New Hampshire Prehospital Rapid Sequence Intubation Manual

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Introduction and Purpose

The purpose of this document is to provide education to New Hampshire paramedics who are currently or will be practicing Rapid Sequence Intubation (RSI). This procedure is essential in the management of the critically ill patient and can be lifesaving in the pre-hospital setting. It is not, however, without potential risks and complications. This is considered a low frequency, high risk procedure. As with any skill of this type, frequent training and review is needed to ensure continued competency. The New Hampshire Bureau of EMS (NH BEMS) wishes to provide materials to ensure that our RSI paramedics are trained to a high level of competency and that this knowledge level is maintained through continuing education and QA/QI. We aim to deliver the most up-to-date and pertinent information to providers in hopes that it will improve comfort level and competency.

This manual describes the indications and procedures to be followed for prehospital emergency RSI. The underlying philosophy is to promote a pre-planned laryngoscopy strategy for first attempt success. It aims to ensure a safe, standardized technique for prehospital RSI while acknowledging the varied circumstances, environments, and pathologies encountered in the prehospital setting. The advice given is derived from the combined experience of a large range of clinicians in prehospital care and is evidence-based where possible. It aims to maximize intubation success at the first attempt thereby avoiding prolonged and multiple attempts and consequent complications. First pass success is associated with significantly fewer adverse effects including hypotension and hypoxia. While a patient in extremis may require airway intervention rapidly, slowing down and taking time to adequately prepare the patient and equipment prior to the procedure will ultimately lead to a better outcome. The information in this manual is provided to ensure the safest, most effective procedures are followed when performing RSI.

Note: This manual describes a system for prehospital RSI; however, many of the principles can be translated directly to in-hospital practice.

What is Rapid Sequence Intubation?

RSI is a procedure that is used to facilitate tracheal intubation of a patient in a way that minimizes the risks and maximizes the chance of success. A sedative agent is given to induce unconsciousness and, simultaneously, a paralytic is given to cause skeletal muscle paralysis. This also results in paralysis of the diaphragm and other respiratory muscles which causes apnea. Once paralysis has taken effect, the patient is intubated. Other techniques have used only sedatives and/or analgesics to facilitate intubation. However, performing intubation in emergent situations without paralytics has been shown to dramatically increase difficulty and the rate of complications. Almost all patients in the emergency setting who require intubation and are not in cardiac arrest should be intubated using RSI.

Standards for RSI Programs

EMS services and medical directors who credential paramedics to perform RSI are expected to maintain and require maximum clinical competency. These services should provide regular and mandatory training sessions which cover a wide array of emergency medicine and critical care topics, especially airway maintenance.

RSI services will maintain a close relationship with their medical director and medical resource hospital. There should be physician involvement at multiple levels in RSI training and the QA/QI process. The physician(s) involved must be competent in airway management and active in implementing evidence-based airway guidelines as they arise.

RSI programs will operate with an expectation of excellence from all paramedics. These standards must be closely monitored in a rigorous QA/QI process and remediation provided when necessary. When requested, RSI services must submit data to the New Hampshire Bureau of EMS regarding their RSI procedures.

Standards for RSI Providers

The RSI paramedic must be clinically competent in all areas of pre-hospital medicine. They must be confident in their ability to handle the most severely ill or injured patient in stressful conditions. Their critical thinking ability must be superior and they must be able to make difficult clinical decisions rapidly and accurately. These providers must be able to think outside of a strict algorithm or guideline and make medical decisions regarding unique presentations. These qualities will ensure that the paramedic can apply their knowledge to complex cases and choose the best approach to secure the airway.

<u>Initial Competency</u>

- Paramedic for at least two years in an emergency response or critical care system
- At least five successful intubations in the past or supervised by an RSI paramedic or physician upon hire at an RSI service
- Complete all required training modules on NHOODLE and review the NH RSI manual in its entirety
- Attend in person approved RSI training provided by NH BEMS or an individual service to include high quality simulation
- Approval by program RSI coordinator and medical director
- Completion of all required documentation and submission to the NH BEMS

<u>Ongoing Competency</u>

RSI competency of individual paramedics must be overseen by the service medical director and RSI coordinator. RSI paramedics should complete regular training and be involved in a closely monitored QA/QI process. At minimum, each RSI paramedic should complete on yearly basis:

- Regular classroom training with focus on airway management
- Regular simulation of RSI cases with critical evaluation by program RSI coordinator and/or medical director
- It is recommended, if possible, that RSI paramedics complete regular airway training in the operating room with the anesthesia service.

Requirements for Each Procedure

Each RSI procedure must be performed in a controlled fashion with an adequate number of providers present. Among these providers must be at least one RSI certified paramedic and one RSI assistant or non-RSI paramedic. Intubation must be performed by the most appropriate provider as determined by the RSI paramedic leading the call. After intubation, the RSI paramedic must remain with the patient at all times unless there are extenuating circumstances (mass casualty, etc.) and ensure that adequate staff remain.

Indications for RSI

Determining whether a patient requires intubation requires clinical judgement. There is no single guideline that will apply to every case. Providers must use guidelines in combination with their clinical knowledge to make these complex decisions. There are certain cases where intubation should always be considered.

1. **Failure of Airway Patency**
   In any case where a patient cannot maintain their own airway, intubation is indicated. Even when basic adjuncts may be effective, these devices are temporizing and patients still require a more definitive airway.

2. **Failure of Airway Protection**
   Patients who have significantly decreased levels of consciousness with an easily maintained airway and adequate ventilation still may require intubation. Many times, these patients would not be able to maintain their own airway should they vomit or experience other airway compromise. Lack of gag reflex or GCS <9 may help in the decision-making process but are not definitive indications. Alternatively, patients with gag reflex or higher GCS still may require intubation.

3. **Failure of Ventilation or Oxygenation**
   Patients often require airway maintenance because they cannot effectively deliver oxygen to their body tissue or expel carbon dioxide due to respiratory inadequacy. These patients have failed or are not candidates for non-invasive techniques such as supplemental oxygen and CPAP/BiPAP. Common examples include severe respiratory distress and toxicological emergencies.

4. **Anticipated Clinical Course**
   Patients may present with imminent or suspected imminent loss of airway but at initial presentation do not have immediate airway compromise. It is often beneficial to secure the airway in these patients early, before they deteriorate. Examples include suspected airway burns, deteriorating head injuries, or spinal injuries with neurological deficit.

5. **To Facilitate Safety**
   Patients commonly present in ways that threaten the safety of EMS providers or themselves. Often, a patient may be combative due to critical illness and there is a need to achieve rapid airway control.

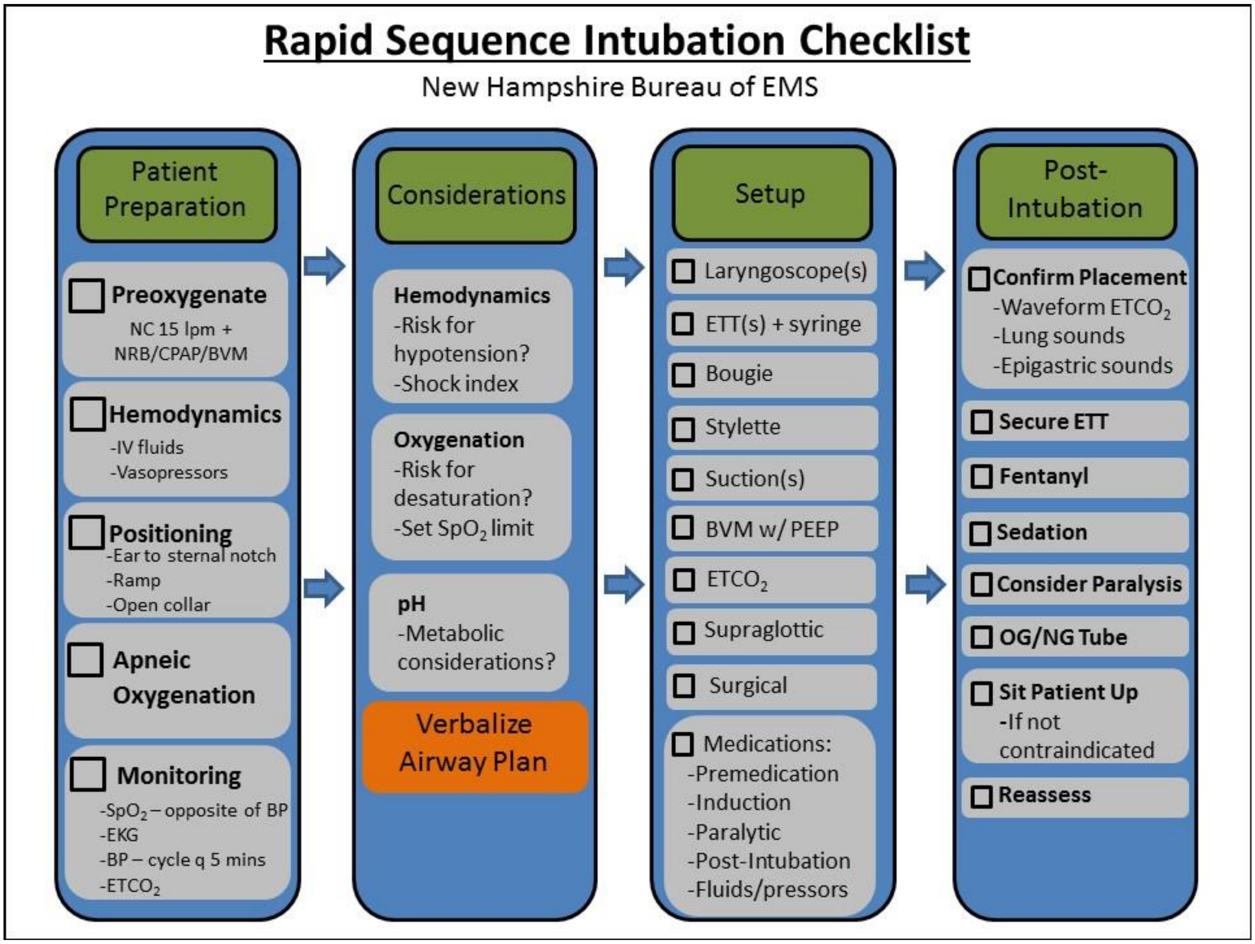
*These points are meant to serve as guidelines or cues to consider airway intervention. There will certainly be patients who fall outside the realm of these categories that still require intervention and the opposite is also true.

When to Consider NOT Performing RSI

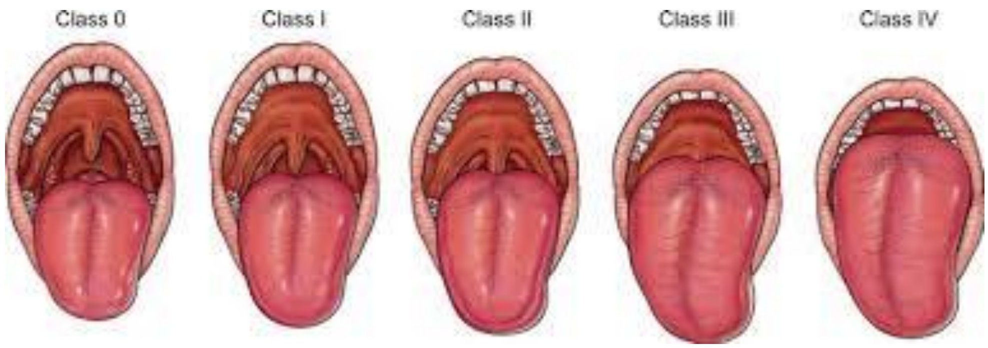
There are cases when, despite the need, pre-hospital RSI should not be performed. Certain patient populations are exceedingly challenging to manage. This decision should be made based on provider comfort and knowledge about the clinical scenario. If there is significant doubt that an airway can be secured the RSI should not proceed. In New Hampshire, prehospital RSI is only allowed for patients who are too tall to fit on a length based resuscitation tape.

The RSI Procedure

The New Hampshire approach to RSI is based upon a single checklist and airway algorithm. This checklist will be elaborated upon significantly throughout this manual. It is meant to serve as a guide for providers when performing the procedure. It is required that providers read the checklist aloud and confirm with other team members that each item is addressed prior to and during setup for every RSI. This will ensure that all key items of preparation and setup are addressed and will improve the chances of an optimal first attempt at intubation. In addition, the person intubating should verbally brief their airway plan. This checklist and procedure must also be used and practiced regularly during simulation.

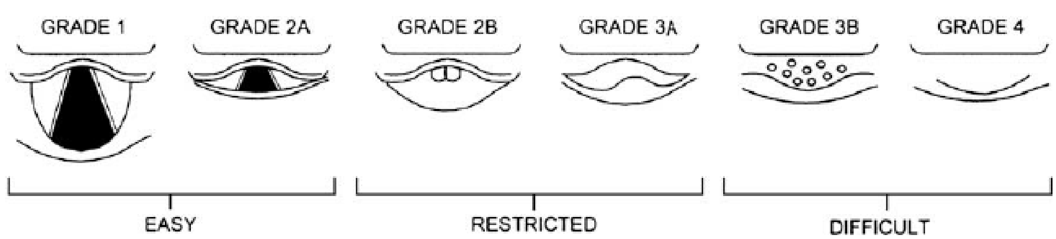


Airway Assessment
There are many factors that must be considered when assessing an airway for difficulty. In the pre-hospital environment, there is often little time or ability to take all these factors into account. Some of the most influential factors are obesity, short neck, small mouth opening, poor neck mobility, and small chin. Facial hair and differing facial shapes can contribute to difficult BVM ventilation.



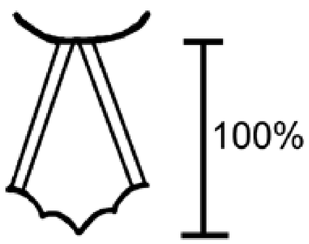
The Mallampati system for predicting airway difficulty *(Springer.com)*

(Nurse-anesthesia.com)



Modified Cormack-Lehane Airway Grading (Cook TM)

Generally, a bougie should not be passed with a view worse than grade 3A which is defined as epiglottis lifted but no posterior cartilages visible. A tube with stylette should not be passed with a view worse than grade 2A.



Percent of Glottic Opening (POGO) scoring may also be used. The percent of visible glottic opening is documented with 100% being a complete view.

Levitan

Predictors of Difficult Airway

Many factors may lead to a difficult intubation. It has been shown that even when the airway can be fully assessed it is very difficult to predict a difficult intubation. The most troubling fact is that most difficult airways cannot be predicted and are only identified once the provider attempts intubation. One large study, looking at intubations by anesthesia in the OR, found that 93% of difficult airways were unanticipated. The best way to predict and plan for a difficult intubation is to **assume every intubation will be difficult** and prepare accordingly. This means optimizing the patient maximally prior to intubation and having all primary and backup equipment prepared. Some common predictors that may be useful are:

- Obesity
- Large tongue
- Short neck
- Small mouth opening
- Airway edema
- Secretions/blood
- Cervical immobility
- Small mandible
- Anatomical variants

Look for anatomic features that may make intubation difficult
- Short neck
- Receding mandible
- Large tongue
- Protruding maxillary incisors
- Narrow mouth with high arch palate
- Large breasts
- Obesity

Evaluate the 3-3-2 rule (Successful laryngoscopy is predicated on normal anatomy)
- Mouth opening (3 finger breadths)
- Hyoid – chin distance (3 finger breadths)
- Thyroid cartilage – floor of mouth distance (2 finger breadths)

Mallampati score
- Class I – soft palate, uvula, pillars visible
- Class II – soft palate, uvula visible
- Class III – soft palate, base of uvula visible
- Class IV – hard palate visible

Obstruction
- Examine for partial or complete upper airway obstruction

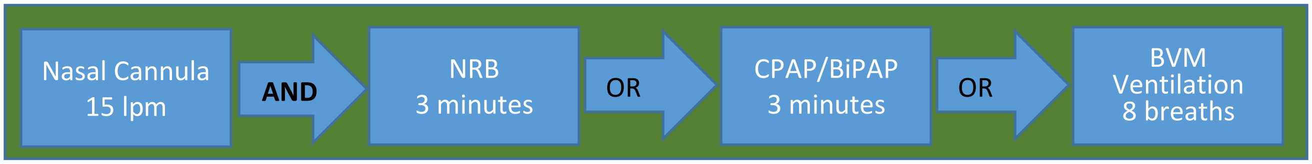
Neck mobility
- Limited neck mobility may make intubation difficult

Patient Preparation

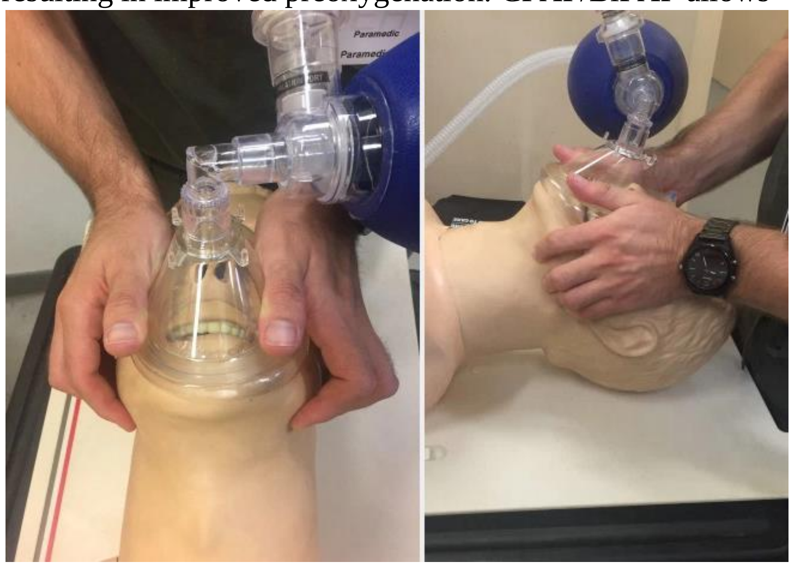
Preparing the patient for intubation is potentially the most important part of the RSI process. Patients who have been adequately prepared will be significantly easier to intubate than those who have not. They also will have less chance of deteriorating during the peri-intubation period. If possible, **all preparation for intubation should be done with the patient sitting upright.**

Preoxygenation

The first step in the RSI process is preoxygenation. This procedure reduces the risks associated with apnea during intubation. Preoxygenation maximizes the safe apnea time during intubation before oxygen saturation begins to fall. Adequate preoxygenation can lengthen safe apnea time by minutes. Preoxygenation has been shown to decrease morbidity and mortality in emergency airway management. It maximizes the amount of oxygen that is in the lungs and bloodstream at the time of apnea. Room air contains approximately 78% nitrogen so if the patient has been breathing room air, then this is also the concentration of nitrogen in their lungs. With adequate preoxygenation, the amount of oxygen in the lungs and dissolved in the blood are maximized and nitrogen is removed. During apnea, the patient can utilize this extra oxygen resulting in a longer time to desaturation. Preoxygenation is performed in an algorithmic fashion.



Once the provider determines that RSI will be performed, a nasal cannula at 15 liters per minute (lpm) should be applied. It should be left in place until the airway is secured and ventilation is in progress. The first line adjunct for preoxygenation is the non-rebreather (NRB). If an NRB is used it should be left in place for at least three minutes at maximum flow. If the patient is hypoxic prior to preoxygenation, CPAP or BiPAP should be considered. These techniques increase the mean airway pressure resulting in improved preoxygenation. CPAP/BiPAP allows the patient to take their own vital capacity breaths with maximum oxygen being delivered. It is especially useful for preoxygenation of patients with pulmonary edema. CPAP can be delivered using a BVM **with a PEEP valve** set to 5-15 cmH_2O by applying a nasal cannula at 15 lpm and maintaining the BVM mask seal. If CPAP/BiPAP fails or is not an option, a BVM **with a PEEP valve** may be used for preoxygenation. If a BVM is used, at least 8 vital capacity breaths should be delivered. BVM ventilation should be performed diligently providing the smallest volume and pressure possible to avoid insufflation of the stomach. It is essential to maintain mask seal and jaw thrust to ensure airway patency. This is best accomplished with a two-person technique. Oxygen saturation should be monitored throughout this process. Prior to administration of induction medications, the oxygen saturation should be as high as possible.

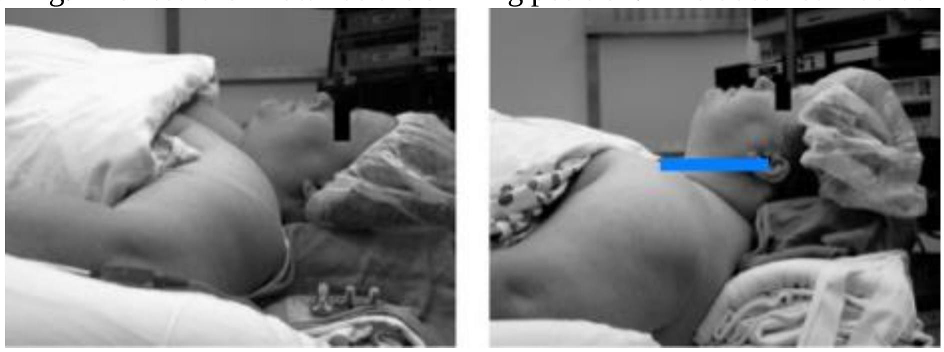


<u>Apneic Oxygenation</u>

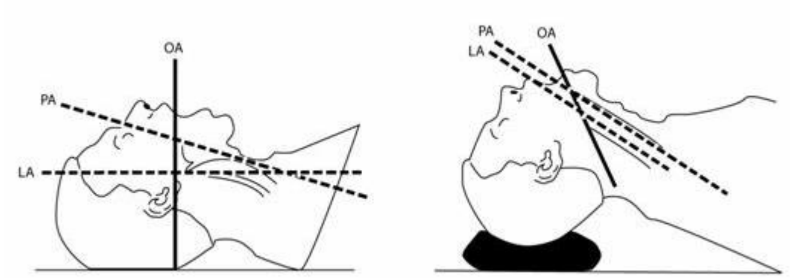
A nasal cannula is the best way to provide oxygen to a patient during the apneic period. Providing 15 lpm of oxygen through a cannula has been shown to effectively prolong the time to desaturation after the induction agent and paralytic are administered. This works by passive diffusion of oxygen into the lungs. As oxygen is absorbed by the pulmonary capillaries the partial pressure of oxygen in the lungs decreases. Through diffusion, oxygen then moves from the pharynx into the lungs so it can be used. It is **essential** that airway patency is maintained for this effect to occur. The best way to do this is to maintain a jaw thrust and/or insert an oropharyngeal airway after the induction medications are administered. This provides a clear path for oxygen to diffuse down the trachea and into the alveoli. Leave the cannula in place and flowing until the airway is secured. This technique must be used in all patients undergoing RSI. BVM ventilation should not be routinely utilized during the apneic period.

Positioning

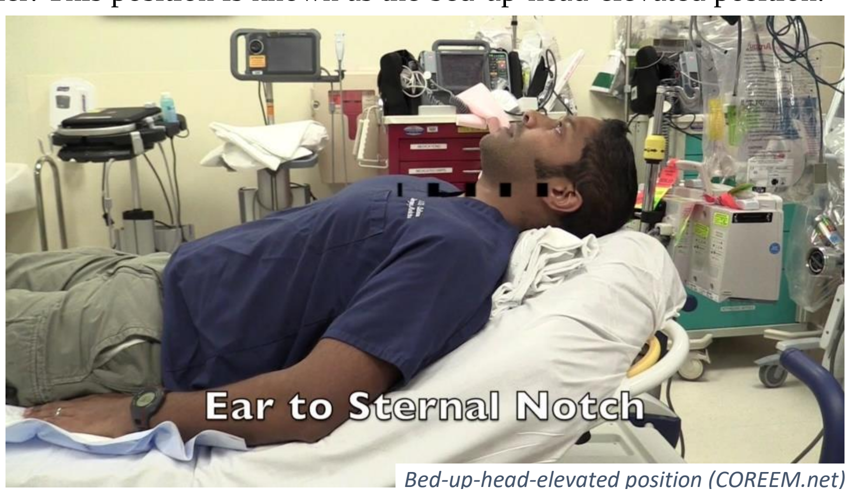
Proper positioning of a patient is the most important contributing factor to the glottic view obtained. There are a few key influencers of patient positioning that must be considered. Patient size and dimensions will determine the optimal positioning technique. All patients should be placed in the external auditory meatus (EAM) to sternal notch position prior to intubation. This involves aligning the EAM with the sternal notch on the horizontal plane. This means that these two anatomical landmarks will be at the same level above the bed. Also, the patient's face should be parallel with the ceiling. The result is known as the sniffing position. This does not involve significant hyperextension or hyperflexion of the neck. It simply causes the head to move forward while maintaining a neutral angle. To achieve this position in a non-obese patient a towel, blanket, or occipital pad is placed under the occiput and posterior neck. Positioning the patient in this manner allows the three axes involved in laryngoscopy to align more closely. It ultimately provides a more direct view of the glottis.



Collins. et al.

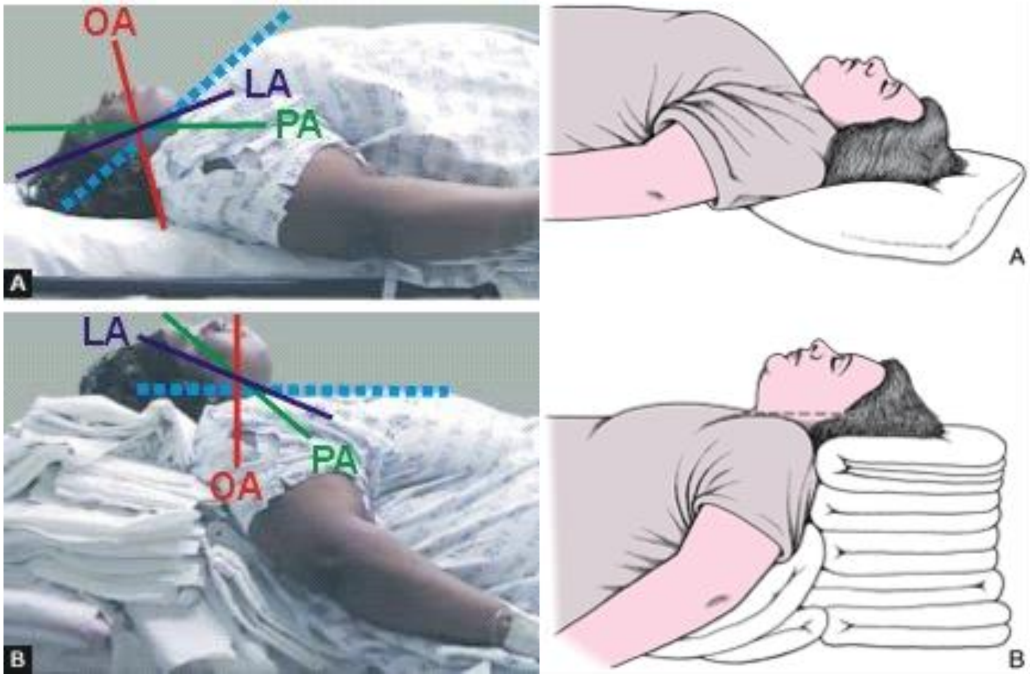


In addition to the EAM position, patients on the stretcher should be positioned at 30° head up by elevating the head of the stretcher. This position is known as the bed-up-head-elevated position. It has been shown to improve the glottic view, maximize oxygenation, and lessen the chance of regurgitation.



Bed-up-head-elevated position (COREEM.net)

There are many factors that can make intubation of the obese patient significantly more difficult. Often these patients will have large chests that rise above the level of the face and are close to the mouth. This can cause difficulty inserting the laryngoscope blade into the mouth due to handle clearance. Also, small mouth opening can contribute to this issue. The ramped position moves the chest downward and allows further jaw opening as neck tissue is moved away. Ramping also improves ability to ventilate the patient by improving airway patency.



International Anaesthesia Research Society *Crashingpatient.com*

To properly ramp a patient support must be provided starting at the mid-back and increasing until the neck. The head should be allowed to fall backward with the face parallel to the ceiling. This technique can require many blankets or pillows. However, it can be performed rapidly in the field if the scenario is planned for. **Intubation of any patient should not proceed until they are adequately positioned.**

<u>Cervical Collars</u>

In trauma, there may be less ability to manipulate the patient's neck due to suspected cervical spine injury. Studies have not demonstrated an obvious correlation between laryngoscopy and worsening of cervical spine injuries. A severely compromised airway should, however, take priority but neck movement should be minimized as much as possible without limiting the ability to manage the airway.

When managing the patient with a suspected cervical spine injury the head should be maintained in a neutral position if possible. The front of the cervical collar should be opened and the patient's head should be maintained in the neutral position by an assistant using manual in-line stabilization. The assistant should be certain that they are not impeding jaw motion but only limiting head movement. The assistant should be above the patient's head with their hands coming from underneath the person intubating.

<u>Monitoring</u>

Patients who are undergoing RSI should have all available monitoring devices applied. This includes EKG, blood pressure, pulse oximetry (SpO_2), and end-tidal carbon dioxide ($ETCO_2$). The blood pressure cuff should not be placed on the same arm as the IV line being used for medications or SpO_2 monitoring. It should be set to cycle at least every five minutes. All cardiac monitors allow easy modification of this parameter. An important downside to pulse oximetry is the delay that exists, known as pulse-ox lag. The delay between actual decrease in arterial oxygen saturation and the device detecting it is at least 15 seconds and can be over 2 minutes in patients with poor perfusion. Waveform capnography can be used in the period prior to intubation. The in-line device placed on the end of an ETT can be placed between the bag and mask on a BVM. If the seal is maintained and ventilation is occurring $ETCO_2$ will be returned. The nasal cannula used for pre-oxygenation and apneic oxygenation cannot be one capable of monitoring capnography. The $ETCO_2$ capable cannulas are not designed to deliver the high flow of oxygen that is required in preoxygenation and apneic oxygenation.

Considerations

Every patient presentation is different and may require a modified approach to securing an airway. This may involve use of different laryngoscopy techniques, modified preparation, or using different airway equipment. One simple pneumonic to help guide the planning of RSI is HOp: hemodynamics, oxygenation, pH. These three topics cover the major aspects of physiology that are affected during RSI. Many specific conditions will be discussed later in this manual.

Hemodynamics

Many patients with airway compromise also have conditions that are causing hemodynamic compromise. In addition, many of the medications used to perform RSI can independently cause hemodynamic compromise. Every effort should be made to develop an approach to securing the airway that minimizes hemodynamic effects acutely and long-term. The shock index (SI) can be used to predict peri-intubation hypotension. The formula is heart rate ÷ systolic blood pressure = SI. A SI of greater than 0.8 is predictive of peri-intubation hypotension and greater than 1 indicates a significant risk and increased chance of mortality. However, if a patient has a normal shock index this does not rule out the possibility of peri-intubation hypotension.

Oxygenation

In many cases, patients are being intubated because they have failed to oxygenate. The RSI process involves a period of apnea which can be detrimental to any patient, especially those who are already hypoxic. These patients also frequently have little oxygen reserve. The intubation plan should be designed to minimize the effect of RSI on oxygenation and ensure that after intubation the patient will be maximally oxygenated. After intubation, oxygen delivery should be titrated to an oxygen saturation of greater than 94%, or lower in patients with COPD.

pH

Potential hydrogen (pH) refers to the acid-base balance. Many patients in extremis have severe metabolic derangement that must be considered when designing a plan for RSI. This often influences choices for medications and post-intubation treatment. More details on specific situations can be found toward the end of this manual.

Setup

Choosing the right equipment is essential to a successful intubation. Also, having all backup plans in place and ready to enact if necessary is paramount when an airway crisis arises. The use of the RSI checklist ensures that all aspects of setup are considered.

Laryngoscopes
The laryngoscope has evolved significantly since its inception. We no longer have only two options (Mac and Miller) for laryngoscopy. The development of video laryngoscopy has revolutionized airway management and made it significantly safer and easier. However, providers MUST be intimately familiar with all devices that they have at their disposal. Each one has nuances that must be known in order to maximize its capability. There are four primary types of laryngoscopy techniques that can be employed depending on the device: direct laryngoscopy (DL), direct video laryngoscopy (DVL), indirect video laryngoscopy (IVL), and channeled video laryngoscopy (CVL).

Direct Laryngoscopy (DL)
DL remains an essential skill for intubation and all pre-hospital RSI providers must be masters of the technique. There are two standard blade types for DL: Macintosh (curved) and Miller (straight). The Macintosh blade is the most widely used blade in adults and the Miller blade is sometimes preferred for children under the age of 2. However, studies have shown that the two blade types may be equally useful in the pediatric population. In adults, the curved blade has been shown to provide better intubating conditions and higher intubation success rates.

The steps to using a Macintosh blade for DL are:
1. Position patient appropriately and ensure all preparation and planning steps are complete.
2. Insertion: Open the mouth fully and insert the tip of the blade into the mouth at the midline. The laryngoscope should be gripped lightly as no significant force is needed until later steps.
3. Epiglottoscopy: **SLOWLY** advance the blade down the tongue at the midline until the epiglottis is seen. Identify landmarks progressively keeping the tongue in view. Once the epiglottis is seen, control the tongue by moving it to the left with the laryngoscope. This creates space for tube passage on the right.
4. Valleculoscopy: Gradually advance the blade until it is seated in the vallecula. The blade must engage the hyoepiglottic ligament to adequately lift the epiglottis. The ligament lies directly within the vallecula.


AIME Airway

5. Laryngoscopy: Once the tip of the blade is seated in the vallecula lifting force should be applied forward and upward without rotating the blade backward. The epiglottis will lift and the larynx will be exposed.
6. If using bougie: Once an optimal view is obtained pass the bougie through the cords. Tracheal rings may be felt if the coude tip remains pointing upright. Advance the bougie slowly until it lodges in the proximal bronchi. Be careful not to advance with too much force as tracheobronchial trauma may occur. If the bougie does not stop advancing this is suggestive of esophageal placement. Advance the lubricated endotracheal tube over the bougie without removing the laryngoscope. If the tube cannot be advanced through the cords rotate it 90° counterclockwise. Visualize the tube passing through the cords if possible and stop advancing once the cuff is past the cords. Remove the laryngoscope, hold tube firmly, and remove the bougie.
7. If using stylette: Ensure stylette is bent in "straight-to-cuff" fashion with 30° bend angle and tube cuff is lubricated. Once an optimal view is obtained pass the tube to the right

and below the line-of-sight to the cords. The tube must be visualized passing through the cords. Advance tube until the cuff is seen passing through the cords. If resistance is felt rotate the tube clockwise as it has likely contacted the cricoid ring. Once the tube is in place hold it firmly and remove the stylette

8. Inflate ETT cuff with 5 mL of air initially and adjust inflation pressure if necessary. The pilot balloon should feel inflated but easily compressible and not too hard.
9. Secure tube and confirm placement.

If using a Miller blade:

1. Position patient appropriately and ensure all preparation and planning steps are complete.
2. <u>Insertion</u>: Open the mouth fully and insert the blade to the right of the tongue. Do not attempt to control the tongue with a straight blade as they are too narrow. The laryngoscope should be gripped lightly as no significant force is needed until later steps.
3. <u>Epiglottoscopy</u>: **SLOWLY** advance the blade down the right side of the tongue until the epiglottis is seen. Identify landmarks progressively keeping the tongue in view. Pass the tip of the blade under the epiglottis or push it forward toward the larynx.
4. <u>Laryngoscopy</u>: Once the epiglottis has been displaced, lifting force should be applied forward and upward without rotating the blade backward. The larynx will be directly visualized.
5. Perform tube passage and confirmation as directed in the Macintosh procedure.

Direct Video Laryngoscopy (DVL)

Most new generation video laryngoscopes offer a DVL blade. These blades are shaped the same as a standard Macintosh or Miller blade but ALSO have video capability. Examples include the C-MAC, McGrath, and Glidescope Titanium Mac series. These devices allow direct and video laryngoscopy in a single tool and in the same attempt**.** DVL is often the preferred technique due to its versatility. The procedure for using this device is the same as standard DL but there is the added benefit of video enhancement. The most beneficial way to use a DVL blade is to obtain the best direct view FIRST then look at the video screen only if necessary. This ensures you have obtained the best possible view and created the largest space for tube passage.

C-MAC D-Blade vs. Mac 4 (EPmonthly)

McGrath MAC (Medtronic.com)

Glidescope MAC T4 (Anestesiar.com)

Indirect Video Laryngoscopy (IVL)

IVL was the first type of video laryngoscopy that was widely used. This is the technique that is employed when using a standard Glidescope or C-MAC with the D-Blade. Also, channeled devices such as the King Vision being used WITHOUT a channeled blade are a type of IVL device. IVL devices are hyperangulated allowing them to follow the curvature of the pharynx without significantly displacing the tongue or jaw.

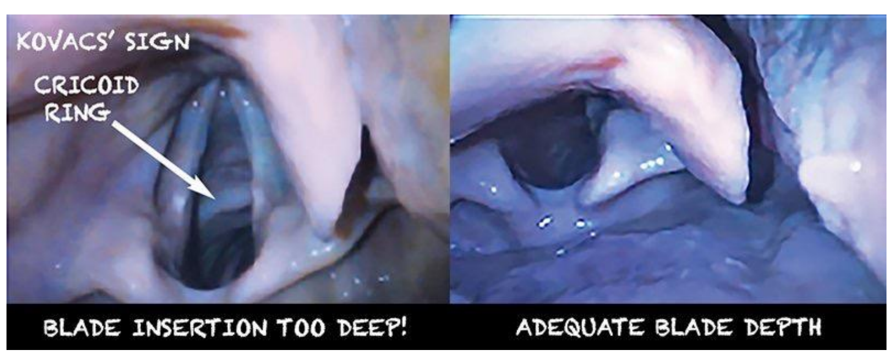
Glidescope (medgadget.com)


C-MAC D-Blade (trialsjournal.com)

Benefits:
- These devices generally provide an excellent view of the larynx.
- IVL may be incredibly useful in those with very difficult airways where a direct view simply cannot be obtained.
- In cervical spine injury when head manipulation should be limited these devices are still able to provide a glottic view.

Downfalls:
- There is often difficulty when attempting to pass the ET tube. Tube delivery is complex with these devices because the tube must be passed around a steeper, indirect angle.
- These devices CANNOT be used to view the larynx directly, meaning the person intubating must rely only on video. This becomes a problem if any secretions such as vomit or blood obscure the camera. Sometimes vigorous suctioning can help clear the pathway enough that the lens does not become obscured. Often, the lens becomes obscured and the attempt must be ended. IVL is not ideal if there are a large amount of secretions. If IVL is to be used when secretions are present, ALWAYS lead with suction ahead of the blade and ensure the airway is maximally decontaminated. Also, if there is a technical problem with the device the video feed can be interrupted with no option to switch to DL.
- Bougies can generally not be used with IVL as they are not designed to negotiate the angle needed to reach the cords.

Procedure for using IVL:
1. Position patient appropriately and ensure all preparation and planning steps are complete.
2. Insertion: Open mouth fully and gently insert blade at the midline.
3. Epiglottoscopy: Gradually advance the blade by rotating handle backward and allowing the tip of the blade to follow the tongue until the epiglottis is seen. Progressively visualize landmarks keeping the tongue in view.



George Kovacs (Image: Sam Ghali)

4. Valleculoscopy: Advance the tip of the blade until it is seated in the vallecula. DO NOT go too deep. The tip of the blade may need to be slightly above the vallecula to facilitate tube passage. If you can see the cricoid ring you are too deep.
5. Laryngoscopy: Lift the jaw straight up with the blade exposing the larynx.
6. Tube passage: A lubricated ET tube loaded on a rigid or standard stylette should be used. The stylette should have a gradual curve at the end to a 60-70° angle. Gripping the tube at the top will allow better control. Pass the tube into the mouth from the right side. The tip should enter view from the bottom of the screen and toward the larynx. When the tube has just begun entering the cords the stylette should be popped up out of the tube slightly using your right thumb or with the help of an assistant. This will allow the tip of the tube to fall into the cords at the correct angle. Pass the tube until the cuff is past the cords.
7. Inflate ETT cuff with 5 mL of air and adjust inflation pressure if necessary. The pilot balloon should feel inflated but easily compressible and not too hard.
8. Secure tube and confirm placement.

JEMS

Gliderite Stylette (verathon.com)

Standard stylette with IVL bend (EMTtutorials.com)

Channeled Video Laryngoscopes

Another option for laryngoscopy is a channeled video device. Examples include the King Vision and Pentax Airway Scope. These devices are a type of indirect video laryngoscope meaning they cannot be used for direct laryngoscopy. They have a built-in channel that the tube is advanced down which directs it into the larynx. The steps to using a channeled video laryngoscope are:

1. Position patient appropriately and ensure all preparation and planning steps are complete.
2. Insertion: Open mouth fully and insert blade at the midline.
3. Epiglottoscopy: Gradually advance the blade by rotating handle backward and allowing the tip of the blade to follow the tongue until the epiglottis is seen. Progressively visualize landmarks keeping the tongue in view.
4. Valleculoscopy: Advance the tip of the blade until it is seated in the vallecula. DO NOT go too deep. The tip of the blade may need to be slightly above the vallecula to facilitate tube passage. If you can see the cricoid ring you are too deep.
5. Laryngoscopy: Lift the jaw straight up with the blade exposing the larynx. Line up the glottis so it is central on the screen and the tip of the tube is directed toward it.

King Vision (King Systems)

6. Advance a lubricated ETT down the channel and use the laryngoscope to direct the tip of the tube between the cords. It may be helpful to pass a bougie down the tube first as it can be more easily directed through the cords. Pass the tube until the cuff is beyond the cords. Remove the laryngoscope.
7. Inflate ETT cuff with 5 mL of air and adjust inflation pressure if necessary. The pilot balloon should feel inflated but easily compressible and not too hard.
8. Secure tube and confirm placement.

Techniques to Improve View

Sometimes, despite proper positioning, preparation, and laryngoscopy technique, the airway view obtained is still poor. If you can see the epiglottis, but no deeper structures, there are a few ways to further improve the view.

1. External Laryngeal Manipulation (ELM), Bi-Manual Laryngoscopy: To perform this technique the person intubating uses their right hand to manipulate the larynx into a position that affords them a better view. An assistant then takes over the holding the larynx and maintains the pressure required. This is NOT Backward, Upward, Rightward Pressure (BURP) OR cricoid pressure. **CRICOID PRESSURE AND BURP ARE NO LONGER RECOMMENDED** as they may worsen airway views and do not reliably prevent regurgitation and may cause it.

ELM (EPmonthly)

2. Head Elevation: Elevating the head off the bed frequently improves laryngoscopic views. This is performed by the person intubating using their right hand, by having an assistant lift the head from below, or by lifting with the laryngoscope causing the head to elevate.
3. Jaw Thrust: Having an assistant perform a jaw thrust will ensure that the jaw is fully engaged and can result in improved glottic view. They can also simultaneously ensure the mouth is fully open.
4. Macintosh Blade as a Miller Blade: In cases where there may be a large or difficult to displace epiglottis the Macintosh blade may be advanced over the epiglottis and used to manually displace it.

Endotracheal Tubes

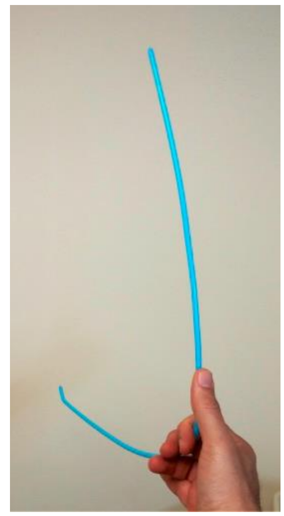
The largest diameter ETT possible should be used. The ability to place a large ETT will generally depend on the size of the glottic opening. Having two sizes of tubes available will allow some flexibility after the glottis is visualized.

Using a large tube will allow the lowest possible pressure to be used for ventilation. This is especially true in patients who have pathological lower airway constriction such as in COPD or asthma. These patients will already have high ventilator pressure requirements.

Bougie
The bougie is a tool that can be used on every intubation but is especially useful in intubations where there is a poor glottic view or epiglottis only view. Use of the bougie on all intubations is encouraged as it is generally easier to pass a bougie through the vocal cords. Also, using the device in “easy” airways will allow providers to become more comfortable with it preparing them for more difficult ones.

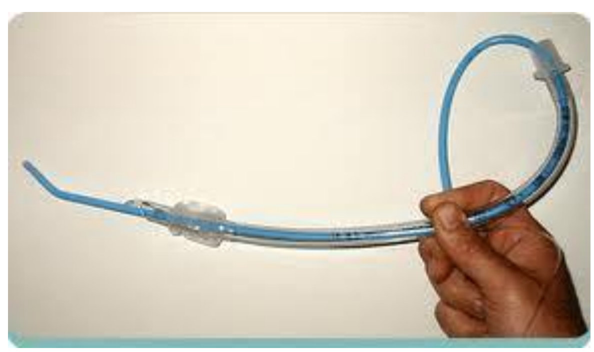
The procedure for using the bougie:

1. Obtain best possible glottic view.
2. Insert the bougie through the cords. In many cases the tracheal rings will be felt as the bougie is advanced as long as the coude tip remains pointing upward. Continue slowly advancing until the bougie stops as it lodges in more distal bronchi. This hold-up is confirmation that the bougie is in the trachea. If it continues advancing unopposed, this is an indication of esophageal placement.
3. Leave the laryngoscope in place maintaining an airway view. Have an assistant pass the lubricated ET tube over the bougie or advance a preloaded tube. Advance the tube under direct visualization if possible until the cuff passes through the cords.
4. If there is difficulty passing the tube through the cords, this can usually be resolved by rotating the tube 90° counterclockwise.
5. Remove the laryngoscope. Remove the bougie while holding the tube firmly in place.
6. Secure tube and confirm placement.


Shaka grip (Airwaycam.com)

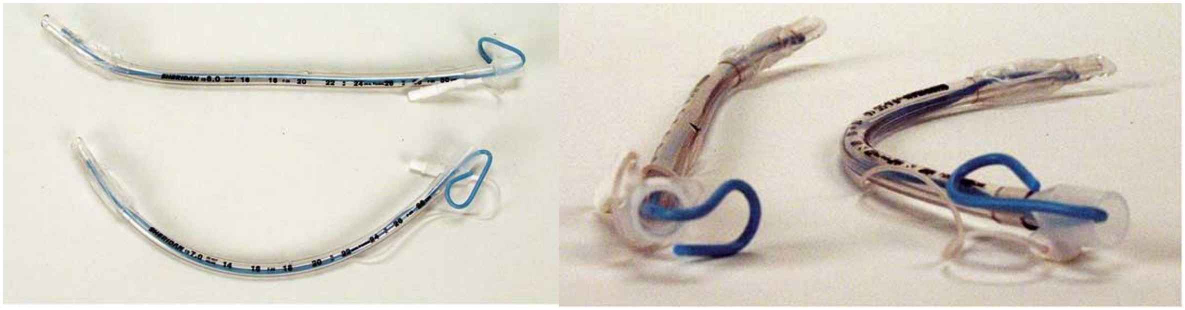
The bougie can be utilized in multiple ways, all of which are probably equally effective. The ET tube can be preloaded on the bougie prior to introducing it. There are also a few different ways to grip the bougie that may be used depending on provider preference.


Standard pre-load technique (Prehospitalmed.com)


“Kiwi-Grip” technique (Airwaycam.com)

Stylette
A stylette is only needed if a bougie is not used. Stylettes make tube control, shaping, and passage significantly easier than if the tube is passed without a stylette. The stylette should be sized appropriately depending on tube size. If using IVL, a rigid stylette or standard one with a gradual curve at the end to a 60-70° angle should be used. For DL or DVL the recommended stylette bend is “straight-to-cuff” with a 30° bend angle. When introducing a tube using a stylette

the tube should enter the mouth from the right side and remain below the line of sight until the tube is at the arytenoid notch. This allows the operator to maintain visualization of the cords while delivering the tube.



Straight-to-cuff (preferred) vs. standard tube bend (EPmonthly)

<u>Suction</u>

Prior to performing RSI, suction with a Yankauer or, preferably, a large bore catheter should be tested and positioned so that the person intubating can easily reach it. If secretions or other obstructions are seen during laryngoscopy they should be suctioned prior to tube placement. It may be helpful in ALL intubations to lead with suction ahead of the blade in order to clear secretions that may not be anticipated. In the case of a large amount of secretions or vomit that are continuously accumulating, a second suction may be employed. If space allows, a catheter can be placed to the left of the laryngoscope and left in place with the tip in the posterior pharynx or proximal esophagus. This will provide continuous pharyngeal suctioning during intubation.

J. Ducanto (Yen Chow)

<u>Bag-Valve-Mask</u>

A BVM must be prepared and easily accessible for mask ventilation or post-intubation ventilation. ALL BVMS SHOULD HAVE A PEEP VALVE in place set to an appropriate level (usually 5-10 CMH_2O) except in cardiac arrest when PEEP may cause decreased venous return to the heart. Also, for patients with poor perfusion, consider using a lower PEEP to maximize venous return. PEEP is a vital part of artificial ventilation as it allows significantly more alveolar recruitment and prevents unnecessary atelectasis. All breaths given via BVM should be slow and controlled, providing as little pressure as is required to create chest rise. In addition, most BVMs provide significantly more volume than is needed if squeezed fully. The recommended technique is to use two fingers of one hand to squeeze the bag. Careful attention should also be paid to ventilatory rate. A rate appropriate for the patient’s condition should be used and maintained. The standard rate is 8-10 breaths/minute or about one breath every 6-7 seconds. $ETCO_2$ can be used to determine ventilatory rate with goal of 35-45 mmHg in most patients.

<u>Mechanical Ventilation</u>

This document does not provide specific guidelines regarding mechanical ventilation. However, use of a mechanical ventilator is always superior to BVM use when operated by a trained provider and with settings appropriate for the patient condition. If available, mechanical ventilation should be used in lieu of bag-valve ventilation.

End-Tidal CO_2
Digital waveform capnography should be pre-attached to the BVM prior to intubation. It can be attached to the BVM with the mask in place as well. Ensure that the tubing is connected to the monitor and that the monitor is set to display a waveform as well as the numeric value. Colorimetric devices are no longer considered adequate. There is no utility for esophageal detector devices if $ETCO_2$ and other confirmation methods are used. NH EMS protocol requires continuous waveform capnography monitoring immediately after intubation.

Supraglottic Airways
A supraglottic airway device should be prepared and easily accessible prior to intubation. This document does not recommend specific devices but providers must be well trained in and comfortable using their selected device. If intubation fails and a supraglottic airway is placed and functional it should be left in place for the duration of care. If the supraglottic airway is unsuccessful, no further attempts to intubate should be made and surgical airway should be performed if the patient cannot be adequately ventilated.

Surgical Airways
Prior to intubation, surgical airway equipment should be prepared and readily available. It is suggested that the provider identify the larynx and cricothyroid membrane before every intubation if anatomically possible. This will help immensely if a surgical airway becomes necessary. Perform a laryngeal handshake to identify the larynx, cricothyroid membrane, and become comfortable with the three-dimensional structure of the trachea. In an anticipated difficult airway, the cricothyroid membrane should be assessed and marked prior to induction during the preparation stage. If resources allow, a "double setup" can be performed. One provider attempts intubation and/or supraglottic airway placement while another sets up to perform a surgical airway. This reduces the delay to establishing an airway. In patients with severely altered airway anatomy due to trauma or anatomical airway variants and deformities, a surgical airway may be considered as a primary option if airway compromise is imminent. Examples where it may be appropriate to perform surgical airway immediately are severe facial trauma where the upper airway is collapsed or in severe angioedema. The bougie-assisted surgical cricothyrotomy is the recommended surgical airway technique in adults as it has been shown to be more effective than percutaneous techniques.

Laryngeal Handshake (TamingtheSRU)

Medications
There are many medications involved in various stages of the RSI process. Each medication has different indications and contraindications that should be considered. This section will review each medication and discuss some specific scenarios. Later in the document more details about RSI in specific pathologies are provided. Generally, patients who are hypotensive or hypoperfused for any reason should have their induction agent dose reduced and paralytic dose increased. Induction agents may cause hemodynamic compromise. Paralytics will be delivered more slowly to body tissues and higher doses will improve onset time. Any medications that can be given IV can also be given IO.

Determining Weight-Based Doses

Many medications are meant to be dosed based on ideal body weight (IBW), not actual body weight (ABW). Ideal body weight is calculated based on the patient's height and is meant to exclude any excess adipose tissue they may have. The dosing guidelines in this manual specify whether a medication is dosed based on ideal or actual body weight. An ideal body weight chart is available on the backside of the NH RSI checklist. Ideal body weight can be roughly calculated using the following formulas:

Male: Height in cm – 100 = IBW in kg   Female: Height in cm – 105 = IBW in kg

Premedication

Historically, there have been many options for premedication including lidocaine for increased intracranial pressure or asthma and atropine for prevention of bradycardia. However, neither of these treatments has been shown to provide any benefit as routine premedication. Any actual vagal response should be treated with atropine per protocol but it should not be used as a routine premedication.

Fentanyl

As a premedication, fentanyl may blunt sympathetic response to intubation and provide analgesia as intubation is a painful procedure. This is valuable in certain situations such as increased ICP. Also, since etomidate does not have analgesic properties, fentanyl should be considered prior to induction. Ketamine, on the other hand, does provide analgesia and premedication with fentanyl may not be as necessary. Do not premedicate with fentanyl if patient is hypotensive or at risk of shock.

Dosing:

- 1-3 mcg/kg of **ideal** body weight IV at least three minutes prior to induction

Induction Agents

The induction agent is meant to cause unconsciousness and anesthesia prior to paralysis and intubation. In New Hampshire, there are two medications that may be used for induction.

Ketamine

Ketamine is often a preferred induction agent due to its safety, pharmacokinetics, and hemodynamic profile. Ketamine is an NMDA receptor antagonist. These receptors are largely responsible for sensory perception and awareness. It has a unique effect that is largely dose dependent. It can be used for analgesia, procedural sedation, and as an induction agent in RSI. It produces a trance-like state known as dissociation. When dissociated, patients are technically awake but unaware of any external stimuli. While under the influence of ketamine, patients are likely to maintain their airway reflexes and have supported or increased respiratory drive. Ketamine is also a mild sympathomimetic so hemodynamics may be supported or enhanced. These points are advantageous over any other common induction agent. However, in patients in shock, even ketamine may result in decline in hemodynamic status which is why reducing the dose is important in these cases. Ketamine also provides analgesia partially due to its weak opiate receptor agonist behavior. Naloxone does not reverse its effects.

Benefits:

- Ketamine is a sympathomimetic medication. This means that it supports many aspects of hemodynamics. It may cause an increase in heart rate and blood pressure.
- Airway reflexes and spontaneous respiration are maintained when under the influence of ketamine which is beneficial for delayed sequence intubation and prior to paralytic onset.
- Ketamine is a bronchodilator and may be beneficial in the setting of COPD or asthma.
- Ketamine has a rapid onset when given intravenously and a duration of action of 5-15 minutes.

Relative Contraindications:

- Use ketamine with caution in patients who may be harmed by an increase in blood pressure. Some examples may be patients with acute myocardial infarction or aortic dissection.
- Ketamine should not be used in situations where increased cardiac workload may be detrimental.

Adverse Effects:

- Hypersecretion: A late effect of ketamine may be increased secretions such as salivation and tears.
- Laryngospasm: This is a rare side effect that is resolved with paralytics.
- Dysphoria: In some cases, patients receiving ketamine sedation will experience a phenomenon known as dysphoria. This entails unpleasant hallucinations and agitation. This is an uncommon reaction and should not be seen if the patient is being intubated and sedated. It generally occurs if lower doses are used and during emergence from ketamine sedation. If encountered, it can be reliably treated with low dose midazolam. Most patients will experience euphoria (pleasant hallucinations) as opposed to dysphoria.

Dosing:

- 2 mg/kg of **ideal** body weight IV
    - For elderly, shock, or risk of hypotension: 1 mg/kg IBW IV
- 4 mg/kg of **ideal** body weight IM (For DSI only)
    - For elderly, shock, or risk of hypotension: 2 mg/kg IBW IM

*Ketamine boluses should be diluted in at least 10 mL normal saline for IV administration and administered via **slow** push.

Etomidate

Etomidate is a safe and efficacious induction agent. It is thought to work primarily as a GABA agonist providing rapid sedation. Etomidate is generally considered to be hemodynamically neutral but it may cause hypotension in some cases. A downside to etomidate is its short duration of action. If airway management takes longer than expected it is likely that the patient would require additional sedation.

Benefits:

- Rapid onset

Relative Contraindications:

- Sepsis
- Hemodynamic compromise

Adverse effects:

- Hypoventilation
- Hypotension

Dosing:

- 0.3 mg/kg of **ideal** body weight IV, maximum single dose 30 mg
    - For elderly or risk of hypotension: 0.15 mg/kg IBW IV

Paralytics

A paralytic agent is essential for creating optimal intubating conditions. Intubation without paralytics has been proven to be more difficult with significantly higher failure and complication rates. In general, higher doses of paralytics are associated with faster onset and improved intubating conditions. Paralytic agents have NO SEDATIVE EFFECTS so sedation must be provided regularly when they are administered. This is especially important when patients have received long acting paralytics. After administering any paralytic, the provider must wait at least 45-60 seconds for paralysis to take effect. Attempting to intubate too early will result in worse visualization and can cause regurgitation. If succinylcholine is used, skeletal muscle fasciculation is often seen which indicates the onset of paralysis. Wait until fasciculation stops before attempting intubation.

Rocuronium

Rocuronium is a non-depolarizing neuromuscular blocker that causes complete skeletal and respiratory muscle paralysis. It has been shown to result in similar intubating conditions and onset times to succinylcholine when dosing is adequate. Rocuronium has NO SEDATIVE EFFECTS. Sedation must be administered after intubation despite the patient having no outward signs of consciousness.

Benefits:

- Long duration of action (30-60 minutes). This negates the need for re-dosing of paralytic agents if airway maintenance takes longer than expected. It also improves ventilatory compliance after intubation.
- Onset 45-60 seconds (equivalent to succinylcholine)
- Rocuronium has no common side effects.

Contraindications:

- There are no contraindications to rocuronium.

Dosing:

- 1.0 mg/kg of **ideal** body weight IV

Succinylcholine

A short acting depolarizing neuromuscular blocker that results in complete muscle paralysis. Succinylcholine has NO SEDATIVE EFFECTS.

Benefits:

- Rapid onset

Contraindications:

- Known or suspected hyperkalemia (diabetic ketoacidosis, rhabdomyolysis, etc)
- History or family history of malignant hyperthermia

- History or family history of any neuromuscular disorder
- Significant burns over 24 hours old

Adverse Effects:

- Hypotension
- Hypertension
- Bradycardia
- Life-threatening hyperkalemia
- Malignant hyperthermia
- Increased oxygen consumption, faster desaturation
- Potential increase in intracranial pressure

Dosing:

- 1.5 mg/kg IV of **actual** body weight, maximum single dose of 150 mg

Malignant Hyperthermia

Succinylcholine can cause a life-threatening condition called malignant hyperthermia. It is caused by a genetic mutation affecting calcium channels in skeletal muscle. In susceptible patients, malignant hyperthermia leads to an overwhelming metabolic activation in skeletal muscles causing significantly increased oxygen demand. Signs include tachycardia, unexplained rise in end-tidal CO_2, and masseter muscle rigidity. Hyperthermia occurs later in the disease process. The primary treatment is administration of dantrolene. If malignant hyperthermia is suspected, notify the receiving facility so that they can obtain and prepare this medication. Prehospital treatment will be based on symptoms including cardiovascular and respiratory support. Do not administer succinylcholine to any patient with personal or family history of malignant hyperthermia.

Rocuronium versus Succinylcholine

Succinylcholine has been a mainstay drug of RSI for some time. This was due to many perceived advantages to succinylcholine including rapid onset and short duration. However, in recent years it has begun to fall out of favor for several reasons. Recent evidence has shown that rocuronium, when dosed appropriately, at 1.0 mg/kg IBW or higher, results in equivalent intubating conditions with the same onset time. Rocuronium has many advantages over succinylcholine in RSI.

<u>Long Duration</u>

Traditionally, succinylcholine has been hailed for its short duration of action. This is, however, not actually an advantage. When a patient in the emergency setting requires airway intervention, it is unlikely that allowing the patient to awaken and breath spontaneously is an option. Additionally, clinically significant oxygen desaturation is likely to occur more rapidly than the effects of succinylcholine will diminish meaning your patient will desaturate before paralysis wears off. Once RSI is initiated, the patient must remain sedated and the airway must be secured. All airway maneuvers, including laryngoscopy, supraglottic airway placement, and BVM ventilation are easier to perform with the patient paralyzed. If airway management takes longer than expected, succinylcholine dosing would often need to be repeated. Rocuronium provides an advantage with its long duration.

Lack of Contraindications
Succinylcholine is contraindicated in many patients, as indicated above. In the emergency setting, it is often difficult to know if these contraindications are present. Rocuronium has no known contraindications.

Lack of Side Effects
Rocuronium has no known adverse effects. Succinylcholine can cause hyperkalemia which can be life-threatening in certain patient populations. Additionally, succinylcholine is thought to cause faster oxygen desaturation as it causes increased oxygen consumption at the cellular level.

There are some situations when succinylcholine may be preferred. These are times when long term paralysis is not desirable such as when neurological exams may impact treatment decisions. For example, in patients with status epilepticus, it is important to be able to monitor for seizure activity. If the patient has received a long acting paralytic, there may be no outward signs if the patient is seizing. Paralytic choice should be made on a case-by-case basis.

Post-Intubation

Analgesia and sedation after intubation are of utmost importance for patient comfort and respiratory compliance with artificial ventilation. Medication administration should be guided by the Richmond Agitation-Sedation Scale (RASS). This can be used to quantify the level of sedation the patient is receiving. Patients should be sedated to at a RASS score of -3 to -5 to ensure adequate comfort. Always use the least amount of medication possible to achieve adequate sedation and ventilatory compliance. In the prehospital setting, it is often more difficult to keep patients adequately sedated due to the high level of external stimuli. Sedation can be titrated by using a variety of clinical markers. Patient movement or visual discomfort is the primary method but others can be used. An increase in heart rate, respiratory rate, blood pressure, or $ETCO_2$ may also be indicative of distress or discomfort requiring additional analgesia or sedation. These indicators are especially important in patients who have received long acting paralytic agents as they will not show outward signs of distress. It is important to ensure that all patients receive adequate analgesia and sedation.

Richmond Agitation Sedation Scale (RASS)

Target RASS	RASS Description
+ 4	Combative, violent, danger to staff
+ 3	Pulls or removes tube(s) or catheters; aggressive
+ 2	Frequent nonpurposeful movement, fights ventilator
+ 1	Anxious, apprehensive , but not aggressive
0	Alert and calm
- 1	awakens to voice (eye opening/contact) >10 sec
- 2	light sedation, briefly awakens to voice (eye opening/contact) <10 sec
- 3	moderate sedation, movement or eye opening. No eye contact
- 4	deep sedation, no response to voice, but movement or eye opening to physical stimulation
- 5	Unarousable, no response to voice or physical stimulation

resus.com.au

Fentanyl

The priority after securing and confirming an airway, initiating ventilation, and addressing life-threats is providing adequate analgesia and sedation. This will improve patient comfort and ease of ventilation and overall patient management. Fentanyl should be administered before sedation. When pain is treated, patients will be more comfortable and require less sedative medication. Fentanyl is the preferred opiate for this purpose as it is the most hemodynamically stable of the common opioids. It is also potent, short-acting, and has some sedative effect when combined with other sedatives. If fentanyl was used as premedication it is appropriate to delay administration of fentanyl after intubation. If ketamine is being used as the primary sedative agent, fentanyl is not necessary as ketamine is a strong analgesic.

Dosing:

- 50-100 mcg IV every 5-10 minutes as needed

Ketamine

In addition to induction, ketamine can also be used for post-intubation sedation. It offers some benefit over other agents as it generally does not cause hemodynamic compromise. It also provides highly reliable sedation and analgesia. It should not be used in situations where increased cardiac workload may be detrimental.

Dosing:

- 1 mg/kg IBW IV bolus followed by infusion via pump 2 – 5 mg/kg/hr.
  - Initial bolus after intubation not needed if ketamine was used for induction.
- If infusion not used: 1 mg/kg IBW IV every 5-15 minutes as needed

Midazolam

Benzodiazepines are frequently used for post-intubation sedation and midazolam is frequently the preferred agent. Note that midazolam may cause hemodynamic compromise. Its sedative effects also somewhat unpredictable.

Dosing:

- 2-5 mg IV bolus followed by infusion via pump 5-30 mg/hour
- If infusion not used or if additional sedation is required: 2-5 mg IV every 5-10 minutes as needed

Lorazepam

Lorazepam is another benzodiazepine option for post intubation sedation. It has a longer time to onset but a longer duration of action.

Dosing:

- 1-2 mg IV every 15 minutes as needed (maximum total 10 mg)

Post-Intubation Paralysis

Ongoing paralysis may be beneficial for patients who have received adequate analgesia and sedation but still are not tolerating the airway device or ventilation. It is also useful for patients who require specific and controlled ventilation where spontaneous respiration may be harmful. If rocuronium is used for initial paralysis this effect will be prolonged. Remember that long-acting paralytics have NO SEDATIVE EFFECTS so sedation must be provided regularly.

Rocuronium

Rocuronium is an effective paralytic for post-intubation sedation. With this dose, it usually results in 20-40 minutes of paralysis.

Dosing:

- 1.0 mg/kg of **ideal** body weight IV

Vecuronium

Vecuronium is a non-depolarizing neuromuscular blocker that causes complete skeletal and respiratory muscle paralysis. Vecuronium is used for paralysis after intubation and has no role as an initial paralytic.

Benefits:

- Long duration of action (45-90 minutes)
- Vecuronium has no common side effects

Contraindications:

- There are no contraindications to vecuronium use

Dosing:

- 0.1 mg/kg of **ideal** body weight IV

IV Fluids

Fluid boluses should be used throughout the RSI process to maintain hemodynamic stability. Many of the medications used in RSI have the potential to cause hypotension. In addition, the action of intubation and applying positive pressure ventilation will often cause some level of hemodynamic deterioration. If a patient is in shock or at risk for shock prior to intubation, fluid boluses should be given prior to administration of induction agents. Fluid should be used cautiously in patients with suspected volume overload or in congestive heart failure. If the patient remains hypotensive after 500 mL of IV fluid, vasopressors should be considered. Hypotension is defined as MAP <65 mmHg or <80 mmHg in patients with head injury and increased ICP. MAP goals can vary from patient to patient so different targets may be necessary. Administer IV fluids as necessary to meet MAP goals. Ensure that hemodynamic concerns are addressed prior to proceeding with RSI.

Vasopressors

The role of vasopressors in RSI has expanded. Many patients who require RSI are in shock or at risk of shock. If a patient is in shock or at risk for shock prior to intubation, these medications should be considered prior to administration of induction agents. If not necessary prior to intubation, vasopressors should always be immediately available should the need arise after intubation. Use the shock index as well to help predict the need for hemodynamic support during the peri-intubation period.

<u>Infusion Dosing</u>

Norepinephrine:

- 1-30 mcg/min IV infusion

Epinephrine:

- 2-10 mcg/min IV infusion

Push Dose Epinephrine

Push dose epinephrine is reserved for the severely hypotensive or decompensating patient who will potentially enter cardiac arrest if immediate intervention is not made.
Preparation of push dose medications should be done PRIOR to intubation during setup if the patient is at risk for deterioration during RSI:

1. Take a 10 mL normal saline flush and waste 1 mL (left with 9 mL)
2. Draw up 1 mL of epinephrine 0.1 mg/mL from the cardiac arrest preloaded syringe into the flush and mix vigorously (now have 10 mcg/mL)
3. Administer 5-20 mcg (0.5 mL – 2.0 mL) IV every 2-5 minutes as needed and reassess hemodynamics frequently
4. Evaluate blood pressure 1-2 minutes after dosing and frequently thereafter
5. Initiate vasopressor infusion as soon as practical

Creating an Airway Plan

Once it is determined that a patient requires RSI, the lead paramedic, in conjunction with other providers, must develop an optimal plan to approach the procedure. Every patient is unique and there will be aspects that differ in every case. The primary components of the airway plan are:

- Role assignments: each provider must have a specific role for preparation, during intubation, and post-intubation.
- Preparation considerations: this includes positioning, preoxygenation strategy, vascular access, and monitoring.
- Medications: every patient should be assessed and have their medication regime chosen based on individual presentation.
- Equipment: the provider should choose the equipment that will maximize chances of first pass success as well as all backup equipment.
- Post-intubation care: all aspects of post-intubation care should be considered and prepared prior to initiating RSI.

Once an RSI plan is established it should be verbally "briefed" to all providers involved. This ensures everyone knows the plan and where they fit into it. It should be done as part of the pre-intubation checklist.

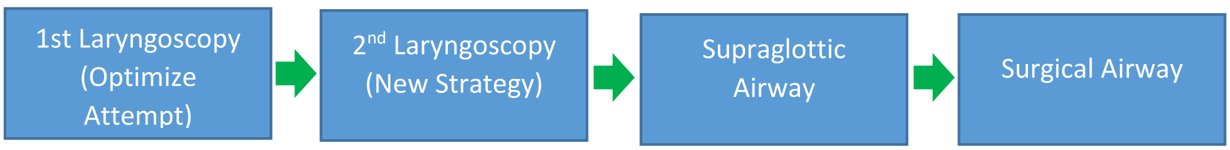
During Intubation

After adequately preparing and resuscitating the patient for intubation, multiple tasks must be completed during the intubation process. The person intubating should be positioned appropriately in relation to the patient. Ideally, the patient's head should be at or near the xyphoid level on the person intubating. In addition, the person intubating should avoid positioning their face too close to the patient's mouth. Being too close worsens the glottic view. Another provider should be assigned to monitor the patient during intubation. This primarily involves monitoring the patient for signs of distress or awakening and watching the monitor. A strict limit should be established regarding when the intubation attempt will end and oxygenation will be provided prior to the next attempt. In a well oxygenated patient with healthy respiratory physiology the threshold is generally set at a pulse oximetry level of 93%. However, this must be adjusted if patients are expected to desaturate more rapidly, as in respiratory disease, or if the oxygen saturation cannot be brought to 100% prior to intubation. A limit that is appropriate for each patient presentation must be established. Keep in mind that pulse oximetry readings can be delayed as long as two minutes in the critically ill. The person monitoring the patient should inform the person intubating if any adverse events occur or if the oxygen saturation approaches the predefined limit. The intention is to prevent significant desaturation as this will negatively impact the patient.

If possible, patients should be intubated with the head of bed elevated to 30°. This will lead to decreased time to desaturation as it allows the lungs to remain expanded. In the supine position about 50% of lung volume is lost. The upright position can also assist in improving glottic views and reduces the risk of regurgitation. In the head-elevated position, the ear to sternal notch position should still be applied. This is known as the back-up-head-elevated position.

Progressing Through the Airway Algorithm

In RSI, a simple airway plan is beneficial as it minimizes the amount of complication during a stressful situation. The algorithm used in the NH RSI system is here:



An intubation attempt is defined as a laryngoscope entering the mouth. The first attempt at laryngoscopy is always the most likely to be successful. Subsequent attempts have worsening success rates and are associated with exponentially higher complication and mortality rates. Therefore, a limit of two attempts is suggested prior to progression to a supraglottic airway. Frequent complications include hypoxia, hypotension, and aspiration. The first attempt should be an optimal attempt. This means that all pertinent peri-intubation factors have been addressed and the patient is well prepared and positioned for the procedure. Providers should also be mentally and operationally prepared for first attempt success. If the first attempt is unsuccessful the second attempt must have a modified approach. Repeating the exact same technique is likely to fail again. An example would be changing to a different type of laryngoscope or employing a different patient positioning. If the second attempt fails, a supraglottic airway should be placed. If the supraglottic airway is effective and appropriate for the patient's condition, it should be left in place and no further attempts at intubation should be made. If the supraglottic device does not function adequately, a surgical airway should be performed if unable to ventilate. It is important to note that allowing a patient to awaken is rarely an option. If RSI is to be performed, then a definitive airway must be secured. When deciding to perform RSI, the possibility of performing a surgical airway should be acknowledged and accepted prior to administering medications during briefing of the airway plan. Providers should be prepared to progress through the algorithm to any extent necessary. At any point, if oxygen saturation drops below the pre-established threshold, airway attempts should cease and the patient should be reoxygenated.

Rescue Plan

Levitan

If the first attempt at intubation is unsuccessful, don't panic! It is usually easy to reoxygenate the patient and prepare for a second attempt. If the oxygen saturation has not fallen and the patient is not showing signs of distress it may be appropriate to go directly into a second attempt at laryngoscopy. If the patient is desaturating it is crucial to reoxygenate before the next attempt. An attempt should always be aborted once the pre-established saturation threshold has been reached. The following procedure should be used in this situation. This approach is suggested because attempting to ventilate a patient with a BVM while they are supine is often ineffective. The supine position leads to anatomical airway obstruction and increased risk of regurgitation.

- Ensure the patient is sitting upright, at least 30° head-up, if possible.
- Ensure a nasal cannula is in place with at least 15 lpm oxygen flowing. As long as the airway remains patent with a jaw thrust the oxygen saturation will likely increase with only the nasal cannula. Minimizing BVM use decreases risk of regurgitation and aspiration.
- Perform a jaw-thrust and apply a BVM with PEEP valve maintaining excellent mask seal. Maintaining this seal will provide CPAP.
- If necessary, provide slow, controlled ventilation with the BVM.
- Insert an oral airway if the airway cannot be maintained with jaw-thrust alone.
- Reoxygenate until oxygen saturation is maximal and the patient has been adequately denitrogenated.
- A second attempt at intubation or supraglottic airway placement may be performed once the patient is reoxygenated.
- If unable to reoxygenate using these methods, it may be appropriate to proceed with one attempt at supraglottic airway placement. If this fails, proceed with surgical cricothyroidotomy. Ideally, in this situation, one provider is attempting supraglottic airway insertion while the other is preparing for the surgical airway (double setup).

Post-Intubation

Confirm Placement

After intubation, tube placement must be confirmed and reconfirmed frequently. Initial and all subsequent breaths given should be delivered with waveform capnography. Bilateral lung sounds and the absence of epigastric sounds should be assessed for. If lung sounds are absent on one side of the chest, the tube may be placed too deep, in a main stem bronchus. If this is the case, withdraw the tube gradually until lung sounds are heard bilaterally. Also, consider other causes of absent lung sounds such as pneumothorax. Waveform capnography must remain in place for the duration of care as it is the most reliable and immediate indicator of tube displacement. Colorimetric $ETCO_2$ and esophageal detector devices are not acceptable.

Secure Endotracheal Tube
The tube should be secured using a commercial device or other reliable means. Standard tape is not recommended as it is easily dislodged and does not perform well if it becomes wet with secretions or other substances. Note the depth the tube is placed at the level of the tooth or gum line.

Medications
Administer analgesia and sedation as described previously. Continued paralysis should be considered in patients who are significantly combative or restless even after adequate analgesia and sedation. Avoid over sedation by considering paralysis early. It should also be considered in patients where ventilation must be strictly managed mechanically such as in head trauma with increased ICP or in COPD and asthma. REMEMBER: Patients who are paralyzed with rocuronium or vecuronium still require the same level of sedation as those who are not. These patients will not move or show other obvious outward signs of distress. Sedation should be administered regularly and/or based on increases in heart rate, blood pressure, respiratory rate, $ETCO_2$, or other signs of discomfort or distress

Gastric Tube
All intubated patients should have an orogastric (preferred) or nasogastric tube placed if feasible. This reduces gastric distention that may have been caused by BVM ventilation prior to intubation. It also decompresses the stomach, reducing intra-abdominal pressure which can improve respiratory function.

Patient Positioning
Intubated patients should be upright whenever possible, ideally head of bed at 30° or higher. This allows the lungs to expand more easily and completely. It also decreases intracranial pressure. Patient who are strongly suspected to have cervical spine injury should remain supine if it does not cause respiratory or airway compromise.

Reassessment
Patients should be continuously reassessed after intubation. This should be performed in a methodical fashion moving from one item of assessment to the next repeatedly. Assessments should include tube placement, hemodynamics, oxygenation, and looking for the need for additional analgesia or sedation. Tube placement should be reassessed anytime the patient is moved.

Delayed Sequence Intubation (DSI)
DSI is a technique that can be used in certain situations to allow the provider more time to adequately preoxygenate a patient or perform other procedures necessary prior to intubation. There may be cases where patients are combative, uncooperative, or in significant respiratory distress and cannot be adequately preoxygenated without sedation. Examples include asthmatics with hypoxia who have altered mental status or combative patients who have overdosed on medication. In DSI, ketamine is given IV or IM and the patient enters a dissociated state. Patients who have received ketamine generally maintain their own airway and continue to have spontaneous respiratory activity. After ketamine is given, the patient can be adequately preoxygenated using whichever means is necessary (NRB, CPAP/BiPAP, BVM) and any further preparation that is needed can be performed. Once the patient has been preoxygenated and is

prepared adequately for intubation, the paralytic agent is administered and the intubation proceeds as usual. All preparation for standard RSI should be done prior to the DSI procedure to prepare for the possibility that the patient fails DSI and requires RSI. If the patient does become apneic after ketamine administration, the paralytic should be administered and RSI should proceed immediately.

Notes on Positive Pressure Ventilation

Providing positive pressure ventilation (PPV) with a BVM or mechanical ventilator can be detrimental. In normal physiology, spontaneous respiration results in decreased intrathoracic pressure during inspiration and equalization of intrathoracic pressure during exhalation. The decrease in intrathoracic pressure during inspiration is a primary mechanism for delivering preload to the right ventricle. In patients with hemodynamic compromise this mechanism for preload is essential for ensuring cardiac output. When PPV is provided, physiology is reversed. A PPV breath causes an *increase* in intrathoracic pressure which does not occur during normal respiratory function. This results in a decrease in venous blood return to the heart which can cause cardiovascular collapse. In patients where PPV is a concern, consider delivering lower PEEP or tidal volume if oxygenation is not compromised. Intrathoracic pressure will be lower using these techniques. Patients with massive pulmonary embolism or other causes of right ventricular failure are at high risk for peri-intubation arrest. These patients should not be intubated if at all possible.

Specific Situations

There are several patient conditions that are frequently encountered in the pre-hospital setting that require individualized or specific management. The examples described here will attempt to cover the most difficult and frequently encountered situations and some nuances to their management. There are certainly many presentations that will not be mentioned.

Traumatic Brain Injury

Patients with severe head injury often require RSI. These patients have been shown in literature to benefit from pre-hospital RSI when performed properly. Conversely, if performed poorly, pre-hospital RSI has been shown to worsen outcomes in head injured patients. This has been primarily attributed to episodes of hypoxia or hypotension during intubation and inadvertent or purposeful hyperventilation after intubation.
Often in severe head injury there is a pathological respiratory disturbance. This can be characterized by hypoventilation, hyperventilation, or irregular ventilation. In any case, these complications can significantly worsen patient outcomes due to derangements in CO_2 levels that cause increases in ICP. In addition, patients with severe head injury and altered mental status often cannot maintain their own airway and require intervention.

- Patients with head injuries can be positioned in the ear to sternal notch method as any other. Patients in cervical collars can still have their head elevated without causing harm. Open the front of the cervical collar prior to intubation and use manual in-line stabilization.
- Intubation of a head injured patient should be done slowly and non-traumatically. Simply performing laryngoscopy can increase ICP; perform the procedure as gently as possible.
- Rocuronium should be considered as the primary paralytic as succinylcholine may cause increased mortality in this patient population. This may be due to increased ICP caused by fasciculation or increased cellular oxygen consumption.

- After intubation, head injured patients must have their ventilation strictly controlled being careful not to hyperventilate or hypoventilate. $ETCO_2$ should be used to guide ventilation with a goal of 35 mmHg. Hyperventilation should only be performed if the patient has evidence of ACUTE brainstem herniation which would be evidenced by seizure activity, dramatic increase in BP, decrease in heart rate, or dilation of one pupil. Hyperventilation to an $ETCO_2$ of 30 mmHg can be employed in this case for a maximum of 10 minutes as a rescue treatment.
- Ketamine should be used for induction of the head injured patient. Previously, it was thought that ketamine increased intracranial pressure. However, this has been disproven and there is evidence that ketamine may lower intracranial pressure and be neuroprotective. In addition, hypotension in patients with head injuries can be detrimental. This is because as ICP increases, blood pressure must increase to maintain cerebral perfusion pressure. This is described by the equation MAP - ICP = CPP. A CPP of 60 mmHg is commonly considered the minimum necessary for adequate brain perfusion.
- Ongoing paralysis with rocuronium or vecuronium should be considered in patients with head injuries. This allows the mechanical ventilation to be managed completely without the patient attempting to breath on their own. This is beneficial for the reasons mentioned previously.
- After intubation, an effort should be made to sit the patient upright. This may be difficult in the setting of trauma but the upright position will help reduce ICP by facilitating blood and cerebrospinal fluid drainage.

Asthma and COPD

Patients with reactive airway disease often present in severe distress and require intubation. These patients are in distress because they have, primarily, an inability to exhale due to bronchoconstriction. This often leads to hypercapnia which can cause lethargy and altered mental status. Tachypnea also contributes to respiratory distress as there is not enough time allowed to fully exhale causing further over inflation of alveoli. Intubation and positive pressure ventilation has potential to worsen the patient’s condition. This should be considered fully before deciding to intubate and intubation should be avoided if possible.

- These patients must be maximally preoxygenated prior to intubation. They have a very poor functional reserve capacity meaning they will desaturate faster than a patient with healthy lungs. Consider using DSI to facilitate preoxygenation.
- A fluid bolus should be administered prior to and during intubation. Patients with reactive airway disease often have increased intrathoracic pressure which means poor venous return to the heart. They also may have increased pulmonary artery pressure which means they are preload dependent. Intubation and positive pressure further increases intrathoracic pressure and decreases venous return to the heart.
- Have a low threshold to initiate vasopressors prior to intubation and always have them ready for use immediately after intubation for the reasons stated above.
- Ketamine should be used as the induction agent for its potential bronchodilatory and positive hemodynamic effects.
- After intubation, these patients must have their ventilation managed properly to prevent worsening of their condition. Usually, there is a need for a prolonged expiratory phase. This must be allowed with BVM or mechanical ventilation by lowering respiratory rate

significantly, usually 6-10 breaths/minute. The rate may be as low as necessary to allow the capnography waveform to return to baseline after exhalation.
    - Auto-PEEP must be considered. If exhalation is not allowed or if the patient has severe bronchoconstriction, air trapping can occur within the alveoli. This results in an increasing intrathoracic pressure which can result in decreased venous return to the heart or pneumothorax. Signs may include bradycardia, hypotension, or sudden PEA cardiac arrest. If auto-peep occurs, remove the BVM or ventilator circuit and allow the patient to exhale fully. It may also be necessary to physically push on the patient's chest to force exhalation. Also, assess for pneumothorax and perform needle decompression if suspected.
- Consider continued paralysis with rocuronium or vecuronium to allow the precise ventilation that is necessary.
- Ensure that you have a method for delivering in-line nebulizer treatments to intubated patients as theses therapies must be continued.

Congestive Heart Failure

In CHF induced pulmonary edema, the left ventricle is not pumping effectively enough to circulate blood forward. The result is often cardiogenic shock and severe respiratory difficulty. These patients may present with elevated blood pressure due to arterial vasoconstriction attempting to compensate for poor cardiac output. Despite having increased blood pressure these patients are often in cardiogenic shock and heavily reliant on endogenous catecholamine support to maintain circulation. The RSI process can result in cardiovascular collapse if not performed properly. In addition, these patients require some specific respiratory support to allow clinical improvement.

- Always position CHF patients as upright as possible. They should remain upright prior to, during, and after intubation whenever possible.
- Prepare vasopressors prior to intubation so that they are ready if the patient decompensates during the peri-intubation period.
- These patients require high levels of PEEP (10-15 cmH_2O) throughout the process. This includes during preoxygenation and after intubation. Preoxygenation with CPAP or BiPAP is often most effective.
- Utilize nitroglycerin liberally in accordance with protocol in hypertensive CHF patients with severe dyspnea.

Metabolic Acidosis

In some cases, patients with severe metabolic acidosis require urgent airway and ventilator management. While most EMS services cannot test pH in the field, acidosis can be suspected based on clinical presentation. Some of the most common causes of metabolic acidosis are diabetic ketoacidosis, salicylate poisoning, and rhabdomyolysis. Because these patients are significantly acidotic, they will often be extremely tachypneic. This is due to respiratory compensation as they try to expel more carbon dioxide to increase their pH. It is commonly manifested as Kussmaul respirations in DKA. If possible, avoid intubation of tachypneic patients with metabolic acidosis.

- These patients can decompensate rapidly during RSI because they often cannot tolerate the apneic period. In this situation, it may be beneficial to provide **gentle** BVM ventilation during the time between medication administration and paralysis onset. As always, this should be done extremely diligently taking care to not insufflate the stomach.

- After intubation, these patients may require a faster ventilatory rate. For example, if a patient with metabolic acidosis starts with a respiratory rate of 30 bpm and then they are ventilated at 12 bpm after intubation they are likely to experience an acute decrease in pH and decompensate. Attempt to match their previous minute volume without causing auto-PEEP or barotrauma.
- Many causes of metabolic acidosis, such as DKA, are accompanied by hyperkalemia. For this reason, succinylcholine should be avoided.

Pulmonary Embolism (PE)

Patients who are in extremis due to PE present a unique challenge in regard to respiratory support. These patients have increased pulmonary artery pressure due to obstruction. This leads to a dilated right ventricle and increased right ventricular pressures. Because of this, these patients rely completely on adequate preload to meet the pressure demands of the pulmonary vasculature. In the setting of a large PE, patients often present with hypoxia and severe respiratory distress. They often remain hypoxic despite delivery of maximal oxygen concentration.

- Intubation and/or positive pressure should be avoided if possible. Delivering positive pressure ventilation will decrease venous return to the heart and potentially cause severe hemodynamic compromise.
- If intubation is indicated, patients must be adequately resuscitated prior to administration of the induction agent. This includes preparation or administration of vasopressors. Consider initiating vasopressors empirically prior to RSI. Push dose epinephrine should be prepared for peri-intubation use if necessary.
- IV fluid should be used cautiously, if at all, in patients with pulmonary embolus or any time pulmonary hypertension is suspected. This is because the right ventricle often cannot handle additional volume due to the increased stress caused by high pulmonary artery pressures. This can lead to rapid deterioration if the right ventricle is overstressed.
- Ketamine should be used as the induction agent as it is more likely to maintain hemodynamic stability. Use a lower induction dose if patient is at risk for hypotension.
- After intubation, care should be taken to deliver the lowest amount of pressure possible during ventilation to allow minimal increase in intrathoracic pressure.

Sepsis

Patients with sepsis often have respiratory compromise. This may be due to a primary respiratory infection or respiratory distress due to compensation mechanisms. In any case, sepsis patients with severe respiratory distress or hypoxia refractory to non-invasive methods should receive endotracheal intubation. Septic patients are often hypotensive or have the potential to become hemodynamically compromised due to hypovolemia or relative hypovolemia due to venodilation. They are also often catecholamine depleted and frequently require vasopressors.

- An IV fluid bolus should be administered before and during intubation. Vasopressors should be considered prior to intubation as hemodynamic compromise is likely during or after the RSI process.
- Ketamine should be used for induction as it is the most hemodynamically stable option. Also, etomidate may cause adrenal suppression in sepsis patients.
- After intubation, care should be taken to use minimal tidal volume as to reduce the risk of acute lung injury.

Hemorrhagic Shock

Patients who have sustained severe trauma with substantial amounts of blood loss often have altered mental status or respiratory distress. This type of patient is at significant risk of becoming hemodynamically unstable during RSI or after the procedure. This is due to the removal of spontaneous respiration and administration of positive pressure ventilation which decreases venous return to the heart.

- If possible, the airway should be temporized with basic maneuvers. This will prevent hemodynamic risk of RSI and prevent unnecessary delay to surgical intervention at the hospital.
- If intubation is necessary, ketamine at a reduce dose should be used as the induction agent for its hemodynamic benefit.
- Blood pressure goals are often unique in hemorrhagic shock. There is likely benefit to allowing some degree of hypotension and avoiding the administration of IV fluid. Crystalloids dilute clotting factors and increasing blood pressure may cause clots to be dislodged. Provide IV fluid and vasopressor support minimally and only as needed to maintain adequate blood pressure.

Exposure to Fire/Heat

Patients who are exposed to smoke, fire, or high temperature gases often require airway intervention. These patients are often conscious and talking but have potential to deteriorate due to ongoing airway swelling and inflammation. Early intervention is critical if airway burns are suspected.

- Signs of possible airway compromise include hoarseness, sore throat, soot in mouth or pharynx, singed nose or facial hair, respiratory distress, cough, hypoxia, and tachypnea.
- Always be prepared to perform a surgical airway as laryngeal or subglottic swelling may prevent passage of an endotracheal tube.
- Consider use of hydroxocobalamin (Cyanokit) for smoke exposure as per protocol.

Documentation

It is essential that EMS documentation is accurate, complete, and consistent. This is especially important when documenting an RSI. There are specific areas in TEMSIS that must be specifically addressed. Good documentation enables services to track performance and use the data to improve care.

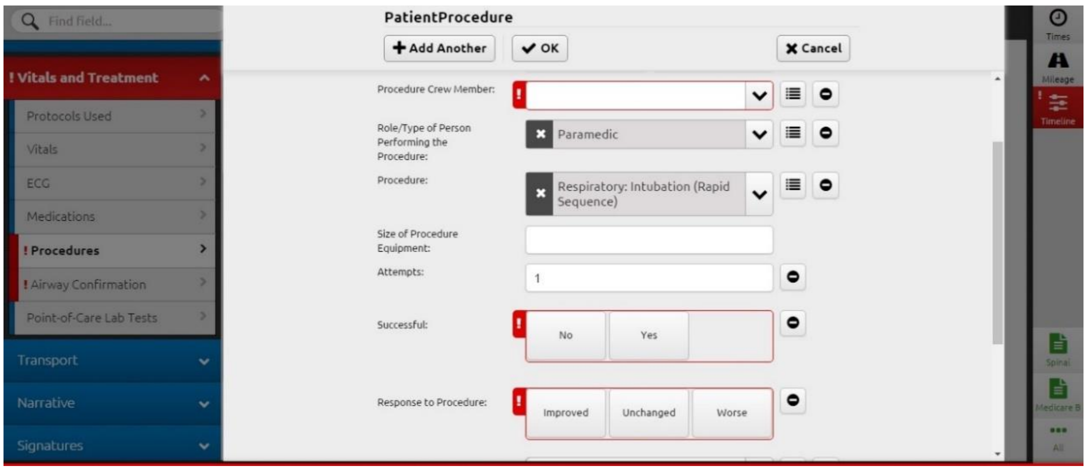
Interventions and Vital Signs

Documentation of all vital signs and interventions in the treatments section in TEMSIS allows the reader to determine the timeline of events and responses to procedures easily. It also allows data to be easily obtained and evaluated from the TEMSIS system. This is extremely important for the QA/QI process.

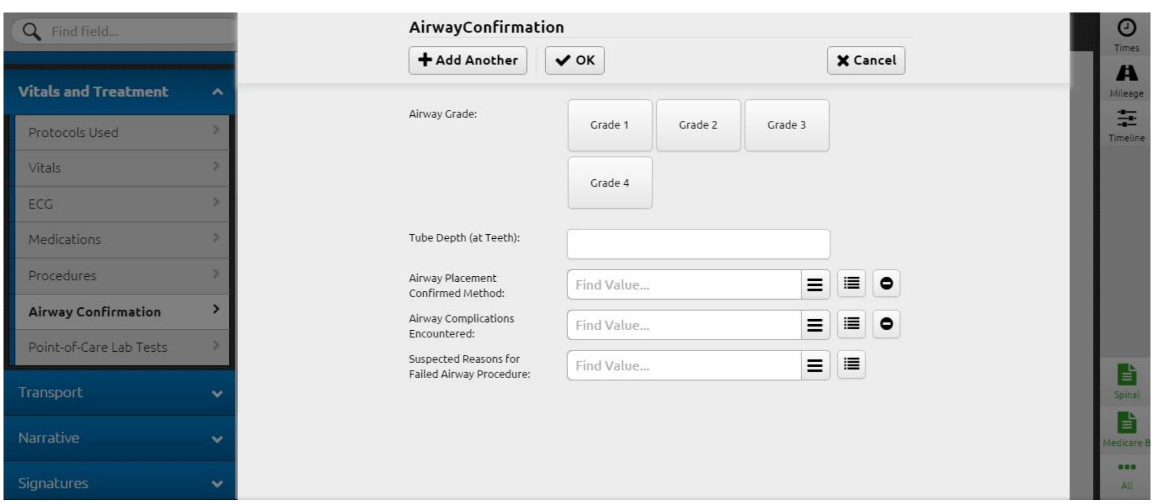
- Vitals should be obtained frequently in critically ill patients. During the RSI process, blood pressure should be recorded at least every five minutes.
- Document all medications administered and accurate times under the Treatment section.
- An intubation after RSI medications are given should be documented as a separate procedure under “Procedures” > “Respiratory: Intubation (Rapid Sequence)”. Do not use “Respiratory: Intubation (Orotracheal)” or “Respiratory: Intubation (Orotracheal Using Bougie Device)”. One procedure should be documented for each provider that attempts.

For example, if one paramedic has one attempt that is unsuccessful and another paramedic completes the second attempt successfully there should be two RSI procedures listed that each specify the provider who completed them.

- Enter the number of attempts at intubation accurately. An attempt is defined as the number of times a laryngoscope was placed in the mouth.
- Enter “Yes” or “No” for the “Successful:” category. Success is defined as an endotracheal tube placed in the trachea that allows effective ventilation and oxygenation.



- Airway confirmation and complications should be fully documented under “Airway Confirmation”.
- Select the appropriate airway grade based on the view that was present when the tube was passed.
- Enter the tube depth at the teeth or gums once it was secured. If the tube had to be withdrawn due to main stem bronchi placement, enter the depth AFTER it was withdrawn.
- Select all methods that were used to confirm tube placement.
- Enter all complications that were encountered and the suspected reasons for them.



Narrative

The narrative should be written with careful attention to detail. All aspects of the patient encounter should be covered and allow the reader to picture the call as it occurred. In addition, the thorough process and justification behind the RSI should be explained. All details of the procedure should be documented and all available methods of ET tube confirmation, initial and ongoing, should be explicitly explained. A sample narrative is below:

C: Dispatched to a residence for respiratory distress. Responded immediately with the first response agency and fire department.

H: Patient, 58 y/o male, complains of worsening dyspnea over the past few hours. He states that he now feels fatigued and cannot take deep breaths. He denies any chest pain, dizziness, nausea, or other associated symptoms. Patient has history of congestive heart failure and takes furosemide daily. He sleeps with a CPAP machine and uses three pillows. He has other history of myocardial infarction with CABG and has a pacemaker. No known allergies.

A: Patient found alert and oriented to person, place, and time GCS 15 sitting in chair appearing in severe respiratory distress speaking two words at a time. He appears pale, diaphoretic, and fatigued. Airway patent, skin cool/pale/diaphoretic, HEENT unremarkable, neck veins distended, spontaneous/rapid/shallow/labored respirations with equal chest excursion, RR 36 bpm, rales heard bilaterally, abdomen soft/non-tender/non-distended, bilateral pedal edema present, weak/rapid radial pulses. 4-lead sinus tachycardia at 120 bpm without ectopy. 12-lead sinus tachycardia without ectopy or ST/T-wave changes, normal QRS axis/duration. Initial ETCO2 30 with normal waveform and tachypnea. Oxygen saturation on room air 76%. Hypertensive at 220/120 mmHg.

R/T: Vitals monitored. Continuous EKG monitoring. Nasal cannula at 15 lpm and CPAP at 10 cmH_2O applied with high flow oxygen. Patient moved to ambulance via stairchair and positioned fowler's on stretcher. Patient continues to have severe distress and becomes anxious and agitated with CPAP. Oxygen saturation on CPAP 82%. Due to continued respiratory distress/failure and intolerance of CPAP decision made to secure airway using RSI. Nasal cannula oxygen at 15 lpm placed. CPAP left in place as tolerated for preoxygenation. Patient in fowler's during preoxygenation. 20 gauge IV left AC established. All appropriate monitoring applied. HOp considered and plan for procedure established: first attempt with Mac 4, second attempt with Miller 4, supraglottic, BVM/surgical. Equipment setup including suction, alternative airways, and surgical airway equipment. Patient height 5'10", ideal body weight is 73 kg. 150 mg ketamine and 75 mg rocuronium administered IV. Patient becomes dissociated within seconds and paralyzed 45 seconds after. Patient repositioned to 30° head up and ear to sternal notch for intubation. 8.0 mm ETT placed without difficulty using Mac 4 laryngoscope on first attempt using bougie. ELM and head elevation used to obtain grade 1 glottic view and bougie visualized passing through the cords. Tracheal rings felt and bougie hold-up occurs. ETT advanced over bougie until cuff past cords. Bougie removed and cuff inflated. Tube secured at a depth of 24 cm at the teeth. BVM ventilation with 10 cmH_2O PEEP initiated with waveform capnography, bilateral lung sounds present, and no epigastric sounds. BVM ventilation continued at a rate of 12 bpm and titrated to $ETCO_2$ of 35-45 mmHg. Oxygen saturation improves to 96% with 15 lpm O2 via BVM. Patient placed back in fowler's position. 100 mcg fentanyl IV for analgesia. Ketamine infusion initiated at 3 mg/kg/hr and titrated to 4 mg/kg/hr via IV pump with adequate

continued sedation. 16 fr OG tube placed to depth of 55 cm with positive epigastric sounds on air insufflation. After intubation blood pressure decreases to 170/100 mmHg and heart rate decreases to 100 bpm. Nitroglycerin IV infusion initiated at 50 mcg/min and titrated to 100 mcg/min during transport. Tube placement continually reassessed and monitored using waveform capnography and lung sounds. No other changes during transport. Upon arrival at the Emergency Department patient lifted to bed and care transferred to Dr. Smith who verifies proper ET tube placement.
Signed, NRP

Additional Resources
(Some details in these resources may differ from this manual or state protocol. In this case, always follow this manual or NH state protocol)

EMCrit Airway Resources
http://emcrit.org/podcasts/emcrit-intubation-checklist/
http://emcrit.org/preoxygenation
https://emcrit.org/pulmcrit/preoxygenation-apneic-oxygenation-using-a-nasal-cannula/

emDocs Airway Tips
http://www.emdocs.net/novel-tips-airway-management/

Bed-Up-Head-Elevated Position
https://coreem.net/journal-reviews/buhe-position/

LITFL Airway Resources
http://lifeinthefastlane.com/own-the-airway/
http://lifeinthefastlane.com/ccc/airway-cervical-spine-injury/

Physiologically Difficult Airway
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4703154/ -The Physiologically Difficult Airway
http://rebelem.com/critical-care-updates-resuscitation-sequence-intubation-hypotension-kills-part-1-of-3/
http://rebelem.com/critical-care-updates-resuscitation-sequence-intubation-hypoxemia-kills-part-2-of-3/
http://rebelem.com/critical-care-updates-resuscitation-sequence-intubation-ph-kills-part-3-of-3/
http://emcrit.org/podcasts/tube-severe-acidosis/
http://emcrit.org/podcasts/intubation-patient-shock/
http://emcrit.org/podcasts/lamw-oxygenation-kills/

Common Airway Pitfalls
http://www.emdocs.net/difficult-airway-common-errors-intubation/
http://epmonthly.com/article/avoiding-common-laryngoscopy-errors/

Surgical Airway
http://www.acepnow.com/article/tips-tricks-performing-cricothyrotomy/?singlepage=1
http://www.acepnow.com/article/make-incision-insert-tube-cricothyrotomy/?singlepage=1

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