



**Measure Abbreviation:** NMB 02

**Data Collection Method:** This measure is calculated based on data extracted from the electronic medical record combined with administrative data sources such as professional fee and discharge diagnoses data. This measure is explicitly not based on provider self-attestation.

**Description:** Administration of neostigmine, Sugammadex, and/or edrophonium before extubation for cases with nondepolarizing neuromuscular blockade

**NQS Domain:** Effective Clinical Care

**Measure Type:** Process

**Scope:** Calculated on a per case basis.

**Measure Summary:** The neuromuscular blocker reversal measure tells you the percentage of your patients that receive a reversal agent after you have given a non-depolarizing neuromuscular blocker. The purpose of this quality measure is to help reduce the number of patients who have residual neuromuscular blockade after extubation. To account for cases where a dose of muscle relaxant was given early in the case, and then not redosed, this measure does not require that neostigmine to be given if a non-depolarizer was not administered for 3 hours before extubation for adults and 2 hours for pediatric patients.

**Rationale:** Postoperative residual neuromuscular blockade can lead to significant complications.<sup>1,2</sup> Several studies have found associations between the use of neuromuscular blockade agents (NMBA) and residual neuromuscular blockade in the recovery room. Adverse postoperative respiratory outcomes are even more frequent when patients receive NMBA and reversal agents are not used. A mainstay of residual blockade prevention continues to be monitoring to allow for detection, and use of reversal agents like neostigmine and sugammadex.<sup>3-5</sup> Due to variability in duration of muscle relaxants, even in defasciculating doses, we recommend that TOF is monitored when any non-depolarizing neuromuscular blockers are administered.

**Inclusions:**

All patients that have received either by bolus or infusion a non-depolarizing neuromuscular blocker (NMB) AND were extubated post-operatively. The following NMBs were included:

- Atracurium
- Cisatracurium
- Pancuronium
- Rocuronium
- Vecuronium

**Exclusions:**

- ASA 5 and 6 cases.
- Patients that were not extubated in the immediate post-operative period.
- Patients not given NMBs.
- Cardiac surgery without pump (CPT: 00560)
- Cardiac surgery with pump and <1 year old (CPT: 00561)
- Cardiac surgery with pump and > 1 year old (CPT: 00562)
- Cardiac surgery with hypothermic arrest (CPT: 00563)
- CABG with pump (CPT: 00567)
- Heart Transplant (CPT: 00580)
- Cases where patients (age > 12) received defasciculating doses of
  - Vecuronium ≤ 1mg
  - Cisatracurium ≤ 2mg
  - Rocuronium ≤ 10 mg
- Any cardiac case with an intraoperative note mapped to one of the following MPOG Concepts:
  - 50399 Cardiopulmonary bypass -- aortic clamp on/off note
  - 50409 Cardiopulmonary bypass terminated
  - 50410 Cardiopulmonary bypass initiated (full)
  - 50416 Cardiopulmonary bypass -- crossclamp and circulatory arrest time totals
  - 50417 Cardiopulmonary bypass -- Access cannula removed note
  - 50714 Cardiopulmonary bypass - Bypass start / stop event
- Cases performed by cardiac surgical service: MPOG concept 80005.

**MPOG Concept IDs Required:**

Neuromuscular Blocker Medications MPOG Concept IDs		Reversal Agent MPOG Concept IDs		Extubation MPOG Concept IDs		Train of Four MPOG Concept IDs	
10043	Atracurium	10170	Edrophonium	50127	Intubation Extubated Awake or Deep	3485	Train-of-four (Acceleromyography)
10129	Cisatracurium	10315	Neostigmine	50202	Emergency- Patient Extubated		
10344	Pancuronium	10739	Sugammadex	50145	Airway – Laryngeal mask airway removed (deep or awake)		
10393	Rocuronium						
10446	Vecuronium						

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### Data Diagnostics Affected:

- Percentage of Cases with a Non-Depolarizing NMB Administration
- Percentage of Cases with an Extubation Note
- Percentage of Cases with Neuromuscular Blocker Reversal Agents Administered
- Percentage of Medications with a Meaningful Medication Mapping
- Percentage of Cases with any Staff Tracking
- Percentage of Anesthesia Provider Sign-Ins that are Timed

### Collations Used:

- AsaNotes
- Asa5or6
- Cardiac
- ExtubationTimes

### Success:

- Documentation of neostigmine, Sugammadex, and/or edrophonium before earliest extubation.  
**OR**
- A period of greater than 3 hours exists between last dose of non-depolarizing medication and extubation for patients  $\geq 12$  years old.  
**OR**
- A period of greater than 2 hours exists between last dose of non-depolarizing medication and extubation for patients  $< 12$  years old.  
**OR**
- An acceleromyography ratio of  $\geq 0.9$  documented after last dose of NMB and before earliest extubation.

**Threshold:** 90%.

**Responsible Provider:** The provider(s) signed in at time of earliest extubation.

### Risk Adjustment (for outcome measures):

*Not applicable.*

### References:

1. McLean DJ, Diaz-Gil D, Farhan HN, Ladha KS, Kurth T, Eikermann M. Dose-dependent Association between Intermediate-acting Neuromuscular-blocking Agents and Postoperative Respiratory Complications. *Anesthesiology*. 2015;122(6):1201-1213.
2. Murphy GS, Szokol JW, Avram MJ, et al. Residual Neuromuscular Block in the Elderly: Incidence and Clinical Implications. *Anesthesiology*. 2015;123(6):1322-1336.
3. Brull SJ, Murphy GS. Residual neuromuscular block: lessons unlearned. Part II: methods to reduce the risk of residual weakness. *Anesthesia and analgesia*. 2010;111(1):129-140.
4. Bulka CM, Terekhov MA, Martin BJ, Dmochowski RR, Hayes RM, Ehrenfeld JM. Nondepolarizing Neuromuscular Blocking Agents, Reversal, and Risk of Postoperative Pneumonia. *Anesthesiology*. 2016;125(4):647-655.

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5. Lien CA, Kopman AF. Current recommendations for monitoring depth of neuromuscular blockade. *Current opinion in anaesthesiology*. 2014;27(6):616-622.