COVID-19 Neuromuscular Blocker Agent Shortage

April 17, 2020

Neuromuscular blockade (N MBA) is often implemented to facilitate mechanical ventilation for treatment of acute respiratory distress syndrome (ARDS). The historical supply shortages with these agents has been amplified by the surge in demand due to treatment of COVID-19. Efforts are underway to obtain a supply of alternate (non-formulary) NMBAs, however with the high demand this alone is unlikely to cover needs. Urgent conservation methods are necessary to prohibit complete exhaustion of drug supply.

The Society of Critical Care Medicine (SCCM) does not recommend routine use of continuous infusion of neuromuscular blockade for all mechanically ventilated patients or for treatment of mild ARDS. For mechanically ventilated patients and with moderate to severe ARDS, the recommendation is as follows:

SCCM Guideline Recommendations:
35. For mechanically ventilated adults with COVID-19 and moderate to severe ARDS:
35.1. We suggest using, as needed, intermittent boluses of neuromuscular blocking agents over continuous N MBA infusion to facilitate protective lung ventilation (weak recommendation, low-quality evidence).
Below are the available NMBA agents, suggested dosing, and dose considerations.

<table>
<thead>
<tr>
<th>NMBA</th>
<th>Onset of Action (MIN)</th>
<th>Duration after INITIAL dose (MIN)</th>
<th>Trinity Formulary</th>
<th>Usual Dose Range#</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisatracurium</td>
<td>1.5-2</td>
<td>20-35</td>
<td>Yes</td>
<td>Intermittent bolus dosing: 0.1 to 0.2 mg/kg/dose; Continuous infusion: <em>INITIAL RATE: 3 mcg/kg/min</em> USUAL DOSE RANGE: 1 - 10 mcg/kg/min*</td>
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<tr>
<td>Vecuronium</td>
<td>2.3-3</td>
<td>20-40</td>
<td>Yes</td>
<td>Intermittent bolus dosing: 0.1 to 0.2 mg/kg/dose; Continuous infusion: <em>INITIAL RATE: 0.8 mcg/kg/minute</em> USUAL DOSE RANGE: 0.8 to 1.7 mcg/kg/minute*</td>
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<tr>
<td>Rocuronium</td>
<td>1-2</td>
<td>22-67 dose dependent)</td>
<td>Yes</td>
<td>Intermittent bolus dosing: 50 mg initial dose followed by 25 mg dose as needed; Continuous infusion: <em>INITIAL RATE: 8 mcg/kg/min</em> USUAL DOSE RANGE: 8-12 mcg/kg/min*</td>
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<tr>
<td>Atracurium</td>
<td>2-3</td>
<td>20-35</td>
<td>No</td>
<td>Intermittent bolus dosing: 0.4 to 0.5 mg/kg/dose; Continuous infusion: 4 to 20 mcg/kg/minute Estimated daily dose 600 mg-2300 mg</td>
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<tr>
<td>Pancuronium</td>
<td>2-3</td>
<td>60-100</td>
<td>No</td>
<td>Intermittent bolus dosing: 0.06 to 0.1 mg/kg/dose; Continuous infusion: 0.8 to 2 mcg/kg/minute. Estimated daily requirement 120 mg – 250 mg</td>
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</tbody>
</table>

# For obsess patients (body mass index ≥ 30 kg/m2), use ideal body when calculating NMBA doses.

**Action Necessary:**
1. Due to extremely limited supply, implement conservation strategies to mitigate drug supply exhaustion including
   a. Limit use to only patients with Severe ARDS (P/F <= 100) or who have failed prone ventilation
   b. Attempt intermittent boluses prior to continuous infusion when appropriated based on SCCM recommendations criteria
      i. Recommend 24 hours of intermittent use prior to converting to continuous infusions
      ii. Local assessment with pharmacy regarding medication supply, available presentations, and dose dispensing should occur with bolus dose strategy to minimize waste
c. If continuous infusion of a NMBA is required, use the lowest dose to achieve clinical goal and reassess the need for infusion at least twice a day. If train of 4 (TOF) monitoring is used, discontinue infusion if TOF reaches 0/4 and reassess need for infusion.
   i. For obese patients (body mass index ≥ 30 kg/m2), use ideal body when calculating NMBA doses.

2. Critical care colleagues should familiarize themselves with alternative agents, dosing, and pharmacodynamic profile in preparation for a need to shift agents based on availability.
3. Use succinylcholine preferentially, when appropriate, for RSI to preserve rocuronium supply. Ensure that a NMBA supply is available for emergent surgeries (succinylcholine or rocuronium).

References/Citations:
1. Surviving Sepsis Campaign Guidelines on the Management of Critically Ill Adults with Coronavirus Disease 2019 (COVID-19)
   https://journals.lww.com/ccmjournal/Abstract/onlinefirst/Surviving_Sepsis_Campaign__Guidelines_on_the.95707.asp