

# Rapid Sequence Induction Medications

What? When? How Much?

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# Disclosures

- No financial disclosures

# Objectives

1. Review Airway Management in Trauma
2. Discuss Rapid Sequence Induction (RSI)
  - a) Preparation
  - b) Sedation
  - c) Paralysis
  - d) Post-intubation management
3. Review Current Literature

# Airway Management Continuum

Nasal  
Cannula

Face Mask/  
Jaw thrust

Oral airway  
/Nasal airway

NIPPV/LMA/I-  
Gel

Intubation

Surgical  
Airway

Least Invasive

Most Invasive

# RSI

- Administration of sedative medication rapidly followed by administration of a paralytic agent.



# Remembered as the 9P's :

- Plan
- Preparation (drugs, equipment, people, place)
- Protect the cervical spine
- Positioning (some do this after paralysis and induction)
- Preoxygenation
- Pretreatment (optional; e.g. atropine, fentanyl and lidocaine)
- Paralysis and Induction
- Placement with proof
- Postintubation management



# Preoxygenation

- Oxygen!
- Minimum of nasal cannula, may require mask
- Nasal cannula can be left on during intubation = apneic oxygenation
- Remember that overall you DO NOT want to bag the patient – try to avoid vomitus and aspiration



# Sedative Medications



- Why bother?
  - Painful and fear inducing
  - Protect against agitation in patients
- Ideal agent would be r without any cardiovascular or other systemic side effect.



# Ketamine

- 1.5-2 mg/kg IV IBW
- Onset 60-90 seconds
- Duration 10-20 min
- Pro: low effect on BP or respiratory effort
- Con: cannot use in ACS, increased secretions, laryngospasm

# Propofol

- 1-2.5 mg/kg IBW
- Onset 15-45 seconds
- Duration 5-10 minutes
- Pro: very short active
- Con: significant cardiovascular effects

# Etomidate

- 0.3-0.4 mg/kg
- Onset 10 seconds
- Duration 4-10 minutes
- Con: adrenal insufficiency (sepsis)
- Pro: few side effects, less cardiovascular effects

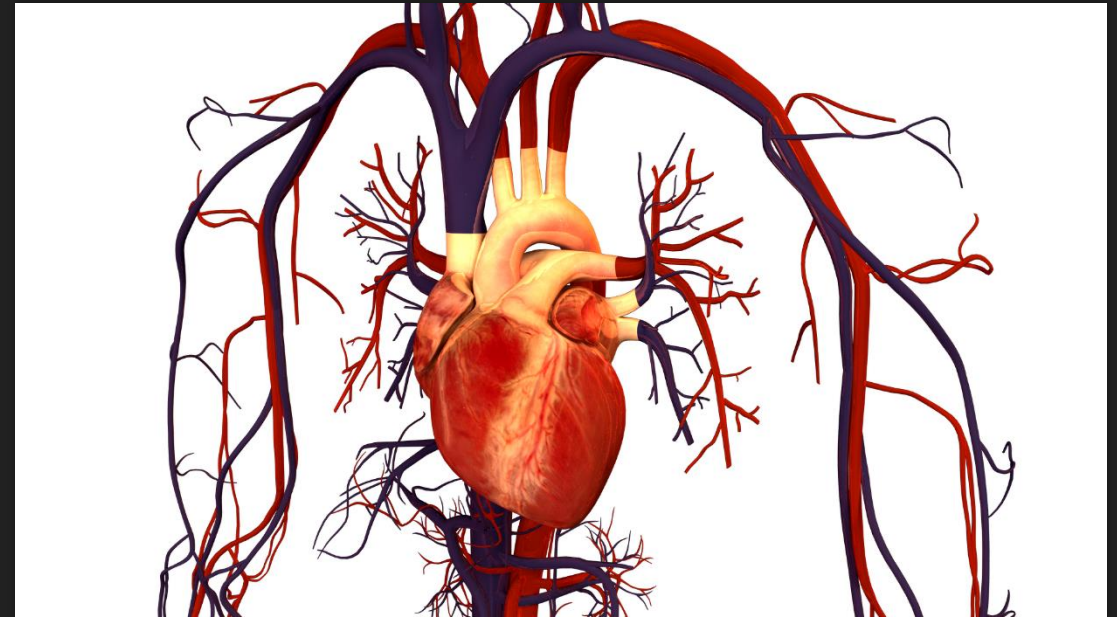
# Hemodynamics of Induction Agents

Drug	Systemic Vascular Resistance	Heart Rate	Mean Arterial Pressure	Cardiac Output
Etomidate	↔	↔	↔	↔
Propofol	↓↓	↓	↓↓	↓
Ketamine	↓/↑	↑↑	↑↑	↑

Adapted from

# Sedative Medications

- Consider resuscitation (IVF, Blood administration) prior to intubation if situation allows.
- Avoid hemodynamic depression in patients in hemorrhagic or neurologic shock.
- Consider adding a new medication to your arsenal during a routine intubation to become comfortable with it.
- More and more, ketamine is coming back as a recommended agent in trauma intubation.



# Ketamine as a Rapid Sequence Induction Agent in the Trauma Population: A Systematic Review

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The choice of drug used to facilitate endotracheal intubation in trauma patients during rapid sequence induction (RSI) may have an impact on survival. Ketamine is commonly used in the hemodynamically unstable trauma patient although it has been associated with side effects. This review sought to investigate whether ketamine should be preferred over other induction agents for RSI in trauma patients. PubMed, Embase, and the Cochrane Library were systematically searched on September 19, 2016 for studies reporting RSI of adult trauma patients with ketamine compared with another induction agent (etomidate, propofol, thiopental, or midazolam). No language restrictions were applied. The primary outcome was 30-day mortality, and secondary outcomes included information on blood transfusions, length of hospital stay, and hospital mortality. Risk of bias was assessed using the Cochrane Risk of Bias assessment tool for randomized trials and the Risk of Bias in Non-Randomized Studies of Interventions for nonrandomized studies of intervention. A total of 4 studies were included. A cohort study from 1976 compared thiopental (n = 26) with ketamine (n = 14) for RSI in trauma patients. The primary outcome was number of blood transfusions, and no significant difference was found. Risk of bias was judged to be serious. A randomized controlled trial from 2009 compared etomidate (n = 57) with ketamine (n = 47) and found no significant difference in 28-day mortality (odds ratio [OR], 0.8 [0.4–2.0]). The trial was judged to have a low risk of bias. Two cohort studies from 2015 and 2017 also compared etomidate (n = 116 and n = 526) with ketamine (n = 145 and n = 442). No significant difference in hospital mortality between the groups was observed.

# Ketamine and Intracranial Pressure: No Contraindication Except Hydrocephalus

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A **podcast** for this article is available at [www.annemergmed.com](http://www.annemergmed.com).

## SEE RELATED ARTICLES, P. 43.

[Ann Emerg Med. 2015;65:52-54.]

Shortly after the 1970 introduction of ketamine, there

patients with known cerebrospinal fluid obstruction. As is always the case in medicine, there were doubters, and the subsequent literature includes a variety of case series and trials investigating ketamine in neurologic disorders, trauma, and critical care.

In this issue of *Annals*, Cohen et al<sup>15</sup> report a systematic review of 10 controlled trials of ketamine in mechanically ventilated



# Paralysis

- Why bother?
  - To give the best possible opportunity for intubation on first attempt



# Succinylcholine

- 1-2 mg/kg TBW
- Onset 45 seconds
- Duration 6-10 minutes
- Pro: short acting
- Con: multiple contra-indications (hyperkalemia, malignant hyperthermia, crush/burns after 24 hours)

# Rocuronium

- 1 mg/kg IBW
- Onset 60-75 seconds
- Duration 40-60 minutes
- Pro: no contraindications, better outcomes in TBI?
- Con: no recourse if failed airway
- \*Suggamadex (Bridion) is a reversal agent

# Vecuronium

- 0.15-0.25 mg/kg IBW
- Onset 120-180 seconds
- Duration 45-65 minutes
- Pro: can be used if rocuronium not available and succ contraindicated
- Con: long onset, long duration, no reversal
- \*Suggamadex (Bridion) is a reversal agent

## Succinylcholine Is Associated with Increased Mortality When Used for Rapid Sequence Intubation of Severely Brain Injured Patients in the Emergency Department.

Patanwala AE<sup>1</sup>, Erstad BL<sup>1</sup>, Roe DJ<sup>2</sup>, Sakles JC<sup>3</sup>.

### ⊕ Author information

#### Abstract

**OBJECTIVE:** To compare succinylcholine and rocuronium regarding mortality in patients with traumatic brain injury (TBI) who are intubated in the emergency department (ED).

**METHODS:** This was a retrospective cohort study conducted in an academic ED in the United States. Adult patients with TBI who underwent rapid sequence intubation (RSI) in the ED with rocuronium or succinylcholine between October 2010 and October 2014 were included. The main outcome of interest was in-hospital mortality. Subjects were stratified based on severity of injury using head abbreviated injury scores. The high-severity group had a severe or critical head injury (score 4 or higher); the low-severity group had a less than severe head injury (score lower than 4).

**MAIN RESULTS:** The final study cohort included 233 patients who were underwent RSI with succinylcholine (149 patients) or rocuronium (84 patients). In patients who received rocuronium, mortality was 22% (12/54) and 23% (7/30) in the low-severity and high-severity categories, respectively (difference 1%, 95% confidence interval [CI] -18% to 20%). In patients who received succinylcholine, mortality was 14% (14/103) and 44% (20/46) in the low-severity and high-severity categories, respectively (difference 30%, 95% CI 14-46). In the multivariate analysis after adjusting for important confounders, there was no significant association between succinylcholine and mortality in the low-severity category (odds ratio [OR] 0.75, 95% CI 0.29-1.92). However, in patients in the high-severity category, succinylcholine was associated with increased mortality compared with rocuronium (OR 4.10, 95% CI 1.18-14.12).

**CONCLUSIONS:** In severely brain-injured patients undergoing RSI in the ED, succinylcholine was associated with increased mortality compared with rocuronium.

# Post-Intubation Management

- Sedation drips
  - Benzos
  - Propofol (if hemodynamically OK)
    - Pet peeve = running a propofol drip and starting pressors at the same time
- Pain control – remember that some induction agents (propofol, etomidate) don't have pain control properties. Ketamine does.
  - Fentanyl
  - Dilaudid
  - Morphine
- Limit crystalloid administration
- Balanced blood product administration

# Summary

- Remember to plan, prepare and pre-oxygenate
- Keep dosing cards nearby medications for easy reference
- Remember oxygen = medication
- Optimize hemodynamics prior to sedative



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