RSI 101

Outline / Notes / References

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Objectives:

- Review the concepts of RSI
- Discuss the 7P's of RSI
- Review the relevant medications used for RSI
- Consider Human Factors involved in RSI

RSI

- Rapid sequence intubation (induction) is utilized in a patient who needs emergent control/establishment of an airway. A combination of medications is used to achieve sedation, analgesia, and paralysis, to introduce an endotracheal tube into the trachea.
- It's vitally important to focus on the SEQUENCE, not just rapid tube delivery!

7 P's of RSI (AHA 2010)

- Preparation
- Preoxygenation
- Premedication/Sedation
- Paralysis
- Protect and Placement
- Placement confirmation
- Post-intubation management

1. Preparation

Preparation is comprised of a wide variety of actions, from education, deliberate practice, equipment/medication familiarity, and planning, as well as set-up for the actual intubation. The most important consideration in the preparation step is to develop two distinct plans:

- A generic "one size fits all" plan for how staff in a particular depart will approach every RSI. This should consider each of the 7 Ps, and how a particular institution will handle them. In effect, create a "menu" of options to draw from for specific patient presentations.
- A patient-specific plan that incorporates the unique anatomy/pathophysiology and circumstances of the patient's presentation. This is critical because any patient has the potential to become the most difficult intubation encountered in one's career…

Fail to plan, plan to fail…

Always remember the potential for the laryngoscope to become a murder weapon! (emcrit.org)

American Society of Anesthesiologists
General Classification of Physical Status

1 Normal, healthy patient
2 Mild systemic disease without function limitation
3 Severe systemic disease with functional limitation
4 Life-threatening severe systemic disease
5 Moribound, not expected to survive operation
6 Brain-dead organ donor

LEMON

- LOOK externally
- EVALUATE (3-3-2)
- MALLAMPATI and ASA Scores
- OBSTRUCTION/OBESITY
- NECK MOBILITY

2. Preoxygenation

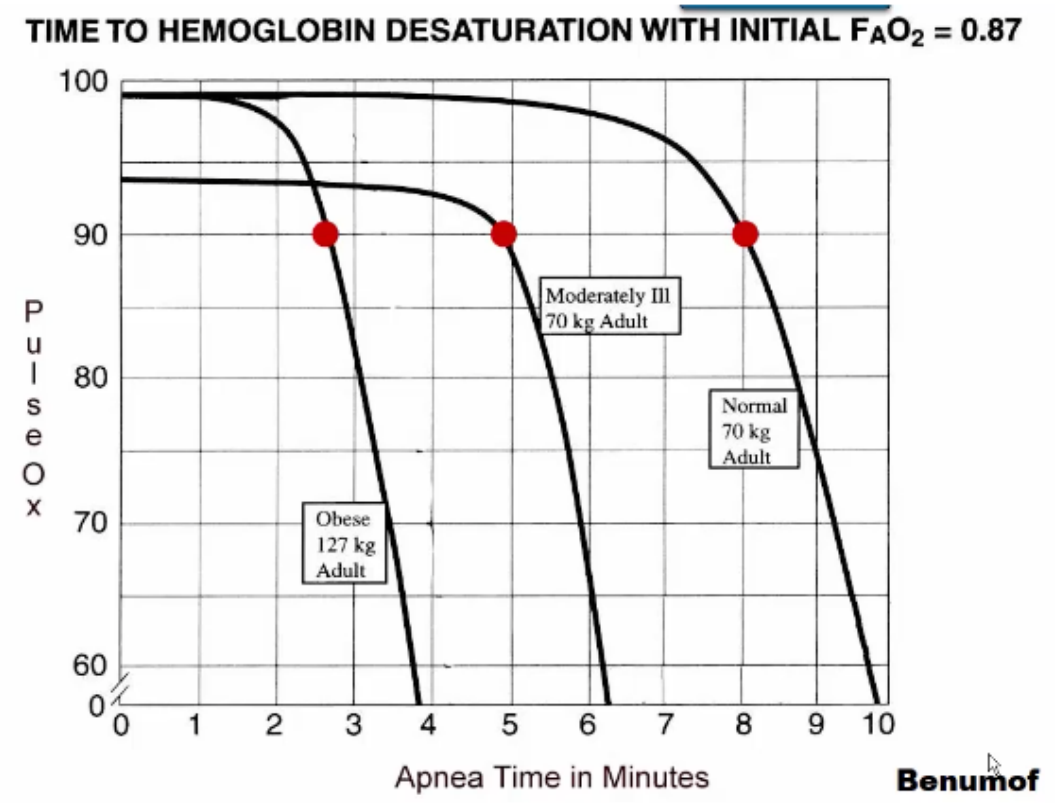
- Requires as close to 100% FiO2 as possible. For ED settings, use a nasal cannula at 15 lpm AND a non-rebreather with the flowmeter all the way open.
- CPAP or BiPap is also an appropriate option to maximally preoxygenate the patient
- Requires 3 minutes of tidal volume breathing, or 8 vital capacity breaths
- A BVM can be used as a non-rebreather due to the one-way on the exhaust port. Utilize a 2-hand seal or BiPap/OR straps to hold the mask on the patient.

Maximal preoxygentation at 100% FiO2 is required to "wash out" the nitrogen that accumulates in the lungs functional reserve capacity.

This enables patients to tolerate the apneic period without lowering their oxygen saturation (Bair, undated).

Remember: **PreOx prevents DeOx!!!**
This helps to correct for some of the "**HOP Killers**"

- **H**emodynamics
- **O**xygenation
- Low **p**H



Source: emcrit.org/preoxygenation

It is also crucial to ***add PEEP*** to your preoxygenation circuit if a SPO2 of 95% cannot be achieved with 100% FiO2 alone. This is important for patients with conditions such as CHF or pneumonia, which require pressure to help displace fluid and drive O2 across the alveolar membrane (Source: http://emcrit.org/podcasts/lamw-oxygenation-kills/).

3. Premedication

Consider resuscitating your patient ***BEFORE*** RSI!!!

- **Trauma**: Achieve hemorrhage control and activate a Massive Transfusion Protocol as appropriate…
- **Sepsis**: Initiate aggressive fluid as appropriate…
- **Shock state**: Utilize push-dose pressors (epinephrine and/or phenylephrine) as indicated and permitted by local protocols…
- **Toxic Ingestion**: Consider specific agents as indicated (e.g. naloxone, glucagon, D50, etc)…

Medications and the actual procedure of RSI can cause a drop in blood pressure. In critically ill patients who arrive hypotensive, this may be enough to precipitate cardiac arrest. Pre-resuscitating your patient may prevent the need for aggressive resuscitation after the RSI, and might provide better outcomes.

Premedication also helps to control some expected side-effects and patient characteristics including:

- Sedation
- ICP
- Vagal response
- Compliance with preoxygenation
- Analgesia

Lidocaine (Lexicomp, undated)
Has traditionally been used to control for increases in ICP related to use of succinylcholine, though research has cast doubt on its' effectiveness. Use caution in high-grade AV blocks and known sensitivity.

- Dosing is **1.5 mg/kg** given 2-3 minutes prior to intubation.

"There is currently no evidence to support the use of intravenous lidocaine as a pretreatment for RSI in patients with head injury and its use should only occur in clinical trials (Robinson & Clancy, 2001)."

Atropine (Lexicomp, undated)
Traditionally used to prevent vagal response/bradycardia during intubation attempts, specifically in children (Fox, 2014). Recent research points to a lack of necessity for most attempts, however it is important to consider the potential for cardiovascular collapse of critically ill patients secondary to bradycardia. Recent studies are also showing that there is no need for a minimum dose, however most sources recommend a minimum dose of 0.1mg.

- Dosing is **0.02 mg/kg**, with a **0.5 mg max** dose.

"Routine anticholinergic premedication is unnecessary, and…atropine should be reserved for children experiencing persistent bradycardia (Fleming, McCollough, & Henderson, 2005)."

Consider in all patients under 1 year of age, and in all patients under 5 years of age receiving repeated doses of succinylcholine.

Fentanyl (Lexicomp, undated)
Consider the physical nature of intubation and the resultant pain and distress inflicted on patients, and the bodies response to the noxious stimuli of intubation can hamper efforts to achieve adequate sedation. Many sources now point to the idea of "analgesia first sedation", whereby controlling pain allows more rapid and effective sedation.

- Dosing is **1-3 mcg/kg** given 3 minutes prior to intubation.

Etomidate (Lexicomp, undated)
Fast acting (onset: 30 seconds and duration: 3-5 minutes) sedative, with some possible neuro-protective benefits. It is important to consider the adrenal suppression caused by etomidate in sepsis patients.

- Dosing is **0.2-0.6 mg/kg** for adults
- **0.3 mg/kg** for pediatric patients.

Midazolam (Lexicomp, undated)
Fast onset (3-5 minutes) and short duration (<2 hours) benzodiazepine sedative agent, useful for both induction and maintenance.

- Induction dosing is **0.3-0.35 mg/kg** over 20-30 seconds,
- May repeat 25% of initial dose every 2 minutes to maximum dosing of 0.6mg/kg

Ketamine (Lexicomp, undated)

- Induction dose is 1-2 mg/kg

4. Paralysis

Rocuronium (Lexicomp, undated)
Nondepolarizing paralytic. Rocuronium has variable onset and duration characteristics that are dose dependent. The higher the dose given, the more rapid the onset, and the longer duration. At 0.6 mg/kg, onset of ideal intubating conditions is reported at approximately 60 seconds; at 1.2 mg/kg dosing, onset of ideal condition is noted at 30 seconds. Typical duration of action is at least 30 minutes, and may be as long as 60 minutes utilizing typical dosing.

- Dosing is **1.2mg/kg** (0.6 -1.2 mg/kg)

Succinylcholine (Lexicomp, undated)
Depolarizing paralytic, with fast onset (30 seconds) and short duration (4-6 minutes). Succinylcholine works by binding to the nicotinic receptor and forcing ion exchange to depolarize the cell, which results in transient hyperkalemia. This is important to consider in patients with burns, crush trauma, and ESRD. There is a US boxed warning for use in children and adolescents.

- Dosing is **1 – 1.5 mg/kg**, up to 2mg/kg in smaller children.

Consider Possibility for IMMEDIATE, FATAL HYPERKALEMIA:

- rhabdomyolysis, immobilization, and patients found down
- electrolyte disturbances, ESRD
- Neuromuscular disorders
- severe infections, crush injuries, and burns (greater that 72 hours)
- malignant hyperthermia

5. Protect/Place, and 6. Placement Confirmation

During the apneic period:

- Maintain the airway
- Continue oxygen via nasal cannula at 15 lpm
- Allow apneic CPAP if initiated for preoxygenation
- DO NOT SQUEEZE THE BVM unless desaturation rapidly occurs
- Intubate
- Confirm with waveform ETCO2 and CXR
- Secure tube using institutional protocols

7. Postintubation Management

Treat pain early and aggressively!!! Less pain translates to better sedation, maximal ventilation, and less adverse events.

Use a validated pain scale, such as the PAYEN score for ventilated patients.

Fentanyl (Lexicomp, undated)
- Bolus dosing: **0.35 – 0.5 mcg/kg** IV push over 1-2 minutes
- Infusion dosing: **0.7 – 10 mcg/kg/hr**

Propofol (Lexicomp, undated)
Can be bolused or used as a continuous infusion, use to achieve target sedation based on RASS score. Rapid onset (30 seconds) and short duration (3-10 minutes), however, provides **NO ANALGESIA** and causes hypotension. Propofol has an added benefit of seizure suppression.
- Initiate drip at **5mcg/kg/min**
- Titrate by 5mcg/kg/min every 5 minutes to achieve desired sedation while maintaining adequate blood pressure.

Midazolam (Lexicomp, undated)
- Bolus dosing: **0.01 – 0.05 mg/kg** over 2-5 minutes, may repeat at 5-15 minute intervals.
- Infusion dosing: **0.02 – 0.1 mg/kg/hr**

Ketamine (Lexicomp, undated)
Provides both sedation and analgesia, and may be used both slow IV push and as an infusion. Both hypersalivation and emergence reactions are reported, benzodiazepines are often used to blunt emergence reactions.
- Bolus dosing is **0.2 – 0.8 mg/kg**
- Infusion dosing is **2-20 mcg/kg/min**

Dexmedetomidine (Lexicomp, undated)
Alpha agonist that can be used for up to 24 hours. A loading dose is given over 10-20 minutes followed by a continuous infusion.
- **Loading dose is 1mcg/kg**
- **Infusion is 0.2 – 0.7 mcg/kg/hr**

Questions?
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