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Neostigmine versus Sugammadex and the Relationship to Reintubation Rates in the PACU

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Background
Reintubation in the post-anesthesia care unit (PACU) is a complication that may be related to residual neuromuscular blockade. Neostigmine and sugammadex have different pharmacokinetics that effect speed and completeness of reversal of paralysis. According to Tillquist et al. (2016) reintubation following general anesthesia in the PACU is associated with a 50% increased risk of mortality. Few studies have investigated the incidence rate of PACU reintubation and its possible relationship and choice of reversal medication.

Methods

- Retrospective Observational Research Study.
- This project was approved by the PSHMC and PHFH institutional review board.
- Patient data was extracted from Epic electronic medical records and accessed from secured REDCap database.
- Eligibility Criteria: Inclusion – Patients ≥ 18 years of age undergoing general anesthesia, intubated at start of procedure and extubated by out of OR time between 2013 and 2019.
- Descriptive analyses examined baseline group comparability, incidence of reintubation and risk factors in the study population.
- Additional statistical analyses were conducted: a-priori power analysis, univariate, bivariate, and multivariable. Additional statistical analyses were conducted: a-priori power analysis, univariate, bivariate, and multivariable.
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- Additional statistical analyses were conducted: a-priori power analysis, univariate, bivariate, and multivariable.
- Time series examined rates of PACU reintubation over time, with stratification into low risk and high risk patient groups.
- Risk factors associated with reintubation were extrapolated based upon Brueckmann et al. (2013) score for prediction of postoperative respiratory complications (SPORC).

Findings

Table 1. Patient Demographic & Clinical Characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Years</td>
<td>57</td>
<td>17</td>
</tr>
<tr>
<td>Body Mass Index</td>
<td>Kg/m2</td>
<td>40</td>
<td>4</td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td>37,665</td>
<td>44%</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>46,617</td>
<td>56%</td>
</tr>
<tr>
<td>ASA Score**</td>
<td></td>
<td>1</td>
<td>5,024 % 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>36,210 % 44</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>34,857 % 41</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>4,019 % 5</td>
</tr>
</tbody>
</table>

Table 2. *Independent Risk Factors for PACU Reintubation

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neostigmine</td>
<td>1.03 (1.01-1.05)</td>
<td>0.05</td>
</tr>
<tr>
<td>Sugammadex</td>
<td>0.92 (0.86-1.52)</td>
<td>0.37</td>
</tr>
<tr>
<td>High Risk Patients</td>
<td>1.67 (1.08-2.65)</td>
<td>0.05</td>
</tr>
<tr>
<td>Non-Neostigmine Procedure</td>
<td>0.96 (1.25-4.09)</td>
<td>0.67</td>
</tr>
</tbody>
</table>

- Reintubation in the PACU is rare and there are no significant differences in reintubation rate among patients receiving neostigmine or sugammadex. (P = 0.57)
- No reversal - received a ne-depolarizing neuromuscular blocker, but did not receive reversal agent
- Not requiring reversal - received either a depolarizing neuromuscular blocking agent or none, and subsequently did not require reversal agent

Discussion

Reintubation in the PACU is rare. Rates of reintubation increased in the years 2016 and 2017. Rates in 2019 were below levels observed in 2014. Patients were stratified into low risk (reintubation risk score <2) and high risk (≥3) groups. Reintubation rates peaked for high risk patients in 2016 and peaked for low risk patients in 2017. A reduction of reintubation in PACU was not associated with the utilization of sugammadex in comparison to neostigmine.

Due to the lack of current research evidence investigating the relationship between reintubation rates and reversal medication, this retrospective observational research study aims to serve as a foundation for generating hypotheses for future randomized control trials that may inform treatment decisions in clinical practice.

References