
RSI MEDICATION
IN THE
CRITICALLY ILL
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disclosure

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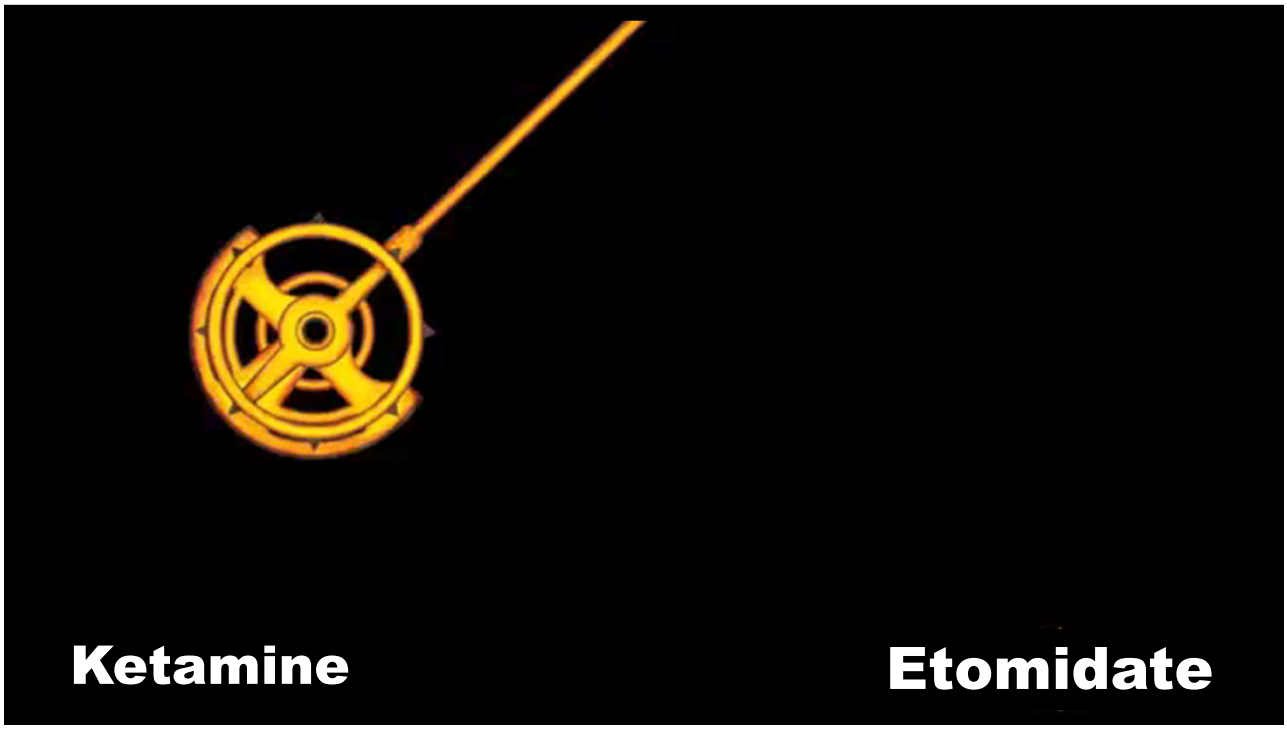

3

Strong Opinions

- Etomidate Team
- Ketamine Team

4

What's Hot Off The Press?

5

Koroki *et al. Critical Care* (2024) 28:48
https://doi.org/10.1186/s13054-024-04831-4

Critical Care

RESEARCH Open Access

Ketamine versus etomidate as an induction agent for tracheal intubation in critically ill adults: a Bayesian meta-analysis

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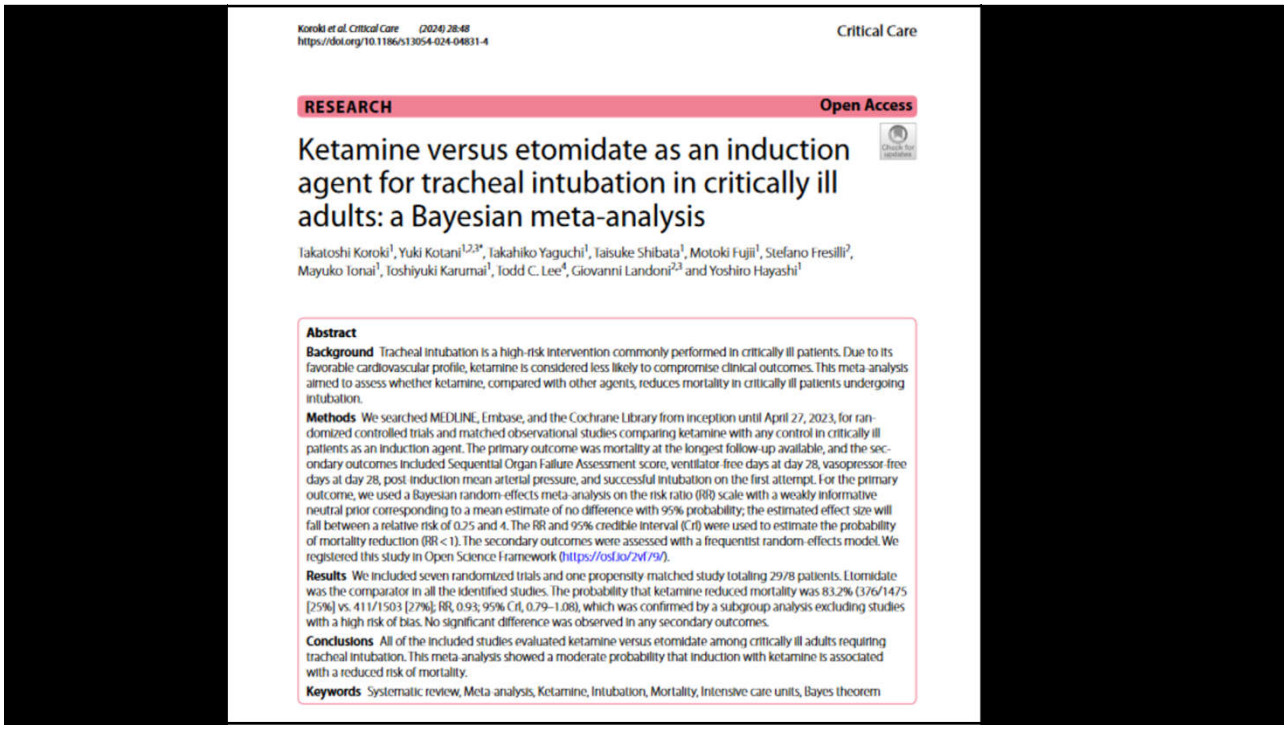

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Abstract

Background Tracheal intubation is a high-risk intervention commonly performed in critically ill patients. Due to its favorable cardiovascular profile, ketamine is considered less likely to compromise clinical outcomes. This meta-analysis aimed to assess whether ketamine, compared with other agents, reduces mortality in critically ill patients undergoing intubation.

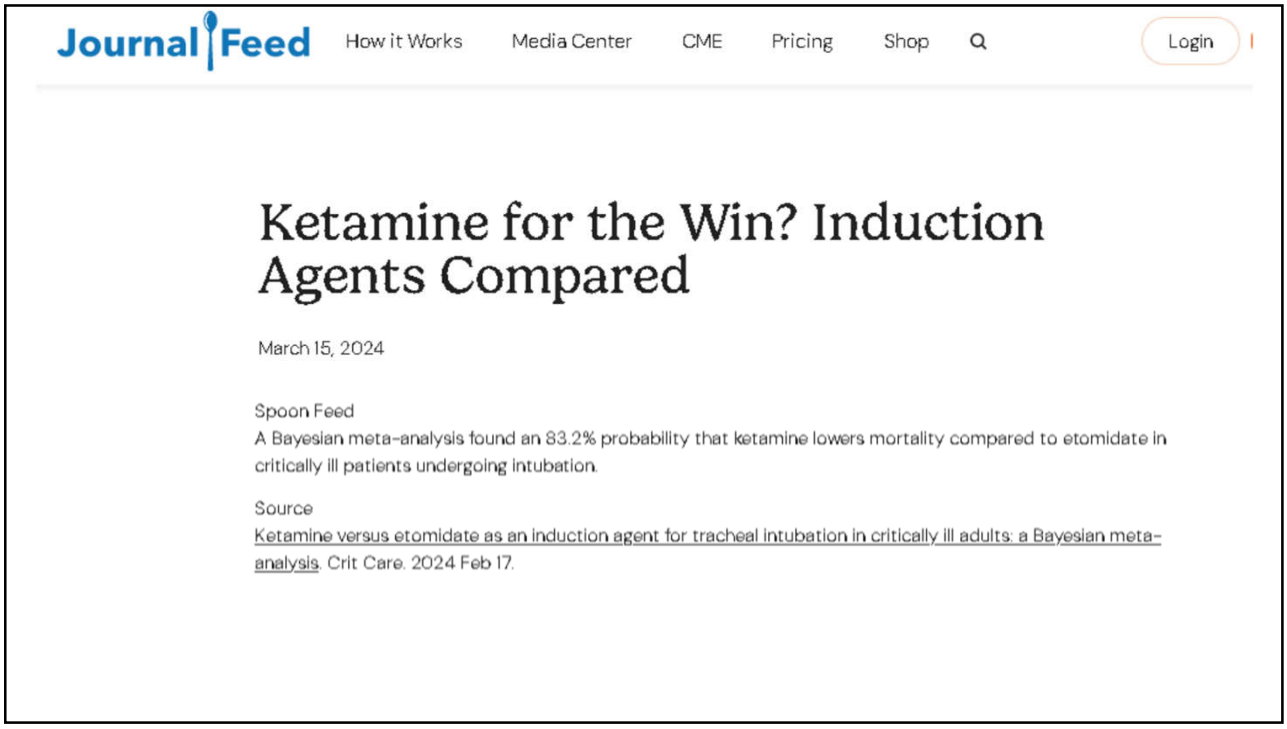
Methods We searched MEDLINE, Embase, and the Cochrane Library from inception until April 27, 2023, for randomized controlled trials and matched observational studies comparing ketamine with any control in critically ill patients as an induction agent. The primary outcome was mortality at the longest follow-up available, and the secondary outcomes included Sequential Organ Failure Assessment score, ventilator-free days at day 28, vasopressor-free days at day 28, post induction mean arterial pressure, and successful intubation on the first attempt. For the primary outcome, we used a Bayesian random-effects meta-analysis on the risk ratio (RR) scale with a weakly informative neutral prior corresponding to a mean estimate of no difference with 95% probability; the estimated effect size will fall between a relative risk of 0.25 and 4. The RR and 95% credible interval (CrI) were used to estimate the probability of mortality reduction (RR < 1). The secondary outcomes were assessed with a frequentist random-effects model. We registered this study in Open Science Framework (https://osf.io/2vf79/).

Results We included seven randomized trials and one propensity matched study totaling 2978 patients. Etomidate was the comparator in all the identified studies. The probability that ketamine reduced mortality was 83.2% (376/1475 [25%] vs. 411/1503 [27%]; RR, 0.93; 95% CrI, 0.79–1.08), which was confirmed by a subgroup analysis excluding studies with a high risk of bias. No significant difference was observed in any secondary outcomes.

Conclusions All of the included studies evaluated ketamine versus etomidate among critically ill adults requiring tracheal intubation. This meta-analysis showed a moderate probability that induction with ketamine is associated with a reduced risk of mortality.

Keywords Systematic review, Meta-analysis, Ketamine, Intubation, Mortality, Intensive care units, Bayes theorem

7



Ketamine for the Win? Induction Agents Compared

March 15, 2024

Spoon Feed

A Bayesian meta-analysis found an 83.2% probability that ketamine lowers mortality compared to etomidate in critically ill patients undergoing intubation.

Source

Ketamine versus etomidate as an induction agent for tracheal intubation in critically ill adults: a Bayesian meta-analysis. Crit Care. 2024 Feb 17.

8

Critical Care Airway Articles Are Difficult To Interpret

they have multiple variables

9

we would need all the patients in the study to have the same underlining critical illness

same duration of that illness

10

we would need all the patients in the study to have the same anatomy

same cardiac, pulmonary, vascular immune and metabolic reserves

11

we would need all the patients in the study to have the same-bacterial infection and the same

reaction
to a induction gent

12

all the intubators would need the same past intubating experience and use the same device

13

This is in reality clinically impossible

So data is suggestive

14

Paralytics

Succinylcholine verses Rocuronium

15

Succinylcholine verses Rocuronium

Apnea time: Rocuronium has a 40-second longer safe apnea time when compared to succinylcholine

Safe apnea time is defined as the time required for a patient to clinically desaturate, with an SpO_2 < 88% after paralysis

16

Succinylcholine verses Rocuronium

SUX causes a decreased safe apnea time is due to the increased muscle oxygen consumption due to the associated fasciculations with it

17

Succinylcholine verses Rocuronium

Succinylcholine has **higher levels of CO2** three minutes after injection, as it causes increased oxygen demand in muscles

18

Succinylcholine verses Rocuronium

Succinylcholine also has a statistically significant **increase in mean recovery time after apneic hypoxia** compared to rocuronium

19

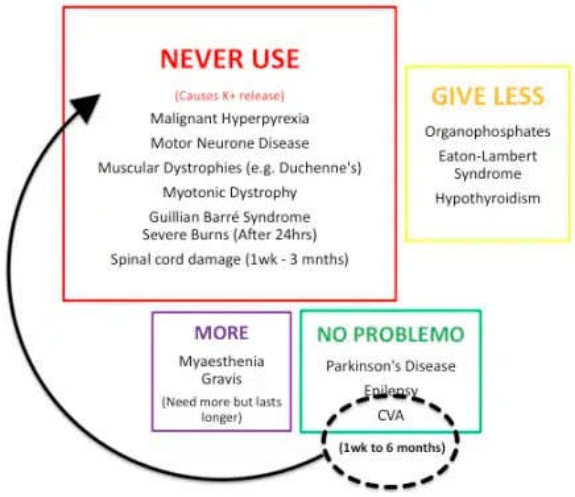
Rocuronium

Safety for **K^+**
Equilibrate the ventilator setting
SUX = Poorer outcome in TBI patients

Duration is beneficial in a failed airway

20

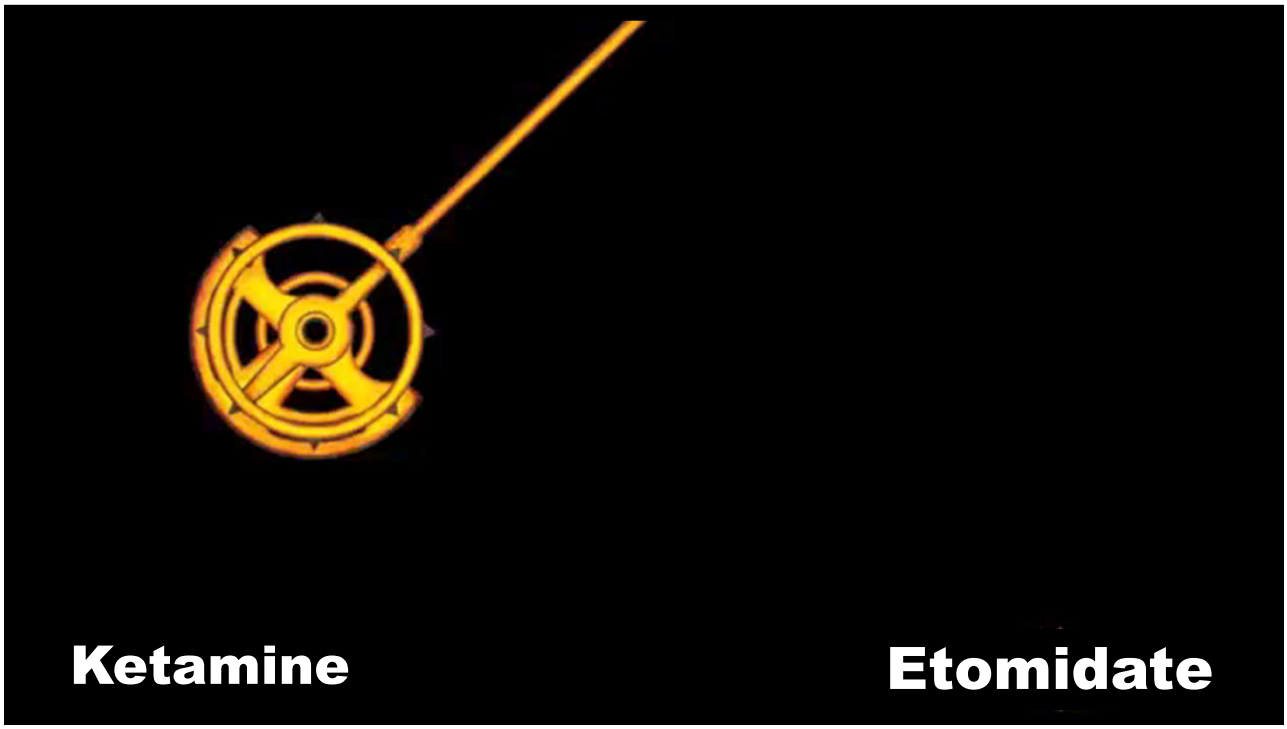
Sydney Helicopter Emergency Medical Service (HEMS) regarding succinylcholine use:



21

Induction Agents

22



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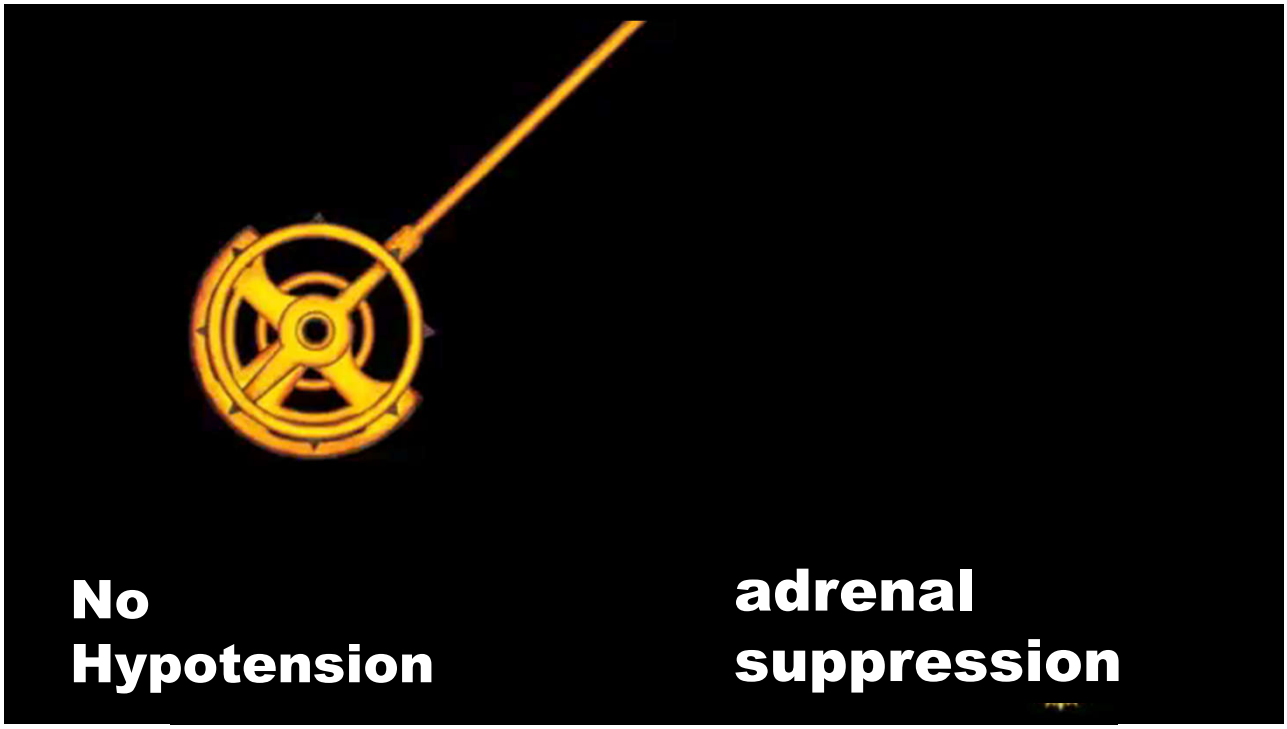
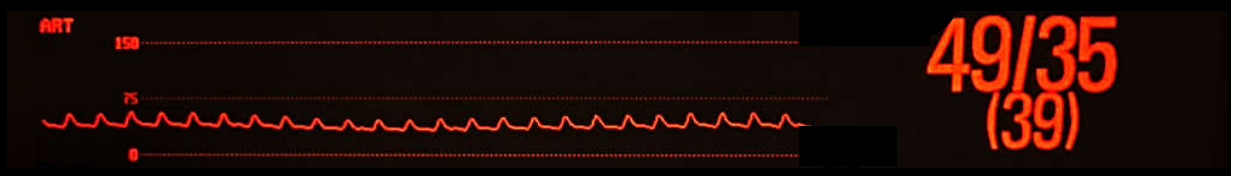


24

PERI-INTUBATION HYPOTENSION



25

Intubation Practices and Adverse Peri-intubation Events in Critically Ill Patients From 29 Countries *JAMA.* 2021

least one major clinical event occurred after intubation in 45.2% of patients, including cardiovascular instability in 42.6%

26

Prevalence Of Peri-intubation Major Adverse Events Among Critically Ill Patients: A Systematic Review And Meta Analysis *Am J Emerg Med* 2023

Peri-intubation MAEs were identified in 30.5%

one in three patients intubated outside the OR and PACU experience a peri-intubation MAE

27

Induction Agents

post-intubation hypotension

Ranges from 5%-45%

However, because hypotension affects organs perfusion, the evidence confirms that even a brief episode of hypotension is a contributing factor to patient mortality and morbidity

28

Induction Agents

post-intubation hypotension

abrupt loss of adrenergic tone due to the sedative or the paralytic drugs that decrease vascular resistance

29

Induction Agents

post-intubation hypotension

Pre-existing volume depletion or severe acidosis which are transiently worsened by pCO2 during the apnea will contribute to the development of PIH and cardiac arrest

30

Induction Agents

post-intubation hypotension

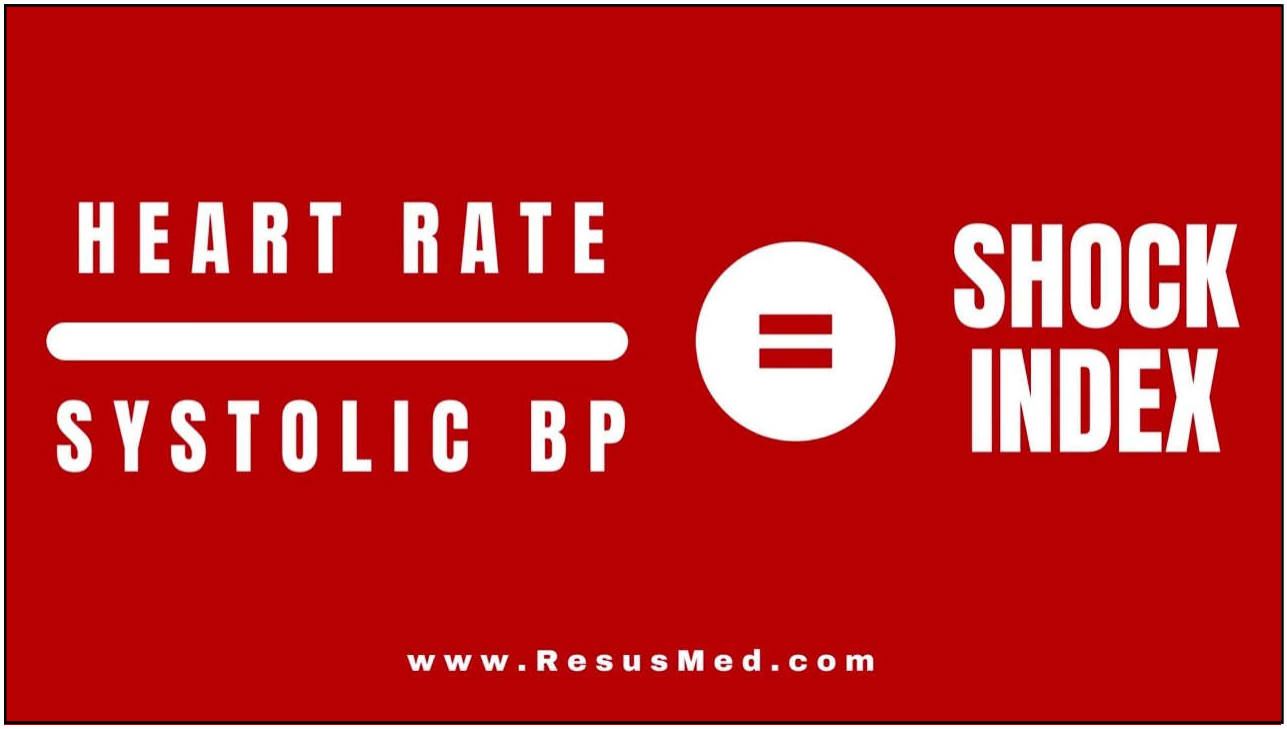
increase in intrathoracic pressure due to PPV, which negatively affects preload, and moreover the direct side effects of induction agents on the cardiovascular system

31

32


SHOCK INDEX

33


HEART RATE
SYSTOLIC BP
=
SHOCK INDEX
www.ResusMed.com

34

Shock Index

Normal range = 0.5 to 0.7

0.8 or higher

for predicting the risk of PIH and the cut-off of 0.9 or higher, for predicting the risk of post-intubation cardiac arrest

35

Association of Shock Indices with Peri-Intubation Hypotension and Other Outcomes: A Sub-Study of the KEEP PACE Trial *J Intensive Care Med* 2024

Shock indices remain a useful bedside tool to assess the potential likelihood of peri-intubation hypotension

36

What's On The Table

37

Each of these anesthetic agents has advantages and disadvantages and one is not necessarily superior to the other

38

The cardiovascular effects of propofol are well-established; it causes myocardial depression, decreased cardiac contractility and reduced MAP and cardiac index

has independent beta and calcium channel blockade

39

I leave this as an initial induction agent for patients in **status epilepticus**

WITH Ketamine

40

Propofol And Ketamine Provide Synergistic Anti-epileptic Activity

The combination of these two effects causes a profound decrease in CNS activity

41

Propofol with Ketamine Provide Synergistic Anti-epileptic Activity

Propofol stimulates the GABA receptors (the main inhibitory neurotransmitter in the brain),

ketamine inhibits NMDA receptors (a major excitatory neurotransmitter)

42

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43

Ketamine Versus Etomidate As An Induction Agent For Tracheal Intubation In Critically Ill Adults: A Bayesian Meta-analysis
Crit Care 2024

"Ketamine reduced mortality compared to etomidate"

patients required intubation due to a critical illness, regardless of where the intubation was performed (e.g., prehospital, emergency department, and intensive care unit)

44

Ketamine Versus Etomidate As An Induction Agent For Tracheal Intubation In Critically Ill Adults: A Bayesian Meta-analysis
Crit Care 2024

Primary Outcome: All-cause mortality at the longest follow-up available

45

Ketamine Versus Etomidate As An Induction Agent For Tracheal Intubation In Critically Ill Adults: A Bayesian Meta-analysis
Crit Care 2024

Secondary Outcomes:

- Sequential Organ Failure Assessment (SOFA) score
- Ventilator-free days at day 28
- Vasopressor-free days at day 28
- Post-induction mean arterial pressure (MAP)
- Successful intubation on the first attempt

46

Ketamine Versus Etomidate As An Induction Agent For Tracheal Intubation In Critically Ill Adults: A Bayesian Meta-analysis
Crit Care 2024

Most were septic - **NO COPD, ICH, HF**

Trauma pts were included in the study

Looked at mortality 28 and 30 day up to hospital DC

47

Ketamine Versus Etomidate As An Induction Agent For Tracheal Intubation In Critically Ill Adults: A Bayesian Meta-analysis
Crit Care 2024

peri-intubation interventions other than induction agents (e.g., opioids, neuromuscular blockades, and vasopressors) were not standardized within each study and were heterogenous among different studies

48

Ketamine Versus Etomidate As An Induction Agent For Tracheal Intubation In Critically Ill Adults: A Bayesian Meta-analysis
Crit Care 2024

QUESTION: How could a single dose of an induction agent affect 28 day mortality?

½ life too short

49

Ketamine Versus Etomidate As An Induction Agent For Tracheal Intubation In Critically Ill Adults: A Bayesian Meta-analysis
Crit Care 2024

Conclusion:

Finding a statistically significant mortality benefit based on a single treatment in all critically ill patients is extremely difficult and would require an enormous sample size

50

Ketamine Versus Etomidate As An Induction Agent For Tracheal Intubation In Critically Ill Adults: A Bayesian Meta-analysis
Crit Care 2024

However, the broad inclusion of a clinically heterogeneous population raises some concerns about the applicability of the resulting data to ALL critically ill patients

51

Ketamine Versus Etomidate As An Induction Agent For Tracheal Intubation In Critically Ill Adults: A Bayesian Meta-analysis
Crit Care 2024

Clinical Bottom Line:

This article *suggests* that ketamine may be a better agent in most clinical situations than etomidate

However, making a blanket statement with such a heterogeneous population and limited sub-group analysis is difficult

52

Ketamine Versus Etomidate As An Induction Agent For Tracheal Intubation In Critically Ill Adults: A Bayesian Meta-analysis
Crit Care 2024

Clinical Bottom Line:

Large, international, multicenter, randomized clinical trials are needed to help discern which subsets of patients may benefit from induction with ketamine vs etomidate

The debate continues…

53

Society of Critical Care Medicine Clinical Practice Guidelines for Rapid Sequence Intubation in the Critically Ill Adult Patient. *Crit Care Med* 2023

Two key clinical recommendations from these guidelines:

#1. NO difference between etomidate and other induction agents administered for RSI with respect to mortality, the incidence of hypotension, or the incidence of vasopressor use in the peri-intubation period and through hospital discharge

54

Society of Critical Care Medicine Clinical Practice Guidelines for Rapid Sequence Intubation in the Critically Ill Adult Patient. *Crit Care Med* 2023

#2. AGAINST ADMINISTERING CORTICOSTEROIDS following RSI with etomidate for the purpose of counteracting etomidate-induced adrenal suppression

55

Take Home

Induction agent selection is nuanced, with many factors to consider

near impossible for one medication to outperform another for all patients when considering the innumerable potential diseases which lead to intubation

56

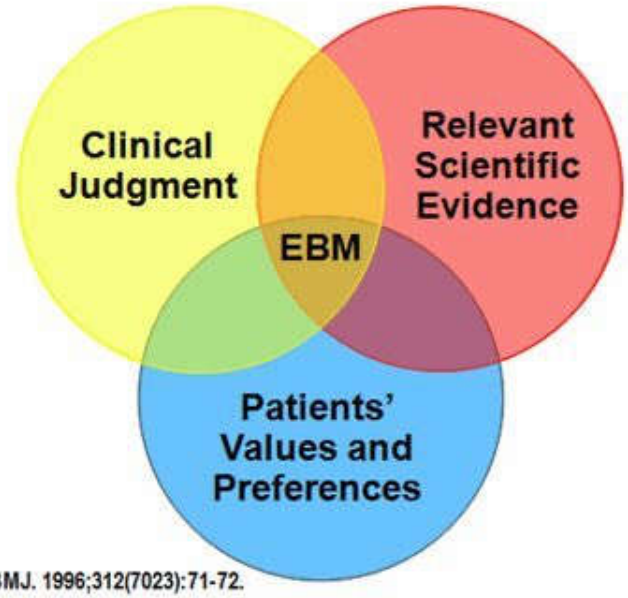
Take Home

ER intubating with an undifferentiated disease is remarkably different than intubating in the ICU with a full panel of diagnostics to reflect upon

We accept that a single antibiotic will not eradicate all bacteria, yet we curiously continue to search for a single agent for RSI induction

57

What Is Evidence-Based Medicine?



Sackett DL, et al. BMJ. 1996;312(7023):71-72.

58


RSI Medication In the Critically Ill
SO OTHERS MAY LIVE
Thank You
KENNETH BUTLER, DO, FACEP,
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59