Intermittent and Continuous Infusion Administration of Non-Depolarizing Neuromuscular Blocking Agents (NMBAs)

Indications:
- ARDS with ventilator dysynchrony
- Sedated with RASS goal -5 achieved prior to initiation of paralysis

Non-Depolarizing NMBA Mechanism of Action:
- Competitively inhibits acetylcholine from binding to the receptors and prevents neural transmission at the myoneural junction without producing depolarization

<table>
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<th>Agent</th>
<th>Bolus Dosing*</th>
<th>Onset</th>
<th>Duration</th>
<th>Elimination</th>
<th>Adverse Effects / Clinical Considerations</th>
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</table>
| Atracurium| 0.4-0.5 mg/kg (round to nearest 50 mg) | 3-5 minutes | 20-35 minutes | 5-10% renal, Hoffman elimination | • High doses may cause histamine release, resulting in hypotension, tachycardia  
• Toxic metabolite: laudanosine – no neuromuscular blocking properties, CNS stimulant that accumulates in renal insufficiency → may lead to CNS excitation/seizures  
• Effects and duration may be more variable in elderly patients |
| Cisatracurium | 0.1-0.2 mg/kg (round to nearest 2 mg) | 2-3 minutes | 35-45 minutes | 5-10% renal, Hoffman elimination | • Does not affect BP and HR  
• Relatively long duration of action |
| Rocuronium | 0.6-1.0 mg/kg (round to nearest 50 mg) | 1-3 minutes | 30-60 minutes | 33% renal ~75% hepatic | • Accumulation may occur in patients with cirrhosis (more prominent) or renal impairment  
• Vagal blockade at higher doses; weakly blocks muscarinic stimulation (bradycardia may occur)  
• Rapid onset and intermittent duration make it a viable option for intermittent paralysis |
| Vecuronium | 0.1-0.2 mg/kg (round to nearest 10 mg) | 3-4 minutes | 35-45 minutes | 50% renal 35-50% hepatic | • Accumulation may occur in patients with liver impairment or anuric patients  
• Minimal histamine release; vagal blockade at higher doses  
• Less cardiovascular effects than other NMBAs |

*Weight-based dosing is based on actual body weight for non-obese patients. Obese patients should be dosed using an adjusted body weight.
Concomitant Therapies:
- Continuous infusion sedative recommended (RASS goal -5 prior to initiation)
  - Ensure all other active sedative medications have RASS goal modified to -5
- Artificial tears ointment Q1H PRN dry eyes
  - In order comments: Please apply to both eyes every time room is entered. KEEP TUBE AT BEDSIDE, MUST NOT RE-ENTER OMNICELL ONCE INSIDE PATIENT ROOM

Drug Interactions:

*Decrease activity of NMBAs*
- Calcium
- Carbamazepine
- Phenytin
- Ranitidine

*Prolong activity of NMBAs*
- Antibiotics: aminoglycosides, vancomycin, clindamycin, tetracyclines
- Cardiac medications: beta blockers, calcium channel blockers, furosemide
- Steroids
- Cyclosporine

Monitoring:
- Before paralysis:
  - Baseline TOF (indicating site and voltage), RASS at -5
- During paralysis:
  - Ventilator synchrony, O2 saturations, PaO2:FiO2, ABG as needed, renal and hepatic dysfunction, vitals
- When discontinuing paralysis:
  - Monitor TOF and once achieved 3 to 4 twitches, can proceed to lighten sedation if necessary to assess neurologic function

References:
- Atracurium Besylate Injection [prescribing information]. Chicago, IL; Meitheal Pharmaceuticals Inc.: 2018.
- Nimbex (cisatracurium besylate) [prescribing information]. North Chicago, IL; AbbVie Inc; 2019.
ARDS requiring ventilator synchrony

STANDARD OF CARE

**Cisatracurium** 15 mg IVP followed by 7.5 mcg/kg/min infusion x 48 hours
- Repeat bolus of 20mg IVP x 1 if end-inspiratory plateau pressure remains ≥ 32 cm H2O for > 10 minutes despite deep sedation (RASS -5 and/or decreasing Vt and PEEP
- Max 2 additional boluses

If cisatracurium unavailable

**Rocuronium** 0.6 – 1 mg/kg (rounded to nearest 50 mg) IVP followed by 8 mcg/kg/min infusion titrated to ventilator synchrony (max 12 mcg/kg/min).

If cisatracurium and rocuronium unavailable

**Vecuronium** 0.08-0.1 mg/kg (rounded to nearest 10 mg) IVP followed by 0.8 mcg/kg/min infusion titrated to ventilator synchrony (max 1.5 mcg/kg/min).

If cisatracurium, rocuronium, and vecuronium unavailable

**Atracurium** 0.4-0.5 mg/kg (rounded to nearest 50mg) IVP followed by 10 mcg/kg/min infusion titrated to ventilator synchrony (max 20 mcg/kg/min)
- Initial dose may be reduced to 0.3-0.4 mg/kg in patients with significant cardiovascular disease or asthma

*PRN dosing will be based on duration of sustained ventilator synchrony following each dose. Doses should not be given more frequently than q1hr