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# Characterization of Rapid Sequence Intubation in the Emergency Department

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## BACKGROUND

- Rapid sequence intubation (RSI) is a sequential process performed to facilitate safe<sup>1</sup> and emergent tracheal intubation
- Based on the urgency of RSI, medication errors may occur due to the need for immediate selection of medications and accurate dosing
- Pharmacists play a major role in the following steps involved in RSI:<sup>2</sup>

Pre-Treatment	<ul style="list-style-type: none"> <li>Suggest pre-treatment in patients when indicated</li> </ul>
Induction	<ul style="list-style-type: none"> <li>Determine optimal induction agent based on patient hemodynamics</li> <li>Ensure appropriate doses are prepared and administered</li> </ul>
Paralysis	<ul style="list-style-type: none"> <li>Determine optimal paralytic based on patient presentation</li> <li>Ensure appropriate doses are prepared and administered</li> </ul>
Post-Intubation Management	<ul style="list-style-type: none"> <li>Ensure analgesedation is being utilized</li> <li>Ensure patients with prolonged paralysis are receiving appropriate sedation</li> </ul>

## OBJECTIVES

- To characterize the overall RSI process in the emergency department
- Identify possible areas for education and improvement
- Identify adverse events associated with RSI medications

## METHODS

This is a retrospective chart review evaluating all patients that received succinylcholine, rocuronium, or vecuronium for RSI from January 1, 2016 to August 31, 2017 in a community hospital emergency department with a level 2 adult and pediatric trauma center. This study was performed as a quality improvement strategy and was not taken for Institutional Review Board approval.

The following patient and medication administration information was collected through the hospital electronic medical record and Web Intelligence reports:

- Patient demographics: age, sex, weight, history of reactive airway disease, baseline Sequential Organ Failure Assessment (SOFA) score, and indication for intubation
- RSI characterization: medications given during RSI process, doses of medications given, and time of administration of medication
- Adverse events: systolic blood pressure change from baseline greater than 20%, heart rate change from baseline greater than 20%, number of intubation attempts due to suboptimal conditions, and emergency department mortality

## RESULTS

**Table 1:** Baseline Characteristics

	Age < 18, (N=28)	Age ≥ 18, (N=315)	Overall Patients, (N=343)
Age, median (range); years	12 (0.5-17)	60 (18-96)	58 (0.5-96)
Male, N (%)	24 (84%)	202 (64%)	226 (65.9%)
Weight, median(range); kilograms	55 (5-169)	85 (33-218)	83 (5-218)
Reactive airway disease, N(%)	0 (0%)	36 (11.4%)	36 (10.5%)
SOFA score, mean ± SD, (N)	9 ± 2 (N=2)	7 ± 2.7 (N=114)	7 ± 2.7 (N=116)

**Table 2:** Pre-treatment for Rapid Sequence Intubation

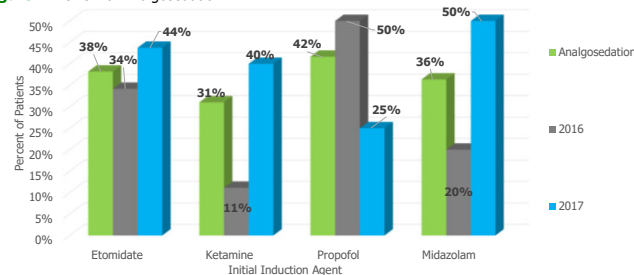
	Age < 18, (N=28)	Age ≥ 18, (N=315)	Overall patients, (N=343)
Fentanyl, N (%)	4 (14.3%)	25 (7.9%)	19 (8.5%)
Lidocaine, N (%)	2 (7.1%)	10 (3.2%)	12 (3.5%)
Atropine, N (%)	1 (3.6%)	9 (2.9%)	10 (2.9%)

**Table 3:** Induction/Paralytic Agents

Induction Agents				
	Percent Used	Dose; mg	Dose; mg/kg	Percent Difference
Etomidate (N=267)	82.7%	20 (3.1-100)	0.26 (0.1-0.79)	-17% (-207.5-61.9)
Ketamine (N=27)	9.0%	80 (40-150)	0.99 (0.24-10)	-0.65% (-310-90)
Propofol (N=12)	4.9%	50 (10-80)	1 (0.12-1)	-184.3% [(-1175)-(-25)]
Midazolam (N=11)	3.4%	2 (1-5)	0.04 (0.013-0.2)	-657.5% [(-1730)-(-50)]
Paralytic Agents				
Succinylcholine (N=268)	78.2%	120 (5-300)	1.49 (0.49-3.1)	20.4% (-146-100)
Rocuronium (N=54)	15.7%	80 (10-120)	1.07 (0.1-1.8)	6.5% (-900-43)
Vecuronium (N=20)	6.1%	10 (1.6-15)	0.1 (0.04-0.22)	0% (-144-53.8)

All results are reported as median (range) unless indicated.

**Figure 1:** Review of Analgesedation



## RESULTS

**Table 4:** Post-Intubation Management With Prolonged Paralysis

Initial Sedative*	Induction Sedative to Post-Intubation Sedative; minutes	Analgesedation, N (%)	Instances of paralysis without sedation; N (%)	Sedation Gap; minutes
Etomidate (N=40)	19 (5-136)	18 (45%)	21 (52.5%)	15.5 (2-121)
Ketamine (N=7)	25 (4-65)	1 (14.3%)	6 (85.7%)	20.5 (6-50)
Propofol (N=4)	47 (2-107)	3 (50%)	2 (50%)	88 (79-97)
Midazolam (N=6)	95 (15-141)	2 (33.3%)	4 (66.7%)	88 (48-111)

All results are reported as median (range) unless indicated. \* Does not include patients who did not receive post intubation sedation

**Table 5:** Adverse Events

	SBP Decreased >20%, N (%)	SBP Increase >20%, N (%)	HR Decrease >20%, N (%)	HR Increase >20%, N (%)	Intubation Attempts, mean ± SD
Etomidate	53 (29%)	72 (40%)	44 (24%)	51 (24%)	1.2 ± 0.5
Ketamine	5 (28%)	13 (68%)	2 (8%)	12 (48%)	1.2 ± 0.6
Propofol	4 (36%)	6 (50%)	3 (21%)	4 (29%)	1.13 ± 0.3
Midazolam	1 (14%)	3 (43%)	1 (13%)	2 (25%)	1.10 ± 0.3

## DISCUSSION

- Pre-treatment was not commonly utilized in this patient population, however when utilized it was used in the pediatric population more frequently
- All induction agents were under doses compared to the recommended weight bases dosing
- Propofol and midazolam were the two most under doses induction agents. This may be due to physician's preference of dosing these agents
- The paralytic agents succinylcholine and rocuronium were overdosed where vecuronium was dosed more appropriately
- Analgesedation in the emergency department was only initiated approximately 36% of the time
- Figure 1 shows that there is an upward trend in the use of analgesedation in 2017, which is when pharmacy coverage was more prevalent in the emergency department
- Patients receiving rocuronium or vecuronium greater than 50% of patients had a gap in sedation leading to paralysis without sedation.
- Adverse effects were as expected, ketamine having the most increase in SBP and HR

## CONCLUSIONS

- Overall induction agents are being under doses and paralytic agents are being over doses in RSI
- Education is necessary to close the gap in sedation where extended paralysis in used during RSI
- Education regarding Analgesedation is needed to increase the amount of analgesedation being used.
- There has been an increase in analgesedations since the implementation of an ED pharmacist, which is only covered from 1430 – 2300. Full converge in the emergency department may lead to an even larger improvement

## REFERENCES

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**Disclosure**  
The authors of this presentation have the following to disclose concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation:  
Jason Eakins: Nothing to disclose | William Armstrong: Nothing to disclose | Bryan Statz: Nothing to disclose | Sarah Sienko: Nothing to disclose