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.

This course focuses on critical thinking and decision-making skills in airway management. Small group practice will focus on difficult and failed airway management, utilization of RSI, rescue and surgical airways & pediatric airway management. This class satisfies the ET tube requirements for Pierce County paramedics who have completed a minimum of one paramedic recertification.

Paramedics must review the course handouts and complete the course pre-test before the start of the class. Pre-test questions are based upon information in the current Pierce County Protocol Book, associated AHA Handbook and the pre-course handouts.

In addition to bringing the course notebook to class, please bring your copy of the Pierce County Protocol Book.
Pierce County EMS
Paramedic Airway Management Class Schedule

07:30-08:00  Registration / Initial Airway Management Skills Assessment
08:00-09:30  Lecture

**09:30-09:45  Break**

**Teaching/Skills Station**

<table>
<thead>
<tr>
<th>Time</th>
<th>Rotation I:</th>
<th>Rotation II:</th>
<th>Rotation III:</th>
<th>Rotation IV:</th>
</tr>
</thead>
<tbody>
<tr>
<td>09:45-10:30</td>
<td>Teaching/Skills Station 1: ET Intubation &amp; RSI</td>
<td>Teaching/Skills Station 2: Difficult Airway Mgmt.</td>
<td>Teaching/Skills Station 3: Surgical Airway</td>
<td>Teaching/Skills Station 4: Pediatric Airway Mgmt</td>
</tr>
<tr>
<td>10:30-11:10</td>
<td>Difficult Airway Management</td>
<td>Surgical Airway Management</td>
<td>Pediatric Airway Management</td>
<td>ET Intubation &amp; RSI</td>
</tr>
<tr>
<td>11:10-11:50</td>
<td>Surgical Airway Management</td>
<td>Pediatric Airway Management</td>
<td>ET Intubation &amp; RSI</td>
<td>Difficulty Airway Management</td>
</tr>
<tr>
<td>11:50-12:30</td>
<td>Pediatric Airway Management</td>
<td>ET Intubation &amp; RSI</td>
<td>Difficulty Airway Management</td>
<td>Surgical Airway Management</td>
</tr>
</tbody>
</table>

**12:30-13:15  Lunch**

13:15-13:30  Review Pre-test

**Testing Stations**

<table>
<thead>
<tr>
<th>Time</th>
<th>Rotation I:</th>
<th>Rotation II:</th>
<th>Rotation III:</th>
<th>Rotation IV:</th>
</tr>
</thead>
<tbody>
<tr>
<td>14:15-14:55</td>
<td>Adult Megacode Scenarios</td>
<td>Pedi Megacode Scenarios</td>
<td>Critical Decision-Making</td>
<td>Written Exam &amp; Review</td>
</tr>
<tr>
<td>15:35-16:05</td>
<td>Critical Decision-Making</td>
<td>Written Exam &amp; Review</td>
<td>Adult Megacode Scenarios</td>
<td>Pedi Megacode Scenarios</td>
</tr>
</tbody>
</table>

16:05-16:20  Review and Student Course Evaluations
16:25  Remediation and Retesting

**Skill Station Matrix**


<table>
<thead>
<tr>
<th>Teaching Stations</th>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
<th>Group D</th>
</tr>
</thead>
<tbody>
<tr>
<td>09:45-10:30</td>
<td>ET Intubation &amp; RSI</td>
<td>Difficult Airway Management</td>
<td>Surgical Airway Management</td>
<td>Pediatric Airway Management</td>
</tr>
<tr>
<td>10:30-11:10</td>
<td>Difficult Airway Management</td>
<td>Surgical Airway Management</td>
<td>Pediatric Airway Management</td>
<td>ET Intubation &amp; RSI</td>
</tr>
<tr>
<td>11:10-11:50</td>
<td>Surgical Airway Management</td>
<td>Pediatric Airway Management</td>
<td>ET Intubation &amp; RSI</td>
<td>Difficulty Airway Management</td>
</tr>
<tr>
<td>11:50-12:30</td>
<td>Pediatric Airway Management</td>
<td>ET Intubation &amp; RSI</td>
<td>Difficulty Airway Management</td>
<td>Surgical Airway Management</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Testing Stations</th>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
<th>Group D</th>
</tr>
</thead>
<tbody>
<tr>
<td>13:30-14:15</td>
<td>Written Exam &amp; Review</td>
<td>Adult Megacode Scenarios</td>
<td>Pedi Megacode Scenarios</td>
<td>Critical Decision-Making</td>
</tr>
<tr>
<td>14:15-14:55</td>
<td>Adult Megacode Scenarios</td>
<td>Pedi Megacode Scenarios</td>
<td>Critical Decision-Making</td>
<td>Written Exam &amp; Review</td>
</tr>
<tr>
<td>15:35</td>
<td>Critical Decision-Making</td>
<td>Written Exam &amp; Review</td>
<td>Adult Megacode Scenarios</td>
<td>Pedi Megacode Scenarios</td>
</tr>
</tbody>
</table>

**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 in a given situation, as well as evaluating whether the intubation is successful, are much more difficult.**
Pierce County EMS
Paramedic Airway Course
# Pierce County EMS
## Paramedic Airway Management Course

### Table of Contents

I. Acknowledgements .................................................................................................................. 3

II. Course Purpose and Description ............................................................................................ 4

III. Background .............................................................................................................................. 5

IV. Assessing the Need for Emergency Airway Management ......................................................... 6

V. Effective Use of the Bag-Valve Mask .......................................................................................... 7

VI. Endotracheal Intubation—Preparing for First Pass Success ...................................................... 8

VII. RSI & Endotracheal Intubation ............................................................................................. 11

VIII. Confirming, Securing and Monitoring Airway Placement .................................................... 14

IX. Use of Alternative “Rescue Airways” ....................................................................................... 15

X. Surgical Airways ..................................................................................................................... 16

XI Emergency Airway Management in Special Populations: ....................................................... 16

   A. Pediatric Patient Airway Management
   B. Geriatric Patient Airway Management
   C. Trauma Patient Airway Management
   D. Bariatric Patient Airway Management
   E. Pregnant Patient Airway Management

XII. Best Practices in EMS Emergency Airway Management ....................................................... 19

XIII. Airway Performance Documentation and CQI Analysis ....................................................... 20

XIV. Conclusion .......................................................................................................................... 21
I. ACKNOWLEDGEMENTS

The Pierce County EMS Paramedic Airway Management Committee acknowledges and appreciates the assistance provided by all of the individuals and agencies that supported this program. Their support and guidance helped make this program possible.

Special thanks to:

A. The Washington Department of Health, Office of EMS and Trauma Services for providing grant funding which allowed the purchase of manikins and equipment needed for this educational project.

B. Mr. Dane Kessler, Education and Training Specialist, Office of EMS and Trauma Services, for assisting with the development of this curriculum.

C. The Pierce County EMS Office, including the support and guidance of Dr. Clark Waffle, Medical Program Director; Norma Pancake, Pierce County EMS Coordinator; and Ms. Bobby Schultz, Office Assistant.

D. The Pierce County Fire Chiefs Association for their support of the program and for providing logistical and administrative support.

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.

A. 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.

B. At the end of this course, participants will be able to:

1. Perform an efficient, logical assessment of each patient’s airway and ventilation status.
2. Accurately identify which patients need advanced airway management.
3. Demonstrate critical-thinking skills in assessing the patient requiring emergency airway management.
4. Assess a patient for signs of possible difficult airway situation.
5. Demonstrate the ability to effectively and consistently manage the airway and ventilation of the patient, regardless of airway difficulty.
7. Discuss the indications and contraindications for use of RSI and correctly demonstrate procedures for safely utilizing RSI.
8. Perform actions necessary to maximize opportunities for “first-pass success” in an endotracheal intubation.
9. Recognize when rescue airway techniques or devices are required salvage a failed airway.
10. Discuss and demonstrate “best practices” in emergency airway management for special patient populations, including trauma, pediatric, bariatric and pregnant patients.

C. Paramedics must review the pre-course handouts and complete the course pre-test before the start of the class.

1. Pre-test questions will be based upon information in the current Pierce County Protocol Book, associated AHA handbook, and pre-course handouts.
2. Questions on the post-test will come from the same materials along with lecture and small group presentations provided during the course.

D. 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, are much more successful.

--Anonymous
III. BACKGROUND

A. 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.

1. 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 was increased concern over complication rates in EMS airway management. These complications include unrecognized esophageal intubations, inadvertent hyperventilation of patients and worsened hypoxia during intubation attempts.

2. Over the last several years 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. A summary of several clinical studies is located in the appendices of this review manual.

   a. 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 be the contributing factors here.

   b. 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.

   c. 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.

3. There may be multiple factors contributing to perceived problems of out-of-hospital endotracheal intubation and airway management.

   a. The EMS environment is often uncontrolled and stressful. Decisions must be made quickly, often without complete information. This environment is “prone to error”.

   b. Inadequate training and lack of experience. 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 prior to 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 paramedics average only 1.3 ET intubations per year. This creates ongoing concerns over degradation of skills and critical decision-making abilities.

   c. 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. Many EMS systems have increased the number of ALS providers, diluting intubation opportunities for individual paramedics. At the same time, increased use of LMA’s 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 that 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 even 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.

A. When does a patient need to be intubated?

1. Failure of airway maintenance or protection.
   a. If there is a need to manually open the airway, is there a need to secure it? As a general rule, any patient who requires the establishment of an airway with oral or nasal airway will also require airway maintenance or protection with an ET tube or other airway.
   b. 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.
   a. Intubation is indicated if the patient is unable to be adequately ventilated, or 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.
   a. 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, and trauma to the neck or anticipated progression of their injury or illness.

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 a BVM, to manage the patient 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. Watch out for the technological imperative. Just because we have a device or tool, does not mean that we have to use it.
5. Look for external markers for difficult airways. Is there a potential that this could be a *can’t intubate -- can’t ventilate* patient or will I be able to manage this patient with a BVM or alternative airway.
6. Once the decision is made that you need to secure the airway, be decisive and plan for success.
V. EFFECTIVE USE OF THE BAG-VALVE MASK

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.
2. **Selecting the right bag and mask for the patient**.
3. **Obtaining the appropriate seal** by detaching the mask, sealing it over the face, and pulling the mandible up into the mask. 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 the patient 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 to prevent aspiration should be considered, but its effectiveness is largely unproven. It’s only benefit is in preventing passive regurgitation.]
5. **Providing slow, low pressure ventilations for all 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. (*Anesthesiology* 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.
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

1. 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 endotracheal 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. In a 2004 study by Mort, analyzed complications associated with 2,833 emergency airways. Hypoxemia associated with one to four intubation attempts increased as follows: 4.8%, 33.1%, 62%, and 85%. The incidence of aspiration increased from 0.3% with one ET intubation attempt to 13% with three or more attempts. Incidents of bradycardia and cardiac arrest climbed alarmingly with repeated attempts.

B. Assessing for the Potential Difficult Airway

1. Assessment and prediction of the “difficult airway” has limited value in the EMS environment. Anesthesiologists routinely assess the patient’s mouth, neck and jaw before elective intubations in the OR. But these tests are dependent upon the patient’s cooperation, something usually lacking in patients we are trying to intubate in the field. (Levitan). Basic difficult airway screening tests cannot 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.

2. 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.

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

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

<table>
<thead>
<tr>
<th>Markers for Difficult BVM Ventilation</th>
<th>Markers for Difficult ET Intubation</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Loss of teeth or dentures</td>
<td>• Immobilized neck</td>
</tr>
<tr>
<td>• Obesity</td>
<td>• Obesity</td>
</tr>
<tr>
<td>• Snoring</td>
<td>• Short, thick neck</td>
</tr>
<tr>
<td>• Beard</td>
<td>• Receding mandible (chin)</td>
</tr>
<tr>
<td>• Age &gt; 55</td>
<td>• Prominent incisors</td>
</tr>
<tr>
<td>• Abnormal facial structures</td>
<td>• Facial or neck trauma</td>
</tr>
<tr>
<td>• Face or neck trauma</td>
<td>• Large tongue</td>
</tr>
<tr>
<td>• Reactive airway disease</td>
<td></td>
</tr>
</tbody>
</table>
C. Preparing to intubate the patient.

1. 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.

   a. Properly position the patient—and the rescuer(s) for both BVM ventilation and intubation.
   
   b. 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, improving the intubating sight-lines for most patients.
   
   c. Most patients will require 8 to 10 cm 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, bringing them up to a semi-fowlers position.

2. Ensure that the patient’s airway and ventilations are being adequately managed.

   a. Ensure that the upper airway is patent, utilizing an oral or nasal airway.
   
   b. Use two-person BVM technique whenever possible. Air should pass quietly and easily from the bag to the patient.
   
   c. Ensure the correct RATE and DEPTH of ventilation—too much of a good thing is not a good thing at all.

3. Prepare your equipment for intubation.

   a. Get an airway partner—someone to assist with the procedure.
   
   b. Check and prepare your equipment, including suction, stethoscope, laryngoscope and blades.
   
   c. Ensure that your waveform ETCO2 adapter is plugged in and working (2nd choice is Easy-Cap).
   
   d. Use a stylet to shape ET tube. Goal is to form ET tube into “hockey stick” shape with a 25% - 35% angle at the distal cuff, which will minimize loss of view of the vocal cords during insertion.
   
   e. Set up appropriate “Plan B” alternative “rescue” airway such as a King LT or CombiTube.
   
   f. Keep equipment, particularly the ET tube, clean to minimize substantial risk of infection.

D. Intubation techniques to assist with “First Pass Success”.

1. Go slow and maximize your first pass success. Don’t hurry your first attempt. There is no rush if your crew is adequately managing the patient’s airway with a good jaw lift, OPA and BVM ventilation.

2. Reconfirm positioning of the patient for ET intubation. The ear-to-sternal notch should be parallel to the surface where the patient is lying.

3. Use External Laryngeal Manipulation (ELM), also known as “bimanual 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. During ELM, the person intubating uses their right hand to manipulate the cricoid membrane, and once the desired view of the cords and opening sight is obtained, the assistant takes over holding cricoid pressure.

4. 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.

5. 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, and being handed the tube.
6. **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% in reality. Break off the intubation attempt and manually ventilate the patient. Your partner should call out SpO2 levels and heart rates during the intubation attempt.

7. **If first intubation attempt fails—do something different.**
   a. Review what just happened—do you need another plan?
   b. Try something different—adjust the patient’s head, try a different blade, consider using an ET tube introducer.

E. **Common mistakes and problems with ET intubation:**
   1. Sliding the ET tube down flange of 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 hyperventilating intubated patients—leading to worsening mortality in cardiac arrest and traumatic brain injury patients.

F. **How many ET intubation attempts should take place before we switch to Plan B?**
   1. Consider “three and out” rule.
      a. First paramedic makes two attempts at intubation.
      b. 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.
      c. 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. While ET intubation continues to be the “gold standard” in emergency airway management, it is not the only standard. The “standard” is an airway that is controlled and the patient well ventilated and oxygenated.

**PEARL:**
Remember patients don’t die from failing to be intubated—they die from a failure from being adequately ventilated and oxygenated.
VII. RSI & ENDOTRACHEAL INTUBATION

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

B. RSI is not necessary in patients who are unresponsive, flaccid and lack gag reflexes, as in a cardiac arrest, or near-arrest. Many airway experts advise using RSI on virtually all patients except the “newly dead and nearly dead” to create optimal intubating conditions. However, even these experts state that exceptions to this clinical rule would include cases such as an alcohol and Valium overdose patient with a GCS of 3.

C. Determining whether the patient needs RSI is best ascertained by an overall assessment of the patient. The larynx is heavily innervated and laryngeal reflexes are among the last protective reflexes to go as a patient deteriorates. Signs that the patient may tolerate insertion of a laryngoscope blade without response include: flaccidity, easy jaw opening, no response to painful stimuli or signs of airway obstruction, such as snoring respirations, poor air exchange and tolerance of an oral airway. Don’t test for a gag reflex, since it may induce vomiting. Instead—try to intubate with suction in hand.

D. The significance of the decision to use RSI cannot be overstated. RSI take away the patient’s respiratory drive and abolish all protective laryngeal reflexes.

1. Once RSI is accomplished, you must either successfully intubate the patient or use an alternative airway or BVM ventilation to ensure adequate oxygenation and ventilation. This must be accomplished while preventing complications such as hypoxic event, which can dramatically increase mortality, or aspiration.

2. You will also 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.

3. Many of the “induction” or sedative agents used in RSI, such as Midazolam, may lower blood pressures in already hemodynamically-comprised 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 Emerg Med 2003; 42: 721-728 Incidence of transient hypoxia and pulse rate reactivity during paramedic rapid sequence intubation

E. Does sedation-assisted intubation work as effectively as RSI?

1. Various airway experts and authors, such as Dr. Levitan 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 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 techniques and controversies.

1. For ethical reasons, be sure to give the sedation agent first, followed by the paralyzing agent.

2. Choice of sedation agents:
   a. Etomidate is increasingly viewed by airway experts as the “sedation” agent of choice for use during intubation, particular in critically ill or injured patients.
   b. Benzodiazepines, such as Versed and Valium can be effectively used after intubation for their sedative/hypnotic effects.

<table>
<thead>
<tr>
<th>Etomidate</th>
<th>Advantages:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Rapid onset, short duration of action</td>
</tr>
<tr>
<td></td>
<td>• Similar profile to that of Succinycholine</td>
</tr>
<tr>
<td></td>
<td>• Limited hemodynamic impact</td>
</tr>
<tr>
<td></td>
<td>• Cerebroprotective (decreases ICP)</td>
</tr>
<tr>
<td>Disadvantages:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Can only be given once</td>
</tr>
<tr>
<td></td>
<td>• Controversy over adrenal suppression (no significance shown with single Etomidate dose)</td>
</tr>
<tr>
<td>Dose:</td>
<td>0.3 mg/kg (20 mg IV)</td>
</tr>
<tr>
<td></td>
<td>• Based on total body weight</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Midazolam</th>
<th>Advantages:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Amnestic, brief acting</td>
</tr>
<tr>
<td></td>
<td>• Anticonvulsant</td>
</tr>
<tr>
<td>Disadvantages:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Slower onset of action—up to two full minutes</td>
</tr>
<tr>
<td></td>
<td>• Can cause cardiovascular depression</td>
</tr>
<tr>
<td>Dose:</td>
<td>4-5 mg IV for intubation</td>
</tr>
<tr>
<td></td>
<td>• Dose may be lowered for critical patients</td>
</tr>
<tr>
<td></td>
<td>• Post-intubation doses typically in 2 mg increments</td>
</tr>
</tbody>
</table>

3. Choice of paralytics:
   a. Succinylcholine remains the paralytic of choice due to its rapid onset and relatively brief duration of action.
   b. Contraindications for use of Succinylcholine are relatively rare. **A personal or family history of malignant hyperthermia is an absolute contraindication to the use of Succinylcholine.** Other contraindications include patients at risk for SUX induced hyperkalemia, including patients with burns more than 24 hours old, post-crush injury patients, or other patients with suspected pre-existing hyperkalemia.
   c. The recommended dose for Succinylcholine is 1.5 mg/kg, 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.
   d. Vecuronium, a non-depolarizing paralyzing agent, can be used for initial RSI if Succinylcholine is contraindicated. Recognize, however, that without the use of a “priming dose” that it may take up to two minutes for full paralysis. Most commonly, however, Vecuronium is used for maintenance of post-intubation paralysis. **Remember—that if you are administering Vecuronium to a patient to maintain paralysis—you will probably need to give additional sedation for the patient.**

---

**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?

   a. 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 2008 Pierce County EMS Patient Care Protocols modified the recommendation for use of Lidocaine to a “consider” recommendation for use in reactive airway and increased ICP patients.

   b. Atropine use as a pre-treatment drug, to prevent Succinylcholine-induced bradycardias for pediatric patients under age 8 is increasingly controversial. However, our 2008 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.

   c. The use of defasciculating doses of Vecuronium to limit the increase in ICP caused by Succinylcholine 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-

5. Ensure that RSI patients are pre-oxygenated.

   a. The goal is to maximize SpO2 levels, creating time for intubation to take place. In the OR, 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.

   b. Unfortunately, most EMS patients need BVM ventilation to support their oxygenation.

   c. 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.

6. Review the 7 P’s for RSI in the Pierce County EMS Patient Care 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 Combitube 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.

---

**PEARL:**
The time to desaturate from 90% to 0% is dramatically less than the time to desaturate from 100% to 90%!
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 ETCO2 was not utilized as technical device for confirming tube placement.

A. Initial confirmation of ET tube placement.

1. Confirmation devices:
   a. The “gold standard” for confirming ET tube placement in the field is through use of 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.
   b. The Color Metric (Easy Cap) device is only useful and accurate in perfusing patients.
   c. The Esophageal Detection Device (EDD) is fairly accurate in detecting misplaced tubes. There are two types of EDDs, the syringe device and bulb device. According to Walls, the bulb EDD is more sensitive. However, according to the manufacturer, neither device will work well if a patient was ventilated prior to ET intubation. That’s a problem.

2. Clinical methods for confirming tube placement—all of which can be unreliable:
   a. Direct visualization of the tube passing through the vocal cords.
   b. Bilateral breath sounds, and absent abdominal sounds, by auscultation.
   c. Condensation or mist in the ET tube when ventilating the patient (which can occur with humidified fluids from the stomach).
   d. Bilateral chest rise.

3. Providers must use multiple methods for confirming tube placement, including at least one confirmation device.

B. Securing the ET tube and alternative airways:

1. Commercial ET tube holders are recommended for securing adult and pediatric airways.
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 rolling of the head which can move enough to pull the tube out of the trachea, particularly in younger pediatric patients.
4. Be careful to disconnect the BVM from an ET tube, when moving the patient in or out of a Medic unit. Never let the BVM drop while connected to the ET tube 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.

With the availability of wave-form capnography in Pierce County ALS transport units, positive confirmation of ET tube placement and continuous monitoring of placement should be the standard for patient care.
IX. USE OF ALTERNATIVE “RESCUE AIRWAYS”

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

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. There are very few patients who can not be adequately ventilated with a BVM. However, the BVM provides no protection from aspiration. Unless transport times are very short, rescuers should consider using alternative devices such as a King LT or CombiTube supraglottic 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 airways, such as the Combitube or King LT, include:
   a. Ease of placement—blind insertion with high percentages of successful insertion and ventilation.
   b. Simplified training to maintain competency.
   c. Provides some degree of protection from aspiration.
3. Disadvantages:
   a. Does not serve as a definitive airway.
   b. Can not insert devices if patients have a gag reflex.
   c. No small infant/toddler pediatric sizes available for CombiTube and King LT.

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 the tip of the posterior cartilage is visible.
2. To use the bougie, an operator works to obtain the best view possible of the larynx using a laryngoscope blade and using external laryngeal manipulation.
3. At that point, the paramedic 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 ET tube is then threaded over the bougie and slid down the device until it enters the trachea, and the bougie is withdrawn.
5. To confirm placement, some authors suggest that the laryngoscope be left in position viewing the larynx until the ET tube is placed.

C. Use of AirTraq and other video/optical intubation devices:

1. Alternative devices for facilitating intubation are already on the market, including the Air Traq device and the Glide Scope Ranger.
2. The exact role, and true capabilities, of these devices in EMS has yet to be determined.

Rescuers should ensure their proficiency in BVM ventilation and at least one alternative airway device as part of their personal “emergency airway management algorithm”
X. SURGICAL AIRWAYS

With the widespread use of RSI, and the advent of a number of supraglottic airways, 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 Seldinger technique cricothyromies. What studies have shown is the need for frequent skills repetition to maintain any proficiency in this seldom-used skill.

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

A. Indications for surgical airway use:
   
   1. Generally limited to “rash airways” in the “can’t intubate and can’t ventilate” scenario.

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

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

D. Open scalpel vs. Seldinger technique.

   1. Rapid 4-step surgical technique vs. traditional approach
   2. Seldinger airway over guide wire technique is often slow and problematic when seconds count, although some studies show that with practice, providers using the Seldinger technique actually were able to establish an airway more quickly than with the surgical technique.
   3. Bottom line – become proficient in some surgical techniques.
XI. EMERGENCY AIRWAY MANAGEMENT IN SPECIAL POPULATIONS

A. Pediatric Airway Management

1. General overview:
   a. Challenges include determining the correct age-related drug dosing, equipment requirements, and assessing for the anatomic variations in pediatric patients.
   b. General principles of airway management in children and adults are the same. However, there are some differences that need to be considered, particularly in infants and toddlers.
   c. Anatomic issues in pediatric airway management:
      i. Children obstruct more readily due to the small diameter of their airways.
      ii. The size of the tongue is large in proportion to the oral cavity, particularly in infants.
      iii. The glottic opening tends to be higher and more anterior in small children.

2. Clinical considerations:
   a. 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. Tips and techniques:
   a. 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.
   b. Always use an OPA when ventilating small kids with a BVM to help displace the large tongue.
   c. 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).
   d. 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.
   e. Use a length-based resuscitation tape to calculate pediatric drug doses and equipment needs.

B. Geriatric Patient Airway Management

1. General overview:
   a. Advanced age can impact critical airway decision-making in three areas:
      i. Elderly patients have diminished respiratory reserves.
      ii. Elderly patients have a high incidence of difficult airway resulting from poor mouth opening, missing teeth and reduced cervical range of motion.
      iii. Ethical considerations.

2. Clinical considerations:
   a. Hypoxic elderly patients desaturate quickly, therefore earlier intubation of these patients should be considered.
   b. Remember to consider use of alternative devices such as CPAP.

3. Tips and techniques:
   a. Two-person BVM ventilation may be required due to difficulties getting mask seals.
   b. Reduced lung compliance and chest wall stiffness may make BVM ventilation difficult.
   c. Well-fitting dentures should be left in place during BVM ventilation and then removed for intubation.
   d. Etomidate is the preferred sedation agent in older patients because of its hemodynamic stability.
C. Trauma Patient Airway Management

1. General overview:
   a. All intubations performed on trauma patients should be considered at least potentially difficult at the outset. The presence of multiple severe injuries needing treatment can be distracting to rescuers and create information overload.
   b. 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 cervical spine stabilization.

2. Clinical considerations:
   a. Critically injured blunt trauma patients have cervical spine trauma until proven otherwise.
   b. 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.
   c. Elevated ICP in traumatic brain injury is not a contraindication for the use of short-acting Succinylcholine.

3. Tips and techniques:
   a. Consider transporting immobilized patients in a position with the head of the board slightly elevated. This will help prevent passive regurgitation and aspiration, which can be a major concern in these patients. It also makes the patient more comfortable. With a slight “reverse Trendelenburg” position, patients will be able to breathe more easily, with the weight of the abdominal contents off of the diaphragm. It also fits in with Pierce County TBI protocols.
   b. 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.
   c. 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:
   a. Perform a structured assessment of the patient, by checking inside the mouth, and looking externally at markers for possible difficult airway status. Some obese patients may have multiple indicators for difficult airway, while others may not. However, all morbidly obese patients will present with clinical challenges.
   b. 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:
   a. 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:
   a. Always try to use two-person BVM ventilation on bariatric patients to ensure good mask seal and improve ventilation.
   b. Consider use of a gum bougie device to help pass an ET tube.
c. 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.

d. When using Versed, Etomidate and Succinylcholine for RSI in an obese patient, the drugs should be dosed at the patient’s actual weight instead of “ideal body weight”.

e. Cricothyrotomy may be extremely difficult in an obese patient due to difficulty in identifying landmarks.

E. Pregnant Patients

1. General overview:
   a. 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.
   b. As always, perform a structured assessment of the patient, by checking inside the mouth, and looking externally at markers for possible difficult airway status.
   c. 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.
   d. Gastric sphincter tone is decreased during pregnancy resulting in increased chances of regurgitation and aspiration.

2. Clinical considerations:
   a. Weight gain, edema, and displacement of abdominal structures can all affect laryngoscopy and BVM ventilation of the late term pregnant patient.
   b. 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:
   a. If patient assessment indicates that RSI is a reasonable choice, be sure to have your backup alternative “rescue” airways ready for use.
   b. Always try to use two-person BVM ventilation with pregnant patients to ensure good mask seal and improve ventilation and oxygenation prior to intubation.
   c. Anticipate a rapid rate of oxygen desaturation.
   d. Though there is little hard evidence supporting the Sellick’s maneuver for prevention of aspiration, it is widely used when ventilating pregnant patients with a BVM because of their increased risk of aspiration.
   e. Head positioning of the pregnant patient is critical. Place padding behind the head and avoid hyperextension as it may worsen the view of the glottic opening.
   f. 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. BEST PRACTICES IN EMS AIRWAY MANAGEMENT

A. PEARL #1: Our goal is FIRST PASS success!

1. Do everything you can to prepare things in your favor.
2. Don’t rush it! Old admonitions, such as holding your breath—when you need to breathe, the patient needs to breathe—predate the deployment of pulse oximetry.

B. PEARL #2: Don’t let your patients desaturate!

1. Remember: the time to desaturate from 90% to 0% is dramatically less than the time to desaturate from 100% to 90%!

C. PEARL #3: If you need to relax the patient—don’t just sedate the patient—use full RSI.

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

D. PEARL #4: You must master the BVM!

1. Two-person BVM technique is better than single-rescuer.

E. PEARL #5: Patients don’t die because they’re not intubated—they die because they are not effectively ventilated or oxygenated.

1. It’s about airway management—not necessarily intubation!

F. PEARL #6: Protect yourself—use appropriate PPE!

G. PEARL #7: Can’t intubate, can’t oxygenate (CICO) = emergency cricothyrotomy in most cases!

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

H. PEARL #8: Develop your own personal airway algorithm.

1. Incorporate the techniques and equipment that you are comfortable with using.

I. PEARL #9: Have everything you need within three feet of you—otherwise it might as well be on Mars.

1. Have suction at your side

J. PEARL #10: Remember Murphy lives here—always be prepared for things to go wrong—have a Plan B.
XIII. AIRWAY PERFORMANCE DOCUMENTATION AND CQI ANALYSIS

All course participants are required to complete a Pierce County Paramedic Airway Management form. These forms, provided to each participating ALS provider agency in the county, are available either electronically, or printed out and placed in your EMS units.

Each time you are the lead in providing emergency airway management for a patient, which includes the use of BVM ventilation or ALS airway attempts; you must complete one of these forms, and turn it in to your EMS supervisor or MSO.

For this pilot program, which is looking at alternative means of providing airway management training for paramedics, each participating agency is required to submit data on a quarterly basis to Dr. Waffle at the Pierce County EMS Office.

Your accurate and timely completion and submission of this paperwork is essential to the success of this pilot program.

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, and clinical judgment and develop the confidence to act decisively when indicated.

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*
BIBLIOGRAPHY / REFERENCES


Margolis, Gregg Airway Management Paramedic, Sudbury, Massachusetts, Jones and Bartlett, 2004


Walls, Ron and Murphy, Michael Manual of Emergency Airway Management, Lippincott, Williams and Wilkins, 2008
Ten Commandments of Airway Management

Simple lessons to guide oxygenation and ventilation

By COREY M. SLOVIS, MD, FACP, FACEP and KEVIN HIGH, RN, MPH, EMT

Nothing can be done to reverse hypoxic brain damage once it occurs. Because of this fact, maintaining an airway and ensuring adequate oxygenation supersedes everything other than scene safety. Each of us must have a well-planned algorithm to deal with both expected and unexpected problems we face when trying to stabilize a patient's airway. Similarly, once we've mastered the basic techniques of airway maintenance and ventilation, we should continue to stay current by learning newer concepts and treatments. The following "commandments" formalize a set of principles for airway management.

Commandment #1
*Oxygenation and ventilation are the top priorities.* There's an old medical adage that remains true: "Patients do not die or suffer brain damage because you cannot, or do not, intubate them; they die or suffer brain damage because you cannot, or do not, oxygenate and ventilate them.”

Care must center on oxygenation and ventilation. Becoming overly focused and developing tunnel vision during intubation attempts can ultimately lead to a disastrous end. Remember, the No. 1 priority is to oxygenate and ventilate the patient, not to place a device or perform a skill.¹ ²

Commandment #2
*Airway management does not mean intubation.* Airway management means just that — managing the patient's airway to ensure patency, provide adequate ventilation and maintain appropriate oxygenation. This should be done in the most prudent and expeditious way available.

Many times we focus on using advanced measures or procedures, forgetting that they're often useless, and perhaps detrimental, without the basics. Merely performing a chin lift or jaw thrust can open and/or salvage many airways. The proper use of basic airway adjuncts, such as oral and nasal airways, can convert a difficult-to-ventilate patient into a stable, well-ventilated one.

The appropriate administration of high-flow oxygen is enormously beneficial. However, patients in extremis continue to be treated with low-flow oxygen or have ventilation attempted with improperly sized or fitted masks. Even worse, some hypoxic patients receive no oxygen therapy at all while their caregivers try multiple medications rather than simply providing oxygen.

Understanding proper oxygen administration and the rationale behind it are paramount. We must never forget that airway management is a collection of skills and techniques, not just an attempt to place a tube or another device into the patient's mouth or trachea.³

Commandment #3
*Be an expert at bag-valve-mask (BVM) ventilation.* BVM ventilation is the most underrated — and perhaps most undermastered — EMS skill. Using properly fitting masks, using the correct size bag for your patient (an adult, a child or a neonate) and employing excellent technique are all imperative to good patient care. Proper technique involves lifting the mandible upward and using an oral airway (and/or a nasal airway) as an adjunct during BVM ventilation. Paying attention to the basics of this skill will make it maximally effective.⁴

Beware of using high bag volumes and pressures; both can cause gastric distention and increase the risk of regurgitation. The use of a nasogastric or an orogastric tube to decompress the stomach is optimal for the infant or child. Your system should consider use of nasogastric and orogastric tubes as airway adjuncts in the mask ventilation of pediatric patients.
Take advantage of clinical time in the operating room or any other opportunities you have to learn and master proper bagging techniques. Practice this skill, remembering that consistent airway basics are usually more helpful than occasional airway brilliance.

Finally, it's important to remember that two or three are better than one when it comes to BVM ventilation. Too many EMS providers feel embarrassed when they can't successfully bag a patient and prefer to let ineffective ventilations continue rather than ask for help.

A two- or three-person technique — with one provider maintaining a good mask seal, another provider bagging and a potential third individual providing cricoid pressure — is almost always more effective than one person trying to bag, maintain a good seal and not provide cricoid pressure.

**Commandment #4**

*Know your equipment.* Becoming an expert in BVM ventilation starts with knowing your equipment. Does your bag have a reservoir? Where's the pop-off valve? What special features does your bag have?

That daily check sheet is there for a reason. You must regularly check and maintain your airway supplies and equipment. Airway equipment is arguably the most important thing you carry, so why not maintain and check it every shift? Be vigilant. A good provider leaves nothing to chance.

Having backups (e.g., laryngoscope blades, bulbs and handles) and the ability to troubleshoot equipment are also important. To enhance your knowledge base, read the product inserts that accompany BVMs, airways and endotracheal (ET) tubes. Manufacturers also provide a lot of information on their Web sites and in other publications.

No new piece of equipment should be introduced into your system without proper training and follow-up. Know all your airway management equipment, and assume personal responsibility for its proper functioning.

**Commandment #5**

*Know at least one rescue ventilation technique.* Rescue ventilation can best be described as a ventilation attempt or technique to use in the face of a failed airway — a technique to use in the "can't-intubate/can't-ventilate" scenario.

The most basic rescue technique is two-person BVM ventilation. It should be tried immediately when you have difficulty ventilating a patient.

If multi-person ventilation isn't effective, at least two techniques should be considered — use of a blind insertion device, such as the CombiTube or King LT-D Airway, and use of the Laryngeal Mask Airway (LMA). These devices are easy to use, can be inserted quickly and safely, and can accomplish ventilation when previous airway attempts fail.5,6

The CombiTube allows for blind insertion in the most difficult of patients and situations and provides some protection against aspiration and higher airway pressures. Inexpensive, easy to learn and simple to master, the CombiTube or another blind insertion device should be in every provider's arsenal of equipment.

The LMA has found its way into the prehospital and emergency department (ED) settings. Its use as a rescue device has been well documented. It forms a seal around the laryngeal inlet and provides a pathway to ventilate the patient and some protection against aspiration. The ability to blindly insert this device and rapidly and effectively ventilate most patients makes it a great prehospital tool for difficult airways.
Few skills are as fast, low-tech and efficacious as these. The LMA and CombiTube can be used to provide ventilation in less than 20 seconds in the hands of airway experts. Similarly, medical personnel with no previous airway skills and a brief manikin demonstration of the devices could effectively provide ventilation with either device in less than 45 seconds. Speed, success and low complication rates make these rescue ventilation techniques the best choices in the prehospital or emergency setting.

**Commandment #6**

*Develop a personal airway algorithm.* Each provider should have an algorithm specific to their skill level and approved scope of practice. Not all patients and situations you encounter are going to be the same. Therefore, having only one or two skills in your repertoire constitutes a potentially dangerous, one-size-fits-all approach to airway management.

Everyone's algorithm should begin with the basics — sort of a "plain vanilla" approach. The basics taught in an American Heart Association Basic CPR course work great; begin there and then enhance your skills in a step-wise approach. Your algorithm should proceed from basic, less-invasive maneuvers to more advanced and potentially invasive techniques as indicated. Example: Start with BVM ventilation; advance to ET intubation; then place a blind esophageal device or use an LMA; and, finally, perform a needle cricothyrotomy.

Each provider must have a plan for a patient they can't intubate or ventilate. A can't-intubate/can't-ventilate scenario is a nightmare. When faced with a critically ill patient, each of us must have a carefully thought-out, step-by-step plan — one that was calmly devised and practiced, not one thought up at the spur of the moment in the middle of a panicked and potentially fatal situation.

**Commandment #7**

*Don't let your ego get in the way.* Hubris (exaggerated pride) can be dangerous for your patient, your partner or colleagues, and your career. Remember, your goal is proper patient care and a good outcome, not skill accumulation or personal success. The "Rule of 2" is a good one to live by: If you're unsuccessful at a skill, give your partner a chance after you've failed twice.

Similarly, if you're unsure about how or when to perform a skill, ask for assistance. Teamwork in EMS is essential, so don't be embarrassed about asking for help. Just be thankful when it arrives. Do the right thing, and don't let your pride get in the way.

**Commandment #8**

*Invest time in learning airway skills.* We all have a finite amount of time that we can use to keep our skills updated. Regularly devote training and practice time to airway management. Practice is important because, as time goes by, we often lose some of the finer points of airway management.

Try to not limit yourself to manikins. Work on gaining access to a local operating room or ED to practice and expand your skills. Contact the attending anesthesiologist or ED director, and explain your needs and goals. Many physicians and certified registered nurse anesthetists are happy to have someone accompany them for a day. During your time with these airway professionals, view airway anatomy and work on improving your BVM ventilation techniques in this controlled, well-lit environment.

Another way to maintain your airway skills is to read about the latest techniques and advances in airway management. The Internet is a great place to start. Here are a few well-organized and informative sites:

- [www.theairwaysite.com/home.html](http://www.theairwaysite.com/home.html)
Finally, if the above venues are unavailable or don’t meet your specific needs, you can attend a major EMS conference. Many sessions focus on advanced airway management and several offer hands-on training with simulators or cadavers.

**Commandment #9**

*Use an end-tidal CO2 (EtCO2) detector and/or esophageal detector device to confirm every intubation.*

For many years, the proper placement of an ET tube was thought to be best confirmed via the physical exam. The gold standard for confirming correct ET tube placement was thought to be observing the tube passing through the vocal cords, determining the presence of breath sounds over the chest, condensation in the ET tube and absence of breath sounds over the epigastrium. However, even with confirmation by all these signs, some patients are still esophageally intubated.⁸

Relying solely on a physical exam for ET tube confirmation is risking up to a 10% chance that the tube is in the wrong location. The physical exam is notoriously inaccurate and should not, by itself, be used to confirm ET tube placement.

If anesthesia personnel are required to use EtCO2 devices for patients they intubate, we should be required to use a confirmatory device, too. Remember that patients in the OR usually haven’t eaten for six to 12 hours, have been evaluated with a full history and physical exam before the intubation and are intubated in a calm, quiet, well-lit operating room. Our patients, however, have to be intubated in the worst of conditions and are usually encountered with food in their stomach or blood or emesis in their mouths. Prehospital intubations are usually performed in uncontrolled settings, such as on the side of the road, or in poorly lit environments, including the inside of partially collapsed vehicles. Therefore, it’s appropriate that we are required to use the same aids to confirm an intubation as the certified airway experts do. It’s shocking to see published rates for unrecognized esophageal intubations by EMS providers as high as one in four when EtCO2 detectors aren’t used.⁹

Another quick and easy way to confirm ET tube placement is with an esophageal detector device (EDD), which uses a syringe or bulb in an attempt to aspirate air from the trachea or esophagus.¹⁰ The rigid, cartilaginous trachea won't collapse around an ET tube, thus allowing the EDD to aspirate fully. If the tube is improperly placed in the esophagus, the soft tissue of the esophageal wall will collapse around the end of the tube, and little or no air can be aspirated by the EDD.

EDDs can be used in conjunction with the EtCO2 and should be mandatory in pulseless patients who don't have any detectable expired CO2. These devices are inexpensive, fast and simple to use. The use of one or both should be considered a standard of care for all intubations performed in any emergency setting.

**Commandment #10**

*When seconds count, don’t count on seconds.* Each airway maneuver or intubation attempt should be your best effort. Often, our best chance at getting a patient intubated or an airway placed is the first attempt. Maximize your chances by leaving nothing to chance. Carefully pre-oxygenate and appropriately position the patient, correctly position yourself, and then perform the procedure. Don’t give a second-best effort to any airway management skill.

Each maneuver or attempt at airway management should be the clinician's best effort, using optimal skills and judgment. Taking an extra few seconds to verify that everything is optimally positioned and prepared for the existing conditions often means the difference between success and failure.

**Summary**

Excellent clinicians have a solid knowledge base and use sound principles to guide their practice. Most of us work in dynamic and, at times, uncontrolled settings. To succeed, you must follow some established guidelines. As you grow in your chosen career, also continue to improve your airway knowledge and strive to follow these commandments. Hopefully, they'll empower you to maximize your skills, expand your knowledge base and enhance your problem-solving abilities.
Drug-assisted intubation (DAI) denotes the use of pharmacologic agents to facilitate endotracheal intubation (ETI). DAI encompasses rapid-sequence intubation (RSI— the use of neuromuscular blocking (NMB) with or without sedative agents to rapidly facilitate ETI) and sedation-facilitated intubation (the use of sedative or anesthetic induction agents to facilitate ETI), among other techniques. The general standards and principles articulated in this document apply to all forms of DAI.

### History of Prehospital RSI

Reports of paramedic ETI in the prehospital setting date to 1975. Endotracheal intubation of the awake or unrelaxed prehospital patient has been recognized as a difficult procedure because of the presence of intact protective airway reflexes. Sedation-facilitated intubation and nasotracheal intubation have been proposed for these patients in both prehospital and in-hospital settings but with mixed results.

“Rapid-sequence induction” was first described by Stept and Safar as a method for minimizing the risk of regurgitation and aspiration during the anesthetic induction of an operating room patient with a full stomach. Rapid-sequence intubation (RSI) evolved in Emergency Medicine as a concise version of the anesthesia technique, using neuromuscular blocking (NMB) agents to facilitate the rapid intubation of awake or inadequately relaxed patients during the course of emergency care. RSI has been used in the prehospital setting in the United States for almost 20 years. A survey in 1998 described prehospital NMB use in 29 of 50 states (58%), with the majority reserving the technique for air medical systems.

As a whole, these studies only support the feasibility of prehospital RSI; that is, whether RSI can be performed in the prehospital setting. These studies do not delineate the safety of the procedure (i.e., “Is the technique free of adverse events and errors?”), the effectiveness of the procedure (i.e., “What is the effect on patient survival and neurological outcome?”), or whether prehospital RSI can be implemented on a large scale. Of these studies, only a single case series has specifically described adverse events from prehospital RSI.

### Prior Scientific Data Describing Prehospital RSI

A range of studies describes prehospital RSI, citing success rates up to 100% and few reported complications. In the most notable series, Wayne and Friedland described 1,657 prehospital RSI uses by a ground paramedic service over a 20-year period.

While these studies suggest that prehospital RSI is “safe and effective,” it is important to recognize that they contain significant limitations:

- These findings originate from single, small EMS services and cannot be generalized to all EMS services.
- Most of these studies occurred on air medical services where personnel received specialized training.
- These studies focused on success rates as the primary outcome measure. Few studies have described the physiologic response, adverse events, errors or outcomes (mortality or neurological outcome) associated with prehospital RSI.

As a whole, these studies only support the feasibility of prehospital RSI; that is, whether RSI can be performed in the prehospital setting. These studies do not delineate the safety of the procedure (i.e., “Is the technique free of adverse events and errors?”), the effectiveness of the procedure (i.e., “What is the effect on patient survival and neurological outcome?”), or whether prehospital RSI can be implemented on a large scale. Of these studies, only a single case series has specifically described adverse events from prehospital RSI.
RSI originate from the San Diego Paramedic RSI Trial. This four-year effort evaluated the effectiveness of large-scale implementation of prehospital RSI among multiple ground and air-based paramedic services. The trial included patients with severe traumatic brain injury (TBI) and a Glasgow Coma Scale (GCS) ≤8 who could not be intubated using conventional orotracheal techniques. The protocol included pre-oxygenation, sedation using midazolam, paralysis using succinylcholine, and allowed a maximum of three ETI attempts (defined as insertion of the laryngoscope blade into the mouth). The Combitube (The Kendall Company, Mansfield, Massachusetts) was used as a rescue device. Rescuers used both qualitative and quantitative capnometry to confirm ET tube placement.

In the trial successful intubation was achieved in 84% of patients, with Combitube insertion successful in an additional 14%. A formal outcomes analysis used 3-to-1 historical non-intubated controls matched by age, gender, mechanism of injury, trauma center, Injury Severity Score (ISS), and Abbreviated Injury Scores (AIS) for each body system (Head, Face, Chest, Abdomen, Extremities, and Skin). Overall mortality was higher in the RSI cohort (31.8% vs. 23.7%; adjusted OR = 2.0; 95% CI 1.4, 2.8; p < 0.001), with a corresponding decrease in good neurological outcomes (46.0% vs. 55.4%; adjusted OR = 0.5; 95% CI 0.4, 0.8; p < 0.001).

The leaders of the trial attributed the results to two critical factors. First, data from downloaded continuous pulse-oximetry devices indicated a high incidence of oxygen desaturation during RSI. Many of these desaturations were associated with concurrent bradycardia. Of note, the paramedics did not appear to be aware of these occurrences, as the intubations were characterized as “easy” in most of these cases.

Secondly, high incidences of hyperventilation ($\text{ETCO}_2 < 25$ mmHg) and severe hyperventilation ($\text{ETCO}_2 < 25$ mmHg) were observed. These events were associated with decreased survival. Patients undergoing RSI by ground paramedics but transported to the hospital by helicopter were the only subgroup in which improved outcomes were observed. This observation was attributed to flight nurses’ experience with the use of capnometry to guide ventilation. In fact, arrival hyperventilation occurred less frequently in air medical patients, both with and without capnometry.

The San Diego Paramedic RSI Trial provided several important perspectives regarding prehospital RSI. The study showed that isolated strategies aimed at improving ETI success (i.e., RSI) did not lead to improved outcomes. Unanticipated adverse events observed during RSI efforts may have offset any potential clinical benefit. The provision of initial and ongoing training was difficult throughout the Trial. Despite prior knowledge of the detrimental effects of hyperventilation on TBI, “accidental” hyperventilation occurred frequently after prehospital RSI. Finally, the identification of significant adverse events affirmed the importance of continuous physiologic monitoring for prehospital RSI.

Two analyses conducted since the San Diego Paramedic RSI Trial arrived at slightly different conclusions regarding patient outcome, but these studies evaluated a different scientific question. In a retrospective analysis, Bulger, et al. observed slightly improved outcomes for TBI patients undergoing RSI by paramedics and flight nurses over conventional ETI, adjusting for CPR status, shock, age, Injury Severity Score, and GCS. In a before-and-after study of TBI patients, Domeier, et al. similarly found that outcomes were improved for 101 prehospital RSI patients compared with 80 matched historical intubated controls. The Bulger and Domeier studies used conventionally intubated controls and thus evaluated the incremental effect of RSI over conventional ETI. In contrast, the San Diego Trial used non-intubated controls and thus evaluated the overall benefit of ETI (via RSI) over non-ETI airway strategies. These are different—albeit equally important—questions.

The current literature do not clearly indicate whether prehospital RSI is beneficial or harmful. However, these studies affirm that prehospital RSI is a difficult and complex procedure, contains significant pitfalls and may interact with other important aspects of patient care. Because of its pivotal role in identifying previously unrecognized adverse events, errors, and system issues surrounding prehospital RSI, the results of the San Diego RSI Trial have provided the basis for many of the recommendations in this resource document. We recognize that additional study is necessary to confirm the observations from these current “best available” data.

**Recommended Standards for Prehospital RSI**

While this section pertains primarily to prehospital RSI, the same standards and principles apply to sedation-facilitated ETI and other forms of DAI.

**System Need for Prehospital RSI**

EMS services should examine their airway management and response characteristics to determine the merits of implementing an RSI program. Most (up to 70%) prehospital ETI occur on cardiac arrests. Non-arrest ETI comprise approximately 30–50% of prehospital ETI, and of this subset prehospital RSI will occur on only the fraction with intact airway reflexes (for example, head injury or pulmonary edema). Thus, only a small percentage of an agency’s total ETI will potentially require RSI. Air medical
or specialty transport services may observe higher numbers. Medical directors should assess the projected total number of RSI as well as the number of procedures per paramedic. While optimal RSI-per-service or RSI-per-paramedic ratios have not been defined, RSI program initiation may not be merited where these figures are small.

Services should also consider transport times to receiving Emergency Departments. Prehospital RSI often requires additional scene time and may not be justified for EMS services with short transport times to receiving Emergency Departments. While there are currently no formal data defining appropriate transport times for RSI systems, prehospital RSI likely has a more meaningful role when there are extended transport times.

**Procedural Experience and Training Recommendations**

There is strong consensus that rescuers who perform prehospital RSI must have exceptional basic ETI skills, ideally at a level comparable with physicians. Experts agree that RSI education should incorporate a period of focused initial training followed by frequent continuing training. Rescuers who do not acquire regular clinical experience with RSI or ETI must have access to frequent supplemental training. Many—if not most—EMS agencies will not be able to provide adequate training and procedural experience to maintain rescuers at this level of ETI expertise.

Several themes regarding training emerge from the existing prehospital RSI literature. First, the actual clinical use of RSI use may be far lower than predicted. In the San Diego Trial, most paramedics performed prehospital RSI less than once per year, and non-familiarity with the procedure appeared to lead to increased medication errors by the end of the Trial. Therefore, intensive continuing training must supplement clinical experience.

The approach to baseline (initial) and continuing training for prehospital RSI is an area of controversy, particularly with regards to the need for supplemental ETI/RSI training using live operating room (OR) patients. While not supported by scientific evidence, many experts believe that the “feel” and management of the pharmacologically-paralyzed airway can only be learned and appreciated on live patients, preferably in the controlled OR setting. Studies that describe successful RSI programs have generally incorporated baseline and continuing ETI/RSI training in the OR. In the Wayne study, paramedics who did not meet minimum clinical ETI standards (12 ETI per year initially, four ETI per year after three years of experience) were required to acquire supplemental ETI experience in the OR. Many directors of established prehospital RSI programs credit baseline and continued OR training as key elements of their success.

In contrast, some experts note that operating room (OR) training time is difficult and often impossible to obtain for many EMS services. In addition, if poorly mentored, these experiences may have little educational value. OR training may also be less meaningful for individuals with substantial prior ETI skill base. In light of these considerations, many EMS services have used mannequins exclusively for baseline and continuing RSI training. This approach may be reasonable where paramedics have (1) a strong preexisting ETI/RSI skill base, and (2) frequent clinical experience with ETI or RSI.

Some experts also identify the need for critical airway management decision-making skills. Rescuers must be able to recognize and manage prehospital RSI scenarios that involve severe airway injury, physiologic compromise, logistical barriers or failed RSI efforts. Since these scenarios cannot be recreated using live operating room patients, mannequins or human simulators may provide the ideal setting for rehearsing these situations.

The current consensus recommendation is that the ideal preparation for prehospital RSI should incorporate:

1. **Formal Didactic Training.** Rescuers must receive regular didactic instruction regarding the techniques, indications and contraindications of RSI, the effects and side effects of RSI pharmacology, recognition of difficult airway scenarios, and the application of rescue airway techniques in the event of failed RSI. Rescuers must receive training in critical airway management decision making.

2. **Acquisition of Baseline (Initial) ETI/RSI Skill.** Rescuers performing prehospital RSI must be possess excellent basic ETI skills, achieved through either prior clinical (prehospital or inhospital) or controlled OR experience on live patients. Rescuers with less prior live ETI experience may benefit from a period of supplemental OR or in-hospital training prior to performing prehospital RSI. Some experts recommend that all rescuers (including those with substantial prior ETI skill or experience) undergo controlled OR training to gain familiarity with the management of the pharmacologically-paralyzed airway. Initial experience with RSI should be closely supervised.

3. **Maintenance of ETI/RSI Skills on a Continuing Basis.** Rescuers must receive frequent intensive didactic and clinical training to maintain ETI and RSI skills. Rescuers should perform RSI or ETI on a frequent basis. Individuals who do not perform ETI or RSI frequently may benefit from additional live (OR or other in-hospital) experience. In selected settings, mannequin or human simulator-based training may
provide a viable alternative to OR training.

It may be reasonable to limit RSI to a select group of rescuers within an EMS service who are able to attain these standards. The relative effectiveness of OR-based and mannequin/simulator-based training merit additional scientific study.

**Recommended Monitoring Equipment**

The San Diego RSI Trial highlighted that critical events such as desaturation and bradycardia may occur during prehospital RSI. Services performing prehospital RSI must use cardiac monitors incorporating continuous monitoring and recording of heart rate and rhythm, oxygen saturation, and end-tidal carbon dioxide before, during and after attempted ETI.

Confirmation and continuous re-confirmation of proper ET tube placement are essential after prehospital ETI and may be particularly difficult in pharmacologically paralyzed prehospital patients. A prior NAEMSP position statement recommends the use of multiple methods for tube placement confirmation.46

We strongly recommend the additional use of continuous digital or (preferably) waveform end-tidal carbon dioxide detection for prehospital RSI. Digital capnometry and waveform capnography are currently considered the most accurate methods for confirming ET tube placement in perfusing patients.47-50 These are also the only techniques currently available for continuously confirming endotracheal tube placement. The San Diego RSI Trial suggested that waveform capnography may also help to facilitate controlled ventilation.51 Most experts favor waveform devices because they are easier to interpret in the context of prehospital care.

While colorimetric detectors may be used for initial identification of ET tube location, these devices are less useful for continuous confirmation and are less accurate in hypoprefusing patients.52-56 Esophageal detector devices similarly may be useful for initial tube placement confirmation but may be less useful during later phases.49,57-60

**Oversight and Quality Assurance**

Prehospital RSI programs must receive medical direction from physicians who have substantial clinical experience with RSI. Medical directors should be involved with all aspects of an RSI program, including program and protocol design, training (baseline and continuing) and quality assurance.

Systems utilizing RSI must have an intensive quality assurance program to help assess and maintain the quality of RSI performance. Performance review should encompass both concurrent and retrospective methods. Systems utilizing RSI should utilize database tracking of all ETI in conformance with the NAEMSP recommended data elements for prehospital airway management.51

Service directors often use intubation success rates to characterize the performance of prehospital ETI or RSI. However, the San Diego RSI Trial highlighted that other measures provide important insights regarding the manner of RSI performance and may be equally important indicators of RSI quality.39

We recommended that prehospital RSI programs identify, at minimum, the following events and measures:

- Successful RSI (both first attempt and overall)—defined as successful placement of the endotracheal tube.
- Measures and observations from tube placement confirmation efforts.
- Successful rescue airway placement.
- Oxygen desaturation.
- Dysrhythmias, including bradycardia and cardiac arrest.
- Hypotension.
- Episodes of hyperventilation.

The San Diego RSI Trial highlighted that patient in-hospital outcome can be impacted by prehospital RSI practices.38 Also, certain RSI complications may not be evident until evaluation in the receiving Emergency Department; for example, tube misplacement or airway injury. EMS services should endeavor to obtain information regarding inpatient course, complications and outcome (survival to admission, survival to discharge, neurological outcome) after prehospital RSI. Complex risk adjustment is necessary to relate prehospital RSI to predicted outcome and may be difficult to perform with small sample sizes. However, unadjusted outcomes information can be useful for identifying systematic patterns related to RSI performance.

**Recommended Methods for RSI**

While this section pertains primarily to prehospital RSI, with the exception of the use of NMB agents, the same standards and principles apply to sedation-facilitated and other forms of DAI.

The purpose of this section is to highlight issues specific to the application of RSI in the prehospital setting. This section does not prescribe a specific method or approach to prehospital RSI. The convention of the “six P’s” (preparation and positioning, preoxygenation, pretreatment, sedation and paralysis, perform laryngoscopy, confirm position, and post-intubation treatment) is used due to its wide recognition. Individual systems should develop protocols that conform to existing system needs or requirements. In addition, since different patients may present in clinical scenarios that preclude the use of certain elements of RSI, it may be
Clinical Indications for Prehospital RSI

In both prehospital and in-hospital settings, clinicians generally use RSI on patients who require urgent or emergent ETI but show evidence of incomplete airway relaxation, making conditions for conventional orotracheal intubation suboptimal.

Because of the nature and limitations of prior data, specific clinical or disease state indications for prehospital RSI are currently not defined. Prior studies of outcome after RSI have focused on traumatic brain injured (TBI) patients. There are no data delineating the benefit of prehospital RSI for patients with other traumatic or medical conditions. Protocols often specify ETI/RSI for a Glasgow Coma Scale (GCS) score <8, but there are no data demonstrating the benefit of ETI or RSI for this subset. In fact, current analyses suggest worsened outcomes for these subgroups. While intubation is often performed in response to hypoxia, it is not known whether early ETI or RSI reverses the impact of this pre-existing condition.

Intubation is often performed to prevent aspiration, but these events may occur prior to the arrival of prehospital personnel and thus may not be preventable with early ETI or RSI.

Generally accepted contraindications to prehospital RSI include situations where the technique cannot be performed in a reasonably safe manner, for example:

- Entrapped patient with inadequate access to patient and airway;
- Unstable or dangerous environment;
- The absence of qualified personnel or appropriate equipment.
- Patients with relative contraindications to RSI pharmacologic agents.

Depending on operator skill and clinical circumstances, RSI may not be appropriate in selected patients with difficult airway anatomy; for example, stridor, severe facial trauma, small mouth, short neck, or morbid obesity, among others.

RSI is not intended for patients who are uncooperative or intoxicated but have no clinical indication for urgent or emergent endotracheal intubation. However, there may be isolated situations where pharmacologic paralysis and airway control are necessary to ensure the safety of prehospital care providers.

There are only limited data describing the use of prehospital RSI on the pediatric population. Individual systems should determine whether pediatric patients should be included in a prehospital RSI program.

Finally, there may be situations where optimization of other treatments may obviate the need for ETI/RSI; for example, the use of continuous positive airway pressure (CPAP) in patients with pulmonary edema, or use of naloxone for victims of opiate overdose, among others.

Positioning and Preparation

Providers should place and position the patient in as controlled an environment as possible. Patients should not receive RSI in unstable environments where there are hazards to patient or provider or where rescuers cannot adequately monitor the patient. Certain situations may dictate placing the patient inside an ambulance or other suitably protected environment prior to initiating RSI.

Preoxygenation

Providers customarily use a non-rebreather mask or bag-valve-mask ventilation to provide up to five minutes of pre-oxygenation prior to RSI. This practice theoretically compensates for potential desaturation during laryngoscopy.

While we recommend this practice for prehospital RSI, current data offer mixed perspectives of this practice. In the San Diego RSI Trial desaturation occurred frequently despite the use of pre-oxygenation. This observation highlights that the pre-oxygenation of critically ill prehospital patients may not afford the same margin of safety as with operating room patients. Experts also note that overaggressive pre-oxygenation by positive pressure ventilation (e.g., BVM) may lead to inadvertent gastric insufflation, increasing the risk of vomiting during laryngoscopy. Additional study is necessary to identify optimal pre-oxygenation strategies specific to the prehospital setting.

Providers often apply cricoid pressure (Sellick’s maneuver) to minimize gastric distention and risk of aspiration during preoxygenation and laryngoscopy.

While we recommend the application of cricoid pressure, we note that there are presently no data to support the effectiveness of this technique during prehospital airway management.
A “priming” dose of a non-depolarizing NMB agent theoretically blunts rises in ICP from succinylcholine fasciculations in suspected TBI. There are currently no data indicating that succinylcholine-associated ICP rises are harmful. While atropine is commonly used in pediatric RSI cases to offset bradycardia associated with NMB agents, the data supporting this practice in emergency settings is equivocal. There are currently no data examining this practice in the setting of prehospital RSI. Because succinylcholine may cause bradycardia in any age group, some clinicians pretreat with atropine prior to repeat doses of succinylcholine.

**Sedation and Paralysis**

A primary goal of RSI is to achieve rapid deep sedation and paralysis while minimizing physiologic response. Prehospital RSI should utilize agents that accomplish rapid, deep sedation of short duration with minimal hemodynamic effects. Etomidate is currently the only drug that meets this profile, and thus it is the most suitable sedation agent for prehospital RSI. The clinical significance of adrenal suppression from a single induction dose of etomidate remains unclear.

While clinicians have used sodium thiopental for ED RSI, this agent causes hypotension and therefore is not recommended for prehospital RSI. ED clinicians often use Ketamine for RSI of status asthmaticus patients because of its brochodilating properties. Ketamine is likely a safe drug for prehospital RSI use, there are no currently data evaluating this application in the prehospital setting. Ketamine can increase ICP and may be harmful in the setting of TBI, which represents a significant fraction of patients potentially receiving prehospital RSI.

Benzodiazepines are not ideal for prehospital RSI. These agents are slow in onset, have widely variable dose-response effects, and cause significant hypotension in patients receiving prehospital RSI. Opioids are also not ideal for prehospital RSI for similar reasons.

Paralysis for prehospital RSI should be accomplished using a rapid-acting, short-duration NMB agent. Currently, the only agent that fits this profile is succinylcholine, which has an onset within 60–90 seconds and duration of only 7 minutes. The potential side-effects of succinylcholine are likely of minimal concern in the prehospital setting. Succinylcholine may cause hyperkalemia in burn patients, but this effect occurs in patients with burns that are over 24–48 hours old; EMS handles mostly acutely injured burn patients. Succinylcholine may increase ICP in head injured patients, but there are no data describing this effect or its clinical significance from acute emergency airway management.

In the event of failed RSI, restoration of the patient’s native airway reflexes may play a significant role in “rescue” airway management; the short duration of succinylcholine (7 minutes) is ideal for this situation. Other NMB agents such as vecuronium, rocuronium and pancuronium have longer durations of action (20–45 minutes) that do not afford a similar margin of safety. These agents should be reserved for long-term paralysis after successful ET tube placement.

Some experts note that in some patients, oxygenation status is so poor prior to RSI that the use of a short vs. long-acting paralytic is of no consequence. However, in contrast to in-hospital RSI, prehospital RSI occurs in the uncontrolled field environment where there are few therapeutic options and no “backup” resources available. Prehospital RSI may fail in small but significant fractions of patients. In the face of failed RSI, rapid restoration of spontaneous respirations may provide vital additional time for selecting and executing subsequent actions. While additional prehospital data are needed, we currently favor the use of primarily short-acting NMB agents for prehospital RSI.

Pediatric practitioners often use vecuronium or rocuronium instead of succinylcholine for pediatric RSI. This practice is based upon operating room reports of malignant hyperthermia occurring when succinylcholine is administered to patients with unrecognized neuromuscular conditions (for example, Duchenne and Becker muscular dystrophy). There are currently no data describing the incidence of unrecognized neuromuscular myopathies in pediatric patients receiving emergency (ED or prehospital) prehospital airway management. The use of alternatives to succinylcholine may be reasonable for specialty pediatric transport teams that handle a wider range of pediatric cases.

**Laryngoscopy and Placement of Endotracheal Tube**

Rescuers should use direct oro-tracheal visualization for prehospital RSI. Nasotracheal approaches should not be used with RSI. The San Diego RSI Trial confirmed that desaturation and bradycardia may occur during prolonged laryngoscopy. Thus, intubation attempts should be limited to 30–45 seconds or if oxygen saturation drops below 90% or baseline. Efforts at RSI should cease and alternate airway methods pursued if intubation is not successful by the third attempt. Alternative methods may be considered sooner that the third attempt if significant difficulties are encountered during earlier efforts.

**Postintubation**

As described previously, rescuers must confirm endotracheal tube placement after RSI by redundant methods, including the use of
capnometry. We recommend waveform capnography over other digital and colorimetric capnometry. Systems utilizing RSI should have access to medications for both prolonged sedation and paralysis after successful intubation such as benzodiazepines (e.g., midazolam, lorazepam, diazepam) and medium- and long-acting NMB agents (e.g., cisatracurium, vecuronium, pancuronium, rocuronium).

Failed Intubation

Systems using RSI must have a protocol and equipment available for addressing failed intubation and the inability to ventilate. All RSI providers must be skilled in BVM ventilation and at least one of the following types of rescue airway devices: Combitube (Kendall Company, Mansfield, Massachusetts), or Laryngeal Mask Airway (LMA North America, San Diego, CA). Medical directors may consider other similar airway devices. Medical directors should also consider training RSI providers to utilize needle cricothyroidotomy (transtracheal jet ventilation) or surgical cricothyroidotomy.

There are considerable data supporting the use of Combitubes in the prehospital setting and after failed RSI. Data on LMA are more limited but are supportive. Prehospital cricothyroidotomy (both needle and open techniques) is widely taught but used infrequently. Recent reports suggest that significant morbidity and mortality can result when surgical airway techniques are attempted by inexperienced operators. While selected cases may necessitate the use of surgical airway techniques, we recommend that services do not rely upon these methods as the sole rescue airway technique.

Additional Considerations

Drug calculation and administration errors are possible given the complexity of the prehospital environment. It is reasonable to minimize the number of drug agents carried for prehospital RSI. For example, the combination of etomidate, succinylcholine, midazolam and vecuronium (the latter agents for post-RSI sedation and paralysis) may be adequate for the vast majority prehospital RSI. To simplify drug dosing, services may elect to use weight-range dosing; for example, the San Diego RSI Trial successfully used a “small/medium/large” scheme for estimating drug dosages.

Precise ventilatory control may be important after prehospital RSI. Both hypo- and hyperventilation have been linked to adverse outcome in a range of prehospital subsets. Feedback from digital and waveform capnography may be useful for preventing these events.

OTHER FORMS OF DRUG-ASSISTED INTUBATION

As an alternative to RSI, many EMS services use sedation-facilitated intubation. This technique denotes the single or combination use of benzodiazepines, opioids, or induction agents to facilitate ETI, without the use of neuromuscular blocking agents. This technique is widely used because these agents are commonly carried by EMS services for other applications. Many clinicians assume that ETI using these agents is safer than with neuromuscular blockade. However, the limited data describing these techniques highlight significant concerns; specifically, resulting suboptimal intubating conditions and the strong potential for clinically significant hypotension.

The only evaluations of prehospital benzodiazepine-facilitated ETI involve intravenous midazolam. These efforts demonstrate suboptimal ETI success rates (Dickinson et al. 85%; Wang et al. 67.5%). A major concern regarding midazolam and other benzodiazepines is the risk of hypotension, especially when used on critically ill patients in the dosages needed to achieve intubating conditions. In the San Diego RSI Trial, Davis et al. found that midazolam caused clinically significant hypotension. Lower dosages may limit these effects but at the expense of optimized intubating conditions. As discussed previously for RSI, benzodiazepines have relatively slow and unpredictable dose-response effects and thus may not be ideal for facilitating prehospital ETI.

As with benzodiazepines, opioids have slow and unpredictable onset and can cause significant hypotension. We therefore do not recommend the use of opioids for facilitating prehospital ETI. Because of the potentiated risk of hypotension in critically ill patients, we also do not recommend combinations of benzodiazepines and opioids to facilitate ETI (for example, diazepam and morphine).

Etomidate has been proposed as an appealing induction agent for sedation-facilitated intubation because of its favorable hemodynamic profile and profound induction/deep sedative effect. Pilot studies have evaluated the use of etomidate as a sole induction agent for facilitating prehospital ETI. Ironically, selected series have found ETI success rates no better than with midazolam. A nonrandomized Delaware series found no difference in ETI success between etomidate (83%), midazolam (83%) or their combination (85%). Preliminary results from a recent Pennsylvania randomized controlled trial of etomidate vs. midazolam found no difference in prehospital ETI success rates (82% vs. 75%) between these agents.

While etomidate can cause clinically significant myoclonus, which may adversely impact airway management efforts, the frequency and effect of these events on prehospital airway management have not been evaluated. Adnet et al. suggest
lower myoclonus and higher ETI success rates with the combination of midazolam and etomidate.15 There are only limited evaluations of other induction agents for prehospital sedation-facilitated intubation.15,18

Finally, some services use topical anesthetics to facilitate ETI, but there are currently no data supporting the safety or effectiveness of this technique in the prehospital setting. Optimized intubating conditions and adequate control of physiological response are unlikely with this technique.

Recommended Standards for Sedation-Facilitated ETI and Other Forms of DAI

Services utilizing sedation-facilitated ETI should apply the same system-level safeguards, training, monitoring and quality assurance measures as those recommended for prehospital RSI. The availability of sedative agents does not denote system qualification to perform sedation-facilitated ETI. EMS personnel must be specifically prepared to utilize these agents in the context of airway management.

With regard to specific drug agents, the consensus recommendation is that benzodiazepines and opioids (individually or in combination) are not ideal for facilitating prehospital ETI. Induction agents such as etomidate show theoretical promise for facilitating prehospital ETI but merit additional study. Additional data are needed to clarify the appropriate agents or combinations of agents for this application. ETI facilitated by topical anesthesia is not recommended.

CONCLUSION

Properly trained and prepared EMS rescuers may use DAI to facilitate ETI in selected patients. Current scientific evidence do not identify clear morbidity or mortality benefits from these techniques. These methods may also lead to increased harm. EMS services electing to use DAI in clinical practice should adhere to the clinical, educational and system standards recommended for these techniques.

References


# Pierce County EMS
Paramedic Airway Management Course

## INITIAL BVM & ET INTUBATION SKILLS ASSESSMENT

<table>
<thead>
<tr>
<th>Participant Names</th>
<th>ALS Agency</th>
<th>BVM Skills Satisfactory?</th>
<th>ET Intubation Skills Satisfactory?</th>
<th>Comments [Including remediation provided &amp; skills retesting]</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES</td>
<td>NO</td>
<td>YES</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Additional Notes / Comments**

- 
- 
- 

**Skills Evaluator Name(s):**

- 
- 
-
# Scenario Evaluation Form

**Paramedic Airway Management Course**

**Student:**

**Date:**

**Score:**

**Evaluator Name:**

**Evaluator Signature:**

**Scenario Description:**

## Action / Skills Performed

<table>
<thead>
<tr>
<th>Action / Skills Performed</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Takes or verbalizes body substance isolation (BSI) precautions</td>
<td></td>
</tr>
<tr>
<td>Provides effective team leadership in directing patient care</td>
<td></td>
</tr>
<tr>
<td>Conducts initial (ABCDE) and focused assessment of patient’s airway &amp; respiratory status and determines need for intervention(s)</td>
<td></td>
</tr>
<tr>
<td>Provides effective BLS Airway Management, including:</td>
<td></td>
</tr>
<tr>
<td>□ Opening / repositioning pt. airway</td>
<td>□ Suctioning</td>
</tr>
<tr>
<td>□ Providing supplemental O2</td>
<td>□ Inserts OPAs &amp; NPAs as indicated</td>
</tr>
<tr>
<td>Ensures that effective airway management and perfusion is being provided</td>
<td></td>
</tr>
<tr>
<td>If required, ventilates patient with BVM at proper volume (@500-600 ml)—<strong>just enough for chest rise</strong> and proper rate (adults: 8-12/min. &amp; pedi pts.: 12-20/min.)</td>
<td></td>
</tr>
<tr>
<td>Assesses patient for potential difficult airway status</td>
<td></td>
</tr>
<tr>
<td>Identifies and selects appropriate equipment for managing patient’s airway, including backup “Plan B” airway equipment</td>
<td></td>
</tr>
<tr>
<td>Prepares equipment, patient &amp; team to maximize probability of 1st Pass Success</td>
<td></td>
</tr>
<tr>
<td>Performs airway management skill(s) in safe and competent manner</td>
<td></td>
</tr>
<tr>
<td>If unsuccessful in initial airway attempt(s), changes technique to improve success</td>
<td></td>
</tr>
<tr>
<td>Recognizes when to switch to alternative airway or ventilation technique</td>
<td></td>
</tr>
<tr>
<td>Confirms proper airway placement with clinical assessment (auscultation) &amp; ETCO2</td>
<td></td>
</tr>
<tr>
<td>Secures the ET tube &amp; reconfirms airway placement</td>
<td></td>
</tr>
<tr>
<td>Ensures that adequate ventilation of the patient is taking place</td>
<td></td>
</tr>
<tr>
<td>Used critical decision-making criteria to guide approach to managing pt. airway</td>
<td></td>
</tr>
</tbody>
</table>

**Deficiency Observed?** (Check only if YES)

- Takes or verbalizes BSI precautions
- Provides effective team leadership
- Conducts initial assessment
- Provides effective BLS Airway Management
- Ensures effective airway management and perfusion
- Ventilates patient with BVM properly
- Assesses for potential difficult airway
- Identifies and selects appropriate equipment
- Prepares equipment, patient & team
- Performs airway management skill(s)
- Changes technique if unsuccessful
- Recognizes need to switch
- Confirms proper airway placement
- Secures the ET tube
- Ensures adequate ventilation
- Used decision-making criteria

**Critical Fail Criteria?**

- Failed to recognize a pt. with profound airway or ventilation problems
- Failed to open patient’s airway
- Failed to adequately ventilate patient with BVM or allowed patient to desaturate
- Inserts or uses any airway adjunct in way that would be dangerous to the patient (i.e. used patient’s teeth as fulcrum, or stylet extended beyond end of ETT)

**Comments:**

- Student successfully completed station by effectively managing airway and ventilation status of patient?
  - [ ] YES  [ ] YES—with remediation  [ ] NO—needs further remediation  (describe issues below or on reverse of page)

**Comments:**

---

[43x743]Pierce County EMS                         Scenario Evaluation Form
Paramedic Airway Management Course
Pierce County EMS                          PARTICIPANT COURSE EVALUATION
Paramedic Airway Management Training Program

Your Name (optional):_________________________  Date of Course:_________________________
Course Coordinator:___________________________  Course Medical Director:_____________________

Please take the time to fill out the course evaluation, ranking the various parts of the class on a scale from 5 (Excellent) to 1 (Poor). Your comments will help us improve the quality of the courses in the future.

<table>
<thead>
<tr>
<th>Question</th>
<th>Excellent</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Were the course objectives clear to you?</td>
<td>5 4 3 2 1</td>
<td>N/A</td>
</tr>
<tr>
<td>2. Did the content of the course meet your needs?</td>
<td>5 4 3 2 1</td>
<td>N/A</td>
</tr>
<tr>
<td>3. Were the instructors enthusiastic, knowledgeable and well prepared for the course?</td>
<td>5 4 3 2 1</td>
<td>N/A</td>
</tr>
<tr>
<td>4. Was the presentation of materials and information well-organized and clear?</td>
<td>5 4 3 2 1</td>
<td>N/A</td>
</tr>
<tr>
<td>5. Were audio-visual materials and class handouts appropriate and useful?</td>
<td>5 4 3 2 1</td>
<td>N/A</td>
</tr>
<tr>
<td>6. Were the pre-course handouts &amp; pre-test useful?</td>
<td>5 4 3 2 1</td>
<td>N/A</td>
</tr>
<tr>
<td>7. Were questions answered appropriately?</td>
<td>5 4 3 2 1</td>
<td>N/A</td>
</tr>
<tr>
<td>8. Would you recommend this course to your co-workers?</td>
<td>5 4 3 2 1</td>
<td>N/A</td>
</tr>
<tr>
<td>9. Would you take a similar course on the same topic?</td>
<td>5 4 3 2 1</td>
<td>N/A</td>
</tr>
<tr>
<td>10. What was your overall satisfaction level with this course?</td>
<td>5 4 3 2 1</td>
<td>N/A</td>
</tr>
</tbody>
</table>

What did you like most about this course?

Was there anything you disliked about this course?

What would you like to see added to the course, or emphasized more in upcoming airway refresher programs?

Do you have suggestions for future EMS education and training topics?

General Comments:

[ ] Cont. on back
### AIRWAY MGMT REPORT

Complete appropriate sections of this form for any pt. receiving CPAP, BVM ventilation or any attempted ALS airway mgmt.

<table>
<thead>
<tr>
<th>Incident Date:</th>
<th>Incident Location</th>
<th>Incident No:</th>
</tr>
</thead>
</table>

**Pt. Age**
- M | F

**Gender**
- kg
- ft. | in.

**Est. Wt.**
- Est. Height:  
- Provider Impression of Pt. Condition (i.e. COPD, CHF, Medical Cardiac Arrest)

#### CPAP REPORT

1. Indication(s) for invasive airway management? (check all that apply)
   - CPR/apnea/agonal resp
   - Decreased Mental Status
   - No airway reflexes
   - Inadequate respiratory effort
   - Direct trauma to face or airway
   - Other:

2. BLS Airway Management Utilized for Patient:
   - Nasal Cannula: Oral or Nasal Airways (circle)
   - Non-rebreather mask: Suction
   - Bag-Valve Mask ventilation: Other:

3. Vitals immediately PRIOR to initial ET/ airway mgmt. attempt:
   - HR:
   - BP:
   - RR:
   - GCS:
   - SpO2:
   - ETCO2:

4. ALS Airway Procedure
   - No. of Attempts
   - Successful?
   - Performed By:
     - ET Intubation
     - ET Intubation
     - Combitube/King LT
     - Surgical Cric
     - Other:

5. IF ALS Airway Mgmt. NOT Attempted, Reason:
   - Pt. airway managed w/ BVM & BLS maneuvers
   - Short ETA—arrived at ED before attempt(s) could be made
   - Pt. evaluated as Difficult Airway:
   - Other:

6. Complicating Factors & Difficulties Present on Intubation Attempt:
   - Intact Gag Reflex
   - Laryngospasm
   - Vomit/Blood in airway
   - Foreign Body Airway Obstruction
   - Trismus/Clenched jaw
   - Unable to visualize cords
   - Combative patient
   - Difficult anatomy:
   - Equip. Failure:
   - Other:

7. Confirmation of ET Tube / Rescue Airway Placement:
   - ET tube size: Placed at mm at teeth

8. Complications resulting FROM procedure:
   - Pt. agitation: CPAP unit issues
   - O2 supply
   - Other:

9. Vitals (1 min.) AFTER Adv. Airway Is Successfully Placed:
   - HR:
   - BP:
   - RR:
   - GCS:
   - SpO2:
   - ETCO2:

10. RSI Utilized To Facilitate Airway Control? Yes No NA
    - Indicate drugs used to initially sedate/paralyze pt. for intubation
      - Etomidate: mg
      - Atropine: mg
      - Versed: mg
      - Vecuronium: mg
      - SUX: mg
      - Other: mg
    - If RSI was unsuccessful, why?

11. Surgical Cric / Pedi Needle Cric:
    - Surgical
    - Pedi Needle Cric
    - Successful?
    - If surgical cric, method: Scalpel PerTrach Cook-Melker Kit
    - No. of attempts required:
    - Comments:

12. Combitube/King Airway Attempted?
    - Successful?
    - If Yes; # attempts?
    - Complications?
    - Size Used?

13. Pleural Decompression:
    - Indications for pleural decompression:
      - S & S of Tension Pneumo
      - PEA with Chest Trauma
      - Other:
    - Needle decompression location(s):
      - R Mid-Clavicular
      - R Mid-Axill
      - L Mid-Clavicular
      - L Mid-Axill
    - Decompression Successful?
      - Yes
      - No
      - NA # Insertions made:
    - Pt. clinical condition improved?
      - Yes
      - No
      - NA

14. If all attempts to intubate failed, how was airway managed?
    - NA
    - Bag Valve Mask
    - King Airway
    - Cricothyroidotomy
    - Other:

15. ED Physician Confirmation of ET / Adv. Airway Placement?
    - Yes
    - No
    - NA; Physician Name:

---

Comments: