

TAKE-HOME MESSAGE

Succinylcholine is superior to rocuronium in providing excellent intubating conditions for emergency rapid sequence intubation.

METHODS**DATA SOURCES**

The authors searched the Cochrane Central Register of Controlled Trials (2015, Issue 2), MEDLINE (1966 to February week 2, 2015), and EMBASE (1988 to February 14, 2015) without language restrictions. For additional citations, the authors searched references of selected articles.

STUDY SELECTION

All randomized controlled trials and controlled clinical trials were reviewed that compared the use of rocuronium (≥ 0.6 mg/kg) and succinylcholine (≥ 1 mg/kg) for rapid sequence intubation and reported intubating conditions. Patients of any age were included in any clinical setting.

DATA EXTRACTION AND SYNTHESIS

Two authors independently screened studies for inclusion, extracted data, and assessed methodological quality, using the Grading of Recommendations Assessment, Development, and Evaluation methodology. Study bias was assessed with the risk-of-bias tool. Patient analysis followed the intention-to-treat principle. Treatment effects were reported with a random-effects model and heterogeneity was assessed with the I^2 statistic.

Update: Does Rocuronium Create Better Intubating Conditions Than Succinylcholine for Rapid Sequence Intubation?**EBEM Commentators**

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Results

Meta-analytic results for rocuronium versus succinylcholine for rapid sequence intubation.

Outcomes*	Number of Studies (Number of Subjects)	Risk Ratio (95% CI)	I^2 , %
Excellent intubating conditions	50 (4,151)	0.86 (0.81–0.92)	72
Clinically acceptable conditions (excellent or good)	48 (3,992)	0.97 (0.95–0.99)	68
Subgroup analysis			
Emergency intubations: excellent intubation conditions	5 (1,073)	0.84 (0.73–0.98)	53
Pediatric: excellent intubation conditions	5 (536)	0.86 (0.70–1.06)	81

CI, Confidence interval.
*Goldberg scale for intubating conditions: excellent, good, poor, and inadequate. Scale assesses the ease of intubation, vocal cord movement, and patient response to intubation (ie, cough, diaphragm movement). "Excellent" indicates ease of intubation with immobile open vocal cords and no patient movement.

Of the 66 identified studies, 50 met inclusion criteria for analysis, comprising 4,151 patients. Main outcomes and selected subgroup analysis are summarized in the [Table](#). The overall evidence was deemed moderate quality because of a high incidence of detection bias (ie, 50% of the intubators were not blinded to the fasciculations caused by succinylcholine), and there was substantial heterogeneity among the trials, which could not be explained by subgroup analysis. Although subgroup analysis of

emergency intubations determined that succinylcholine is superior to rocuronium in achieving excellent intubating conditions, there was no difference between the 2 drugs in terms of clinically acceptable intubating conditions. In the pediatric subgroup analysis, there was no difference between rocuronium and succinylcholine; however, the sample size was small and substantial heterogeneity was identified. None of the trials in this systematic review reported severe adverse outcomes.

Commentary

Selecting the ideal paralytic for rapid sequence intubation is often challenging, and there may be specific cases in which one paralytic is preferred over another; however, identifying one agent that overall creates more ideal intubating conditions is important. In this updated systematic review, succinylcholine was determined to be superior to rocuronium for producing excellent intubating conditions overall and also in the subgroup of emergency intubations.

The ongoing debate about succinylcholine and rocuronium must weigh the risks and benefits of each paralytic. The benefits of succinylcholine include a rapid onset (50 seconds) and a short duration of action (7 to 11 minutes).¹ Because succinylcholine is a depolarizing neuromuscular blocker, there is a risk of malignant hyperthermia- and hyperkalemia-induced cardiac arrhythmias in patients with “denervation syndromes” (eg, amyotrophic lateral sclerosis, multiple sclerosis, Guillain-Barré) and in patients who began “denervation states” 48 to 72 hours earlier, including spinal cord injuries, major burns, and crush injuries.² A recent study found that, compared with rocuronium, succinylcholine was associated with increased mortality in emergency department patients with severe traumatic brain injury who underwent rapid sequence intubation.³

The benefits of rocuronium include a rapid onset (55 to 90 seconds) and no known contraindications.¹ However, because rocuronium is a nondepolarizing blocker and it has an intermediate duration of action (37 to 73 minutes), it may be less

desirable under certain clinical situations.¹ Prolonged paralysis can be problematic for patients with a difficult airway, with unstable vital signs, or requiring frequent neurologic checks.

The dosing of rocuronium is an important covariate because it may have an effect on intubating conditions. In subgroup analysis, although succinylcholine was superior to rocuronium at doses of 0.6 to 0.7 mg/kg, there was no difference at doses of 0.9 to 1.0 mg/kg or 1.2 mg/kg. Although the small sample size of the higher doses prevented drawing a conclusion, Patanwala et al⁴ found equivalency between succinylcholine and rocuronium at these higher doses.

Recent reports suggest that trends in paralytic choice are evolving among emergency physicians. A multicenter prospective registry collected data on 17,583 adult emergency intubations from 2002 to 2012.⁵ Although data indicated succinylcholine was used in 75% of rapid sequence intubations, its use decreased sharply during the 10 years. In contrast, rocuronium use increased from 8.2% (2002 to 2005) to 42% (2009 to 2012), suggesting that physicians are becoming more familiar and comfortable with rocuronium.⁵

Additional outcomes of interest in rapid sequence intubation have been studied and further suggest equivalency between the 2 paralytic agents. Marsch et al⁶ found no difference between succinylcholine and rocuronium in terms of oxygen desaturation, intubating conditions, or failed intubation attempts. Patanwala et al⁴ also reported no difference in first-attempt

intubation success between succinylcholine and rocuronium at a median dose of 1.19 mg/kg.

Although succinylcholine remains superior to rocuronium as the first-line agent in maximizing intubating conditions, rocuronium is a suitable alternative in emergency intubations when succinylcholine poses a risk.

Editor's Note: This is a clinical synopsis, a regular feature of the *Annals'* Systematic Review Snapshots (SRS) series. The source for this systematic review snapshot is: **Tran DT, Newton EK, Mount VA, et al. Rocuronium versus succinylcholine for rapid sequence induction intubation. *Cochrane Database Syst Rev.* 2015;(10):CD002788. <http://dx.doi.org/10.1002/14651858.CD002788.pub3>.**

1. Magorian T, Flannery KB, Miller RD. Comparison of rocuronium, succinylcholine, and vecuronium for rapid-sequence induction of anesthesia in adult patients. *Anesthesiology.* 1993;79:913-918.
2. Martyn JA, Richtsfeld M. Succinylcholine-induced hyperkalemia in acquired pathologic states: etiologic factors and molecular mechanisms. *Anesthesiology.* 2006;104:158-169.
3. Patanwala AE, Erstad BL, Roe DJ, et al. Succinylcholine is associated with increased mortality when used for rapid sequence intubation of severely brain injured patients in the emergency department. *Pharmacotherapy.* 2016;36:57-63.
4. Patanwala AE, Stahle SA, Sakles JC, et al. Comparison of succinylcholine and rocuronium for first-attempt intubation success in the emergency department. *Acad Emerg Med.* 2011;18:10-14.
5. Brown CA, Bair AE, Pallin DJ, et al. Techniques, success, and adverse events of emergency department adult intubations. *Ann Emerg Med.* 2015;65:363-370.
6. Marsch SC, Steiner L, Bucher E, et al. Succinylcholine versus rocuronium for rapid sequence intubation in intensive care: a prospective, randomized controlled trial. *Crit Care.* 2011;15:R199.

Michael Brown, MD, MSc, and Alan Jones, MD, serve as editors of the SRS series.