



# Introduction

## Chapter 1

### What is RSI?

Rapid Sequence Intubation (RSI) is defined as a series of steps, which must include the administration of a paralytic agent, to a critically ill or injured patient who is presumed to have a full stomach, in order to facilitate rapid, successful oral intubation while minimizing complications.



#### ***Why does it seem like everyone eats and drinks right before their accident?***

*For one thing, many people do! However, as soon as your body suffers grave injury or illness, gastric motility shuts down. This means that the normal secretions into the stomach and swallowed saliva as well as any residual food and drink will not pass into the intestines. So every critically ill or injured patient really does have a full stomach and is waiting to aspirate, regardless of whether or not they just ate. This is a time bomb in airway management.*



The nearly simultaneous administration of both a neuromuscular blocking agent (paralytic) and a potent induction agent will facilitate intubation while decreasing the risks of aspiration, elevated intracranial pressure and airway trauma. When properly done, the patient literally can no longer breathe without the clinician. There is ample evidence that both pediatric and adult patients emergently intubated with the principles of RSI by a trained, experienced provider, have both lower complication rates and higher success rates when compared to other common intubation techniques, including intubation without pharmacological assistance, blind nasotracheal intubation and sedation-facilitated intubation.



Rapid Sequence Intubation should be distinguished from both “Rapid Sequence Induction” and “Sedation-Facilitated Intubation”.

## Rapid Sequence Induction

In this technique, which is used by anesthesiologists and anesthesiologists in the O.R., the end-point is the induction of anesthesia rather than intubation. This technique is used primarily in fasted patients at low risk of aspiration (i.e. an empty stomach). Many such patients are managed exclusively with a laryngeal airway or other extraglottic airway device (EAD) rather than intubation for the duration of the case.

## Sedation-facilitated Intubation (SFI)

This technique involves the administration of a powerful sedative drug such as midazolam or etomidate without a paralytic. While this sounds intuitively appealing in that it avoids the risks of paralysis, it is problematic for several reasons. A dose of medication that may only make a healthy person relaxed may have profound effects in a fragile patient. When given to critically ill or injured patients, these drugs may produce apnea and blunt the patient’s ability to protect their airway without eliminating the gag reflex or their ability to vomit. Furthermore the sedative alone does not overcome muscle tone like a paralytic does, thus failing to optimize laryngoscopy. **Taken together, this may be a recipe for disaster: sticking a big piece of metal down the mouth of a patient who still has the ability to gag and vomit, but limited ability to protect their airway, without improving your chances of success!**

In the academic Emergency Department setting, Sagarin et al report a first-intubator success rate of 91% with RSI compared with 84% for SFI. This may seem to be a small difference but it can have important implications in this critical patient population, especially when associated with the potential for serious complications. Prehospital studies have found success rates for SFI from 25% to 87%, well below the rates for RSI.





In the case of a predicted difficult airway, the very situation when many providers are drawn to SFI, embarking on a procedure with a proven lower success rate and a higher potential for complications is probably not the wisest course of action. Appropriate options in this circumstance will be discussed later.

*Airway911* bottom-line: avoid SFI if at all possible

***Is there ever a time you would attempt sedation-facilitated intubation?***

*I have been doing this long enough to never say "never." Every circumstance is different. SFI may be safe and successful in the setting of elective intubations of fasted patients in the operating room setting or semi-elective intubations of fasted patients in the ICU setting, for example. I have had the unfortunate displeasure of actually witnessing several aspiration events that occurred from SFI using etomidate. I cannot imagine a time I would try it in any patient at risk of having a full stomach though I know of some excellent physicians experimenting with the use of ketamine in this circumstance.*

***What is drug-assisted or medication-facilitated intubation?***

*This terminology is becoming more common. Some sources consider it a more general term that covers everything from sedation-facilitated intubation to RSI. While this may become the "politically correct" terminology, I prefer to use more specific terminology. To me, a conversation or policy about sedation-facilitated intubation is very different than one about RSI or one about RSA.*

## What is RSA?

RSA stands for Rapid Sequence Airway. This is a new approach to emergency airway management being introduced in some EMS and air medical services. RSA involves all the same preparatory steps and pharmacology as RSI but the goal is insertion of an extraglottic airway device (EAD) rather than intubation. The fundamental concepts behind RSA are: 1. the greater than




realized aspiration protection afforded by some EADs and 2. the potential for significant hypoxemia and transport delays during out-of-hospital RSI. RSA is discussed further in Chapter 7.

## The Spectrum of Airway Management

Although this is a textbook about RSI, it is important to realize that not all patients need RSI. In fact, outside of the O.R., most patients do not require airway management at all. Of those patients who do require airway management, most do not need intubation. And of those who do need intubation, not all require RSI.

There is a spectrum of airway management that progresses from awake to nearly dead as mental status and respiratory failure worsen. RSI/RSA may occur at variable points along the middle of the spectrum. When performed earlier in the spectrum, the patient has more reserve to tolerate the procedure but the stakes are also much higher if something goes wrong.

The spectrum of airway management	
Position of comfort	Awake
Supplemental oxygen	
Non-invasive PPV	
Bag-valve-mask "assisted" respirations	
Nasopharyngeal airway	
Oropharyngeal	
Bag-valve-mask ventilation	
Blind Nasal intubation	
Extraglottic airway without medications	
Oral intubation without medications	Nearly Dead



## Four Purposes of RSI

1. To permit laryngoscopy when the patient is awake, has intact airway reflexes and/or has trismus (jaw muscle spasm seen in some severely injured patients)
2. To improve laryngeal view and increase the success of intubation by overcoming intrinsic muscle tone
  - The three inherent obstacles to laryngoscopy are:
    - Patient anatomy - not modifiable
    - Muscle tone - modifiable with paralytic agents
    - Technique - modifiable with education and practice
3. To minimize complications such as aspiration and increased ICP as compared to intubation without RSI
4. To allow total control of the patient, thereby facilitating life-saving treatments and diagnostic studies

## Five Indications for RSI

1. Impending or actual respiratory failure
  - Example: anticipated airway edema from burns and trauma
  - Example: marked fatigue due to increased work of breathing
2. Impending or actual inability to maintain airway
  - Example: GCS<9 or rapidly decreasing level of consciousness
3. Hypoxemia despite supplemental O<sub>2</sub>
  - Note that this is also a definition of failed airway. This potential confusion will be addressed later
4. Combative with high suspicion of significant head injury
  - Note that many such patients are simply intoxicated
5. To facilitate transfer, specific treatment or evaluation

### ***Are these situations always handled with RSI?***

*No. Intubation should be the treatment of last resort for all of these conditions. When intubation becomes necessary and the patient is at risk for aspiration, RSI is usually the method of choice.*



# Contraindications for RSI

## Absolute Contraindications

The absolute contraindications are cardiac or respiratory arrest. There is no advantage to using RSI in the patient who has had an arrest as they should have no muscle tone (except rigor mortis!). In most other patients, RSI is faster and safer than any alternative technique. RSI should be considered in every non-arrested patient requiring emergency intubation.

## Relative Contraindications

The relative contraindications include: 1. an anticipated difficulty intubating the patient and/or 2. an anticipated difficulty in bag-valve mask ventilation (BVMV) should intubation fail. These considerations will be explored in depth later. When relative contraindications are present the provider should consider other potentially safer options such as bag-valve-mask ventilation, watchful waiting (with rapid transport if appropriate), awake intubation, nasal intubation, etc. These options will be discussed in later chapters.

The third relative contraindication is 3. the crash airway. This is the patient who is not yet in cardiac or respiratory arrest but very close. In these patients it is generally advisable to avoid any delays and attempt immediate intubation without RSI. In the event that the patient appears to have enough “fight left in them” that intubation is likely to be unsuccessful, traumatic or trigger vomiting, then the attempt can be aborted and RSI attempted.

### ***Does this mean I should never attempt RSI if the airway looks difficult?***

*Absolutely not. These are only relative contraindications. If the patient needs emergent airway management you will sometimes need to forge ahead even when the airway is anticipated to be difficult. An extreme example would be the morbidly obese immobilized patient with multi-system trauma, severely decreased mental status, vomiting, seizure activity, trismus and very decreased oxygen saturations on a non-rebreather mask. While this may indeed be a true airway nightmare, there is little choice but to proceed with RSI if we hope to save the patient. We must be thinking ahead, however, and be prepared for a difficult and missed airway. This is our scary business!*





Caution

## Complications & Risks of RSI

The risks of RSI can be great and numerous. Since cardiac or respiratory arrest are absolute contraindications to RSI, anyone who undergoes RSI is, by definition, breathing. This may not be very effective breathing – hence the reason we may be considering RSI - but it is breathing nonetheless. **If you take away that respiratory drive with medications and intubate the esophagus and fail to recognize it or are unable to maintain critical oxygenation, whether or not you are able to get them intubated, you are at risk of the “clean kill”.** Other potential complications of RSI include:

- Aspiration
- Hypoxemia
  - particularly dangerous for patients with acute neurological problems or underlying cardiovascular/cerebrovascular disease.
- Increased intracranial pressure
  - problematic in patients with critical ICP at the outset.
- Bradycardia
- Oropharyngeal and laryngeal trauma

## Take Home Points

- Rapid Sequence Intubation (RSI) is defined as a series of steps, including the administration of a paralytic agent, to a critically ill or injured patient (who is presumed to have a full stomach) in order to facilitate rapid successful orotracheal intubation while minimizing complications
- Sedation-facilitated intubation is generally discouraged in emergency situations as the risk of complications is higher and the success rate is lower than with RSI
- Three obstacles to laryngeal view:
  1. Patient anatomy
  2. Muscle tone
  3. Operator technique
- Indications for RSI:
  1. Actual/impending respiratory failure
  2. Actual/impending inability to protect the airway
  3. Combative secondary to presumed head injury
  4. Hypoxemia despite supplemental oxygen
  5. Facilitate evaluation/treatment/transfer
- Absolute RSI contraindications:
  1. Respiratory arrest
  2. Cardiac arrest
- Relative RSI contraindications:
  1. Anticipated difficult intubation
  2. Anticipated difficult BVMV
  3. Crash airway
- RSI risks:
  1. Failure to intubate
  2. Aspiration
  3. Hypoxemia
  4. Increased ICP
  5. Bradycardia
  6. Trauma
  7. Esophageal intubation