

Washington University Emergency Medicine Journal Club
Succinylcholine Versus Rocuronium for RSI in the Emergency Department

Vignette

You are working a day shift in TCC when EMS brings you a 67 year old obese gentleman with a history of COPD. Due to his respiratory distress, he was placed on CPAP en route, and you immediately have the respiratory therapist place him on BiPAP. You have the nurse administer 125 mg of IV methylprednisolone while you perform your physical exam. The patient is somnolent and does not answer any questions, opening his eyes and localizing to painful stimuli. He has near-absent breath sounds, cyanotic lips and nailbeds, and is tachycardic. His O₂ saturation is 88% on BiPAP with an FiO₂ of 100%

You decide that this gentleman needs some plastic in his trachea if he is going to survive this ordeal. You ask the nurse to draw up etomidate for sedation and succinylcholine for paralysis. You're told that succinylcholine supplies have been exhausted due to manufacturing delays, and the nurse suggest rocuronium instead. After looking up the appropriate dose (1.0 mg/kg), you proceed with intubation using the video-assisted laryngoscope without incident.

At the end of your shift, you consider the reasons that succinylcholine has become the "go-to" drug for paralysis in RSI. After a little online research, you discover that the time of onset for succinylcholine and rocuronium is similar (30-45 seconds vs. 60-90 seconds) and likely not clinically significant. You remember being told as a medical student that succinylcholine is preferred due to its short duration: if the intubation fails, at least the patient will start breathing spontaneously more quickly. However, if you're intubating the patient, they probably couldn't breathe that well to begin with. You then turn to the literature to see if intubating conditions and success have been compared for the two drugs, and identify the selected articles.

PICO Question

Population: Emergency department patients intubated using rapid sequence intubation (RSI)

Intervention: Rocuronium for paralysis with any sedative agent

Comparison: Succinylcholine for paralysis with any sedative agent

Outcomes: Intubation success, ease of intubation, oxygen desaturation, clinically significant rise in serum potassium, mortality, and neurologic outcome.

Search Strategy

Pubmed was searched using a strategy of ((succinylcholine) AND rocuronium) AND RSI, with 27 articles resulting. Of these, 2 articles were identified as having

been conducted in the ED. Additionally, a randomized controlled trial conducted in an ICU setting was chosen. A Cochrane systematic review was chosen as the fourth article.

Article 1: [Laurin EG, Sakles JC, Panacek EA, Rantapaa AA, Redd J. A comparison of succinylcholine and rocuronium for rapid-sequence intubation of emergency department patients. Acad Emerg Med. 2000 Dec;7\(12\):1362-9. ANSWER KEY.](#)

Article 2: [Patanwala AE, Stahle SA, Sakles JC, Erstad BL. Comparison of succinylcholine and rocuronium for first-attempt intubation success in the emergency department. Acad Emerg Med. 2011 Jan;18\(1\):10-4. ANSWER KEY.](#)

Article 3: [Marsch SC, Steiner L, Bucher E, Pargger H, Schumann M, Aebi T, Hunziker PR, Siegemund M. Succinylcholine versus rocuronium for rapid sequence intubation in intensive care: a prospective, randomized controlled trial. Crit Care. 2011 Aug 16;15\(4\):R199. ANSWER KEY.](#)

Article 4: [Perry JJ, Lee JS, Sillberg VA, Wells GA. Rocuronium versus succinylcholine for rapid sequence induction intubation. Cochrane Database Syst Rev. 2008 Apr 16; \(2\):CD002788. ANSWER KEY.](#)

Bottom Line

Due to the high risk of pulmonary aspiration of gastric contents in patients with potentially full stomachs, rapid sequence intubation (RSI) has become standard procedure in emergency departments in the US ([Sagarin 2005](#)). While previous Washington University journal clubs have assessed aspects of RSI, including pretreatment with lidocaine ([July 2005](#)), prehospital intubation ([May 2009](#)), and etomidate use in sepsis ([March 2010](#)), we elected this month to discuss paralytic choice. In the majority of such cases the paralytic of choice is succinylcholine ([Dagal 2012](#)). However, potential adverse effects of succinylcholine, such as significant hyperkalemia in susceptible individuals ([Gronert 1975](#)), increased intracranial and intraocular pressure in patients with head or eye injuries ([Rubin 1996](#)), and malignant hyperthermia in those genetically susceptible ([Rosenberg 2003](#)) has led some to advocate an increased use of non-depolarizing neuromuscular blocking agents such as rocuronium. Actual complication rates with succinylcholine use have not been well quantified.



[Click here for video of Al Sacchetti demonstrating RSI with rocuronium.](#)

While the incidence of “can’t intubate, can’t ventilate” patients is rare in elective operating room cases, estimated at 0.01-2 per 10,000 cases ([Benumof 1993](#)), the incidence in ED patients is likely much higher. Advocates of succinylcholine often cite the short duration of paralysis as an advantage in such situations ([Mallon 2009](#)), with the hope that return of spontaneous ventilation will prevent the need for surgical airway.

Others have suggested that the duration of paralysis with succinylcholine would result in cardiac arrest in such patients, and the prolonged paralysis with rocuronium provides ample [time to secure an airway](#) without worrying about patient movement interfering. There

Rocuronium vs. Succinylcholine		
	Rocuronium	Succinylcholine
Depolarizing	No	Yes
Onset	30 sec	5-10 sec
Intubation	90 sec at 1.0-1.2 mg/kg	30-60 sec at 1.5-2.0 mg/kg
Fasciculations	Yes	No
Duration	45-60 min	8-15 min
Precautions	Duration and quality of intubation	Hyperkalemia, denervation syndrome, crush injuries

Source: Dr. Mallon

also exists a reversal agent for rocuronium, suggamadex, which specifically binds the agent and can result in reversal of paralysis in approximately 6 minutes ([Lee 2009](#)), similar to the duration of paralysis with succinylcholine. While suggamedex is currently used in the European Union, it is not yet approved by the FDA for use in the United States.

Our literature search comparing succinylcholine and rocuronium in RSI revealed only two studies involving ED patients, both retrospective and observational. One of these studies revealed a statistically significant, but likely clinically insignificant difference in time to onset of paralysis, favoring succinylcholine, as well improved body movement and physician satisfaction ([Laurin 2000](#)). The other study revealed no difference in first-attempt intubation success or median number of intubation attempts ([Patanwala 2011](#)). A randomized trial, in which the treating physicians were aware of group allocation, was identified in the Critical Care literature which revealed no difference in the occurrence of oxygen desaturation with the two drugs ([Marsch 2011](#)).

Finally, a large systematic review and meta-analysis was identified from the Cochrane Database of Systematic Reviews ([Perry 2008](#)). This review sought to compare intubating conditions with succinylcholine and rocuronium using the Goldberg scale, in which a score is given for each of: ease of intubation, vocal cord movement, and patient response to intubation (Table 1). It was found that succinylcholine performed better overall than rocuronium with respect to both the primary outcome, excellent intubating conditions (NNH of 8), and the secondary outcome, adequate (excellent or good) intubating conditions (NNH of 22). However, subset analyses suggest that there is no difference when more appropriate doses of rocuronium (0.9-1.0 mg/kg and 1.2 mg/kg) are used. Notably, none of the studies included in the meta-analysis were conducted in the ED.

Table 1 Scoring system for intubation conditions

	Score 3	Score 2	Score 1
Laryngoscopy <ul style="list-style-type: none"> Jaw relaxation Resistance to blade 	Relaxed None	Acceptable relaxation Slight resistance	Poor relaxation Active resistance
Vocal cords <ul style="list-style-type: none"> Position Movement 	Abducted None	Intermediate Moving	Closed Closed
Intubation Response <ul style="list-style-type: none"> Limb Movement Coughing 	None None	Slight Diaphragmatic	Vigorous Severe coughing or bucking

The increase in [drug shortages](#) have made it necessary for physicians to become comfortable with alternate medications in many instances. While the current literature does not seem to strongly favor either paralytic, these studies were felt to make those of us firmly attached to succinylcholine more comfortable with using rocuronium when clinically indicated ([neuromuscular disorders](#), [hyperkalemia](#), crush injuries and [burns](#) over 24-48 hours old). It was agreed that rocuronium seems to work at least as well as succinylcholine when appropriate doses are used (at least 1.0 mg/kg). Issues with hospital supply, where succinylcholine is stocked in favor of rocuronium due to current heavy use, would need to be addressed if a large number of providers choose to switch to rocuronium use primarily.