possible) in 20 degree head-up position and use apneic oxygenation.
   - Reduced lung compliance and chest wall stiffness may make BVM ventilation difficult.
   - Be gentle when intubating—the majority of dental injuries and significant soft tissue injuries and perforations occur in elderly patients.
   - Etomidate is the preferred sedation agent in older patients because of its hemodynamic stability.

C. TRAUMA PATIENT AIRWAY MANAGEMENT:

1. **General Overview:**
   - All intubations performed on trauma patients should be initially considered at least potentially difficult. The presence of multiple severe injuries needing treatment can be distracting to rescuers and create information overload.
   - Paramedics must check inside the patient's mouth and look at external markers for difficult airway assessment. Facial trauma, injury to the anterior neck, facial burns or airway swelling from smoke inhalation may increase the difficulty of the intubation, especially if we need to maintain in-line c-spine stabilization.

2. **Clinical Considerations:**
   - Critically injured blunt trauma patients have cervical spine trauma until proven otherwise.
   - While trauma patients may present with airway challenges, in most cases, RSI is still the best choice for intubating these patients, provided the operator is confident about her abilities to manage the airway with a BVM, supraglottic airway or surgical airway.
   - Elevated ICP in traumatic brain injury (TBI) is not generally viewed as a contraindication for the use of short-acting succinylcholine. Any transient rise in ICP during intubation is seen by many airway experts as having limited clinical impact. Our Pierce County Patient Care Protocols state "use with caution in patients with possible increased ICP."

3. **Tips and Techniques:**
   - If RSI is used have a Plan B airway and a Plan C (cricothyrotomy kit) ready for use.
   - For potential traumatic brain injury (TBI) patients without signs of increasing intracranial pressure (ICP), maintain ETCO2 at 35-40 mm Hg. If the patient is showing signs of increasing ICP, use increased ventilation rate to lower ETCO2 to between 30-35 mm Hg. *(2012 standards—may change)*
   - Before intubating a spinally-immobilized patient, be sure to release the front section of the c-collar, and resume manual in-line spinal stabilization. The chin section of the collar may make it difficult to fully open the mouth and move the mandible to optimize vocal cord visualization.
   - Don't delay intubation of patients who have significant upper airway injury, or smoke inhalation, as their clinical conditions may deteriorate, while intubating conditions significantly worsen.

D. BARIATRIC PATIENTS

1. General Overview:

- Carefully assess the obese patient, by checking inside the mouth, and looking externally at markers for possible difficult airway status. Some will have multiple indicators for difficult airway, while others may not. However, all morbidly obese patients will present with clinical challenges.
- The main impact on airway management are rapid oxygen desaturation time, difficult BVM ventilation due to increased risk of anatomical obstructions and increased resistance to bagging due to increased weight of the chest.

2. Clinical Considerations:

- As discussed earlier, proper positioning of the patient is crucial for "first pass" intubation success. The sternal notch should be level with the opening of the ear when viewed from the patient's side. This position will improve intubation success, but can also prolong the time to O2 desaturation.

3. Tips and Techniques:

- Always try to use two-person BVM ventilation on bariatric patients to ensure good mask seal and improve ventilation, and place the patient in a 20 degree head-elevated position, when possible.
- Consider use of a gum bougie device to help pass an ET tube.
- Even if intubated, consider transporting the patients in a "reverse Trendelenburg" position, which will make it easier to ventilate the patient with a BVM or through an ET tube.
- When using Versed, etomidate and succinycholine for RSI in an obese patient, the drugs should be dosed at the patient's actual weight instead of "ideal body weight".
- Cricothyrotomy may be very difficult in an obese patient due to problems in identifying landmarks.

E. PREGNANT PATIENTS

1. General Overview:

- Late term pregnancy presents unique challenges in airway management. In fact, airway management failure rates remain ten times higher in women in labor, than in age-matched non-pregnant women.
- As always, perform a structured assessment of the patient, by checking inside the mouth, and looking externally at markers for possible difficult airway status.
- A major consideration in airway management is the rapid oxygen desaturation of the pregnant patient due to decreased functional residual capacity and increased metabolic demands including oxygen demands of the fetus.
- Gastric sphincter tone is decreased during pregnancy resulting in increase chances of regurgitation and aspiration.

2. Clinical Considerations:

- Weight gain, edema, and displacement of abdominal structures can all effect laryngoscopy and BVM ventilation of the late term pregnant patient. Additionally, a patient lying in a supine position may cause acute hypotension if the fetus is pressing on the vena cava.
- While administration of RSI drugs may cause some concern, the general rule of thumb is "if it benefits the mother in the acute setting, it will ultimately benefit the fetus".

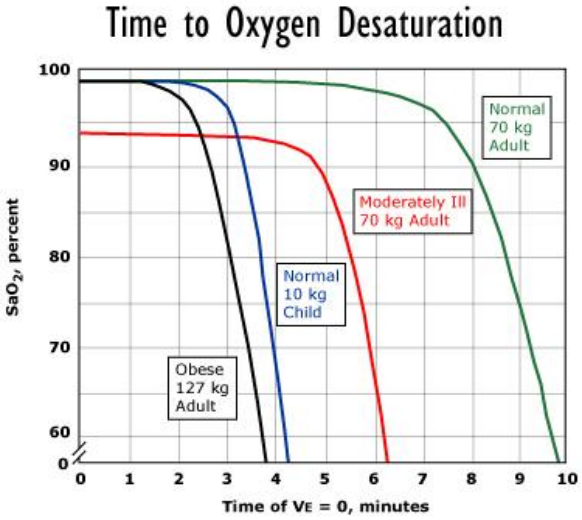
3. Tips and Techniques:

- If patient assessment indicates that RSI is a reasonable choice, be sure to have your backup alternative "rescue" airways ready for use.
- Always try to use two-person BVM ventilation with pregnant patients to ensure good mask seal and improve ventilation and oxygenation prior to intubation.
- Anticipate a rapid rate of oxygen desaturation—consider apneic oxygenation.
- Though there is little evidence supporting the Sellick's maneuver for prevention of aspiration, it is often used with BVM ventilation of pregnant patients because of their increased risk of aspiration.
- Head positioning of the pregnant patient is critical. Place padding behind the head and avoid hyperxtension as it may worsen the view of the glottic opening.
- Supraglottic airway edema is a common cause of intubation failure in the pregnant patient, so a smaller 6.5 to 7.0 mm ET tube may be required.

XI. Ten Tips for Best Practices In Emergency Airway Management:

TIP #1:
Patients don't die because they're not intubated—they die because they are not effectively ventilated or oxygenated.

- It's about airway ***management***—not necessarily intubation!
- The time to desaturate from a 90% SpO2 level to 0% is dramatically less than the time to get from 100% to 90%. It's like falling off a cliff.



Mean time to recovery of twitch height from 1 mg/kg succinylcholine IV

SaO_2, percent	10	50	90
Time of VE = 0, minutes	6.8	8.5	10.2

TIP #2:
Mastery of the BVM is critical for EMS providers.

- Two person BVM operation is better than single-rescuer use.
- BVM ventilation provides time for emergency airway management.

TIP #3:
Develop your own personal airway algorithm

- Incorporate the techniques and equipment that you are comfortable using.

TIP #4:
Once decision is made to intubate, prepare and set-up your Plan A and a Plan B for the airway.

- Check ALL necessary equipment for your Plan A and Plan B while pre-oxygenating the patient.
- Have everything you need within three feet of you—otherwise it might as well be on Mars.

TIP #5:
Our goal is FIRST PASS success!

- **Don't rush it—do everything you can to prepare things in your favor**.
- Have an airway partner to assist with positioning the patient, performing the "Fish Hook" and bimanual pressure techniques, and calling out SpO2 levels when they start to fall.

TIP #6:
Keep your patient's from experiencing oxygen desaturation with two simple techniques:

- Position your patients—particularly obese, geriatric—with a 20 degree elevated position to extend time to desaturation.
- Consider use of "apneic oxygenation" via nasal cannula at 5 to 15 L/min of O2 while intubating patient.

TIP #7:
Use full RSI—not just sedation—to create best conditions for you need to relax the patient—don't just sedate the patient—use full RSI.

- Using the combination of a sedative and a paralytic provides better relaxation of the patient, better visualization of the cords, and fewer complications, such as aspiration, than using sedation only.

TIP #8:
When starting first attempt to intubate, have laryngoscope in left hand and suction in your right

- Go slow, clean up the airway to make sure the "coast is clear" and no problems are seen.

TIP #9:
Can't intubate, can't ventilate (CICV) = emergency cricothyrotomy in most cases!

- While prepping your surgical airway kit you can try to insert one supraglottic airway.

TIP #10:
Remember Murphy lives here—always be prepared for things to go wrong—have a Plan B

XII. AIRWAY PERFORMANCE DOCUMENTATION AND CQI ANALYSIS

All course participants are required to complete airway documentation on medical incident reports, and as directed by Pierce County EMS for quality improvement monitoring of EMS advanced airway clinical performance.

Each time you are the lead in providing emergency airway management for a patient, please ensure that you complete all required airway documentation, with as much specificity as possible. We want to be able to demonstrate the quality emergency airway management being delivered by Pierce County paramedics.

XIII. CONCLUSION

Emergency airway management requires the mastery of technical skills, critical decision-making processes and sound clinical judgment. As an experienced paramedic, the PC EMS Paramedic Airway Management Course should provide you with a comprehensive review of airway management procedures. As professionals we continuously update our clinical knowledge base, technical skills, clinical judgment and develop the confidence to act decisively when indicated. Please take the time to keep practicing these vital, lifesaving skills.

We are focusing on airway management in this class—which does not necessarily involve endotracheal intubation. When we make the decision to intubate a patient our focus is on preparing for, and achieving "first pass" laryngoscopy success. This will be a key performance benchmark for Pierce County EMS providers. Healthcare quality is the application of a "best practice" model for emergency airway management that optimizes success and minimizes patient complications.

Thank you, in advance for your commitment to improving the quality of care we deliver to our patients.

The Pierce County EMS Paramedic Airway Course Committee

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