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Comparing Succinylcholine and Rocuronium for Emergency Intubation

To the Editor:

An observational study by April et al[1] comparing emergency department (ED) intubation success with succinylcholine and rocuronium in 2,275 patients from the National Emergency Airway Registry who were undergoing rapid sequence intubations showed no association between neuromuscular-blocking drug choice and first-pass intubation success or peri-intubation adverse events. The strengths of this study are a large sample and inclusion of most known factors affecting ED intubation success. Furthermore, the authors applied correct statistical methods, including multivariable logistic regression and subgroup analyses, to determine associations of neuromuscular-blocking drug choice with intubation outcomes. Besides the limitations described in the discussion, however, there are several issues in this study that need further clarification.

First, difficult airway is an important determinant of ED intubation success, but the initial impression of difficult airway was not clearly defined in the methods. Furthermore, difficult airway characteristics were determined if the patient had at least one of the following: reduced neck mobility, Mallampati score greater than 1, reduced mouth opening, airway obstruction, facial trauma, and blood or vomit in the airway. The available evidence shows that no single factor can accurately predict difficult airway because each one individually has a rather low positive predictive value. If a patient has more predictors of difficult airway simultaneously, however, the likelihood of difficult airway will increase.[2] For this reason, the National Emergency Airway Management Course has developed a composite score based on the 5 criteria (look externally, evaluate the 3-3-2 rule, Mallampati classifications, obstruction and neck mobility, abbreviated as LEMON) for identification of difficult airways in the emergency setting. It has been shown that the LEMON score can successfully stratify the risk of intubation difficulty in the ED, and a higher LEMON score is significantly associated with difficult intubation.[3] We believe that this study would have provided more conclusive results if the LEMON score had been used for assessment of difficult airway.

Second, intubation is a difficult skill to acquire and maintain. The experience and competency with intubation mainly depend on the frequency and amount of clinical use.[4] We argue that the intubator characteristics used in this study cannot accurately indicate the competency levels of the intubators. It would have been better had the intubators been divided into experienced and inexperienced operators according to their skill levels.

Third, adequate muscle relaxation can facilitate successful intubation and decrease traumatic intubation complications. Both succinylcholine and rocuronium can be used for rapid sequence intubation in the ED, but their pharmacologic features are significantly different and succinylcholine seems to produce intubation conditions

with higher satisfaction scores.[5] Because different doses of succinylcholine and rocuronium were used in this study, the authors should have clearly described how they determined the start time of the intubation procedure according to the degree of neuromuscular blockade, especially for patients receiving succinylcholine at less than 1.5 mg/kg and rocuronium at less than 1.2 mg/kg. Furthermore, we would like to know whether inadequate muscle relaxation was one reason for failed intubations at the first attempt.

Fourth, besides first-pass intubation success rate, intubation time is another concern for ED patients requiring intubation, especially patients at risks of hypoxia and aspiration.[6] We argue that this study would have provided more useful information about the choice of 2 neuromuscular blocking drugs for ED intubation if a reasonable cutoff time had been included in the definition of first-pass intubation success rate.

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In reply:

We appreciate the authors' letter in regard to our National Emergency Airway Registry (NEAR) study comparing first-pass intubation success with rocuronium versus succinylcholine.[1] Incorporation of difficult airway characteristics is vital for observational studies such as ours, given the need to attempt to control for confounding when testing for associations. We agree that the look, evaluate, Mallampati, obstruction, neck mobility (LEMON) construct is useful for highlighting to clinicians and researchers alike those patient features likely to portend a difficult airway. In regard to the authors' point that none of these individual characteristics have sufficiently high predictive value to warrant use in isolation, NEAR collects variables on all of the individual components of LEMON, and we incorporated each of these characteristics into our analysis. It is unclear whether an alternative approach using a score strictly based on the 2005 article by Reed et al that is referenced by the authors would have yielded significantly different results. Nevertheless, until LEMON undergoes more robust validation in emergency department (ED) settings, we believe alternative approaches such as ours that still conceptually account for the same difficult airway markers remain reasonable analytic strategies.

Intubator experience also plays a critically important role in intubation success. NEAR captures intubator experience as an ordinal variable related to operator level of training: emergency physician postgraduate years 1, 2, 3, and 4; fellow; attending physician; or other (nonemergency) physician.[2,3] We believe this variable provides a reasonable surrogate marker of each intubator's level of airway management experience. Although a more nuanced variable such as numbers of previous intubations may provide a better measure of intubation skill, we believed such self-reported numbers would be unreliable for a registry study. It would require capturing individual metrics for each intubator, and although this might be possible in a single-center study, it would be a significant logistic hurdle in a registry of this size.

In regard to medication administration times, we agree that these data would have been a welcome addition to the analysis, given the different times of paralysis onset for rocuronium versus succinylcholine.[4] Our decision to not collect these data again reflects our concerns that collecting this information would prove overly burdensome for a registry study. Given our desire to include as many centers as possible in NEAR and to maximize the external generalizability of the registry data, many sites lack robust research infrastructure such as dedicated research assistants or video recording. Without such resources, we worry that detailed time data related to the myriad events composing