Characterization of Rapid Sequence Intubation in the Emergency Department

Jason P. Eakins PharmD
William Armstrong PharmD, BCPS
Bryan Statz PharmD
Sarah E. Sienko PharmD

Follow this and additional works at: https://researchrepository.parkviewhealth.org/pharma
Part of the Pharmacy and Pharmaceutical Sciences Commons
Characterization of Rapid Sequence Intubation in the Emergency Department

Jason P. Eakins, PharmD; William L. Armstrong, PharmD; Bryan M. Statz, PharmD, BCPS; Sarah E. Sienko, PharmD
Parkview Regional Medical Center; Fort Wayne, Indiana

BACKGROUND

- Rapid sequence intubation (RSI) is a sequential process performed to facilitate safe 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: 2
  - Pre-Treatment
    - Suggest pre-treatment in patients when indicated
  - Induction
    - Determine optimal induction agent based on patient hemodynamics
    - Ensure appropriate doses are prepared and administered
  - Paralysis
    - Determine optimal paralytic based on patient presentation
    - Ensure appropriate doses are prepared and administered
  - Post-Intubation Management
    - Ensure analgosedation is being utilized
    - Ensure patients with prolonged paralysis are receiving appropriate sedation

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

<table>
<thead>
<tr>
<th>Age &lt; 18, (N=28)</th>
<th>Age ≥ 18, (N=315)</th>
<th>Overall Patients, (N=343)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, median (range), years</td>
<td>12 (3-17)</td>
<td>60 (18-96)</td>
</tr>
<tr>
<td>Male, N (%)</td>
<td>24 (86%)</td>
<td>252 (64%)</td>
</tr>
<tr>
<td>Weight, median (range), kilograms</td>
<td>55 (5-160)</td>
<td>85 (30-218)</td>
</tr>
<tr>
<td>Reactive airway disease, N (%)</td>
<td>0 (0%)</td>
<td>36 (11.9%)</td>
</tr>
<tr>
<td>SOFA score, mean ± SD, (N)</td>
<td>9 ± 2 (N=2)</td>
<td>7 ± 2.7 (N=114)</td>
</tr>
</tbody>
</table>

Table 2: Pre-treatment for Rapid Sequence Intubation

<table>
<thead>
<tr>
<th>Induction Agents</th>
<th>Induction Percent Used</th>
<th>Dose, mg</th>
<th>Dose, mg/kg</th>
<th>Percent Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Etomidate (N=267)</td>
<td>82.9%</td>
<td>20 (1.1-120)</td>
<td>0.20 (0.19-0.72)</td>
<td>-1.7% (-205.61-9)</td>
</tr>
<tr>
<td>Ketamine (N=27)</td>
<td>9.0%</td>
<td>80 (40-150)</td>
<td>1.49 (0.24-10)</td>
<td>-0.65% (-210.90)</td>
</tr>
<tr>
<td>Propofol (N=12)</td>
<td>4.9%</td>
<td>10 (5-80)</td>
<td>0.12 (0.12-1)</td>
<td>-184.3% (-8175-2-25)</td>
</tr>
<tr>
<td>Midazolam (N=11)</td>
<td>3.4%</td>
<td>2 (1-5)</td>
<td>0.04 (0.013-0.2)</td>
<td>-557.5% (-1735-1-50)</td>
</tr>
</tbody>
</table>

Table 3: Induction/Paralytic Agents

<table>
<thead>
<tr>
<th>Paralytic Agents</th>
<th>Dose, mg</th>
<th>Dose, mg/kg</th>
<th>Percent Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Succinylcholine (N=268)</td>
<td>70.2%</td>
<td>120 (5-300)</td>
<td>1.49 (0.40-3.1)</td>
</tr>
<tr>
<td>Rocuronium (N=54)</td>
<td>15.7%</td>
<td>80 (10-120)</td>
<td>1.27 (1-1.8)</td>
</tr>
<tr>
<td>Vecuronium (N=20)</td>
<td>6.1%</td>
<td>10 (1.6-15)</td>
<td>0.11 (0.08-0.22)</td>
</tr>
</tbody>
</table>

Table 4: Post-Intubation Management With Prolonged Paralysis

<table>
<thead>
<tr>
<th>Sedation Initial Intubation %</th>
<th>Sedation Without Paralysis %</th>
<th>Sedation Gap %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Etomidate (N=40)</td>
<td>19 (45%)</td>
<td>21 (52%)</td>
</tr>
<tr>
<td>Ketamine (N=7)</td>
<td>25 (4-65)</td>
<td>6 (85.7%)</td>
</tr>
<tr>
<td>Propofol (N=4)</td>
<td>47 (10-17)</td>
<td>3 (50%)</td>
</tr>
<tr>
<td>Midazolam (N=6)</td>
<td>95 (15-141)</td>
<td>2 (13.3%)</td>
</tr>
</tbody>
</table>

Figure 1: Review of Analgosedation

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 whereas vecuronium was dosed more appropriately
- Analgosedation 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 analgosedation 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 used under doses and paralytic agents are being over doses in RSI
- Education is necessary to close the gap in sedation where extended paralysis is used during RSI
- Education regarding Analgosedation is needed to increase the amount of analgosedation being used.
- There has been an increase in analgosedations 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

1. Bernhard M et al. The First Shot Is Often the Best Shot: First-Pass Intubation Success in Emergency Airway Management. Anesth Analg. 2015; 120(5):1182-8. 6.5% (40-150) | 1.49 (0.40-3.1) | 20.4% (-146-100) |

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

Figure 1: Review of Analgosedation

Disclosure

The authors of this presentation have no financial or personal relationships with other persons or organizations that could inappropriately influence the content of this presentation.

acknowledgments

The authors would like to thank the following people for their contributions to this project: Bryan Statz, Sarah Sienko, and William Armstrong.

The authors of this presentation have no financial or personal relationships with other persons or organizations that could inappropriately influence the content of this presentation.