MPOG Pediatric Subcommittee Meeting

August 18, 2021

MPOG
MULTICENTER PERIOPERATIVE OUTCOMES GROUP

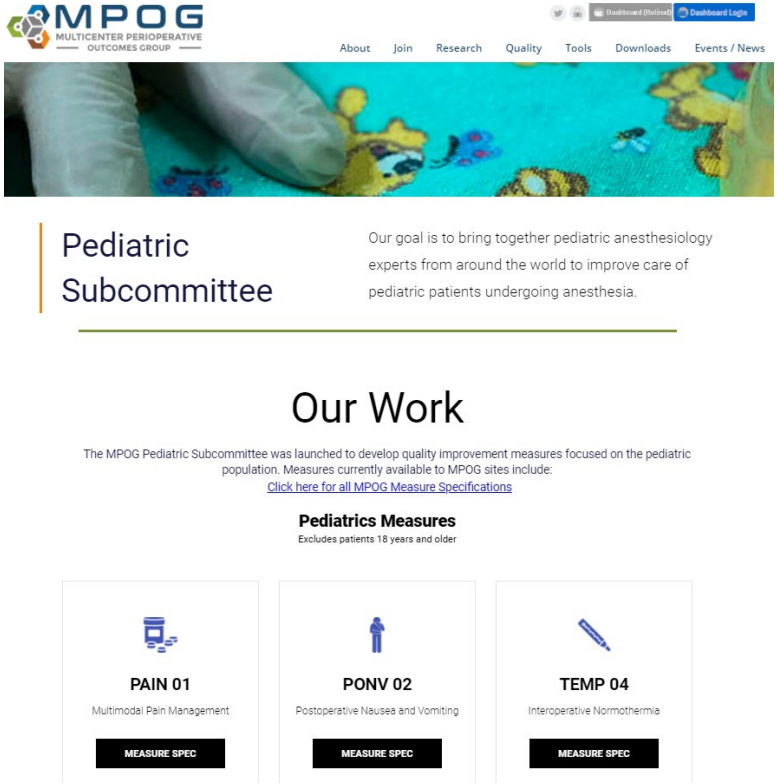
Agenda

Announcements *Measure Updates*
TOF Monitoring (NMB-01) *Measure Review and Discussion*
Reversal Administered (NMB-02) *Measure Review and Discussion*
Proposed Measure: NMB Dosing
Open Discussion

Announcements

- Remaining 2021 Meeting Dates
  - MPOG pediatric subcommittee update at SPA Q&S (virtual)
  - Next Subcommittee meeting:
    - December 15th, 1pm EST via Zoom

Coming Soon! Pediatric Subcommittee Website



PAIN 01 - Multimodal Pain Management

- New! Local anesthetic administered at surgical site added as passing criteria
- Currently, this measure is informational only, with no attribution to individual providers. As a result, individual providers are unable review their cases on the QI Reporting Tool.
- MPOG Quality Committee voting in progress to help decide if we should attribute this measure to Individual Provider(s) signed into case. Options include:
  - Providers signed into case at Induction
  - For longest duration
  - For any duration and at any time during the case (all providers who signed into case)
  - At Emergence
  - No attribution. Keep at departmental level

PONV 04 - PONV Prophylaxis in Pediatrics

Description Edit

Percentage of patients 3 through 17 years of age, who receive appropriate antiemetic prophylaxis preoperatively and/or intraoperatively.

Measure Time Period Edit

Preop Start to PACU Start

Inclusions Edit

Patients ≥ 3 and < 17 years old who have one or more risk factors for PONV:

- Age ≥ 3
- Females ≥ 12 years of age
- Hx PONV in patient, parent or sibling
- Surgery at Risk
  - Procedure Type: Strabismus
  - Procedure Type: Adenotonsillectomy
  - Procedure Type: Tympanoplasty
- Inhaled Anesthetic Duration ≥ 30 minutes
- Administration of long acting opioids (see other measure build details)

Exclusions Edit

- Patients < 3 or > 17 years old.
- ASA 5 or 6
- Labor Epidurals (Value code: 3 and 6)
- Radiology Procedures
- Patients transferred directly to the ICU

- Expected Release October 2021
- Phenotype Build
  - Diagnostic Imaging (exclusion)
  - Adenotonsillectomy
    - *Adenoidectomy alone is not considered as risk factor*
  - Tympanoplasty

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Is there interest in development of an informational measure for # of tonsil bleed cases?

Value	Value Code	Definition
No	0	Case did not involve Tonsils or Adenoids
Tonsillectomy	1	Case was Tonsillectomy without removal of adenoids
Adenoidectomy	2	Case was Adenoidectomy without removal of tonsils
Adenotonsillectomy	3	Case was Adenotonsillectomy; Removal of both tonsils and adenoids
Tonsil Bleed	4	Case was a tonsil bleed; Control of tonsil bleeding, without removal of tonsils or adenoids

TRAN-01 and TRAN-02

Plan is to build separate TRAN 01/02 measures specific to pediatric patients in 2022

- Include patients ≥ 6 months old *(previous inclusion ≥ 2yo)*
- Exclusion Updates
  - Cardiac bypass cases and all obstetric procedures
  - Patients on ECMO
  - Massive Transfusion/blood loss: Change definition from Total transfused volume (or EBL) of *30cc/kg* → 40cc/kg
- TRAN 02 Revision: If No Hb/Ht checked within 18 hours of Anesthesia End, the case should be flagged for systematic review

MPOG Pediatric Data Review

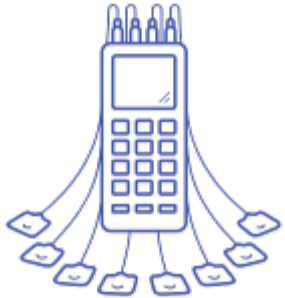
- MPOG enables participants to view institutional comparison data on select measures at collaborative meetings
- Facilitates further discussion and provides additional context to the comparison scores on the dashboard
- Would the Peds Subcommittee be interested in a performance review once per year?
- We would encourage low/high performers on the pediatric measures to speak to the care they provide and current barriers they face

Measure Review

Measure	Description	Peds Meeting Review
PONV 02 (PEDS)	*PONV prophylaxis, Pediatrics*	2/17/2021
TRAN 01	*Transfusion Management Vigilance*	5/19/2021
TRAN 02	*Overtransfusion*	5/19/2021
NMB 01	*Train of Four Taken*	8/18/2021
NMB 02	*Reversal Administered*	8/18/2021
PUL 03	*Administration of PEEP*	10/9/2021
TOC 01	*Intraoperative Transfer of Care*	10/9/2021
PUL 01	*Protective Tidal Volume, 10 mL/kg PBW*	12/15/2021
TEMP 03	*Perioperative Hypothermia*	12/15/2021

Train of Four Monitoring
NMB-01

NMB-01 - TOF Monitoring



Description

Percentage of cases with a documented Train of Four (TOF) after last dose of nondepolarizing neuromuscular blocker

Measure Time Period

Anesthesia Start → Earliest Extubation

Responsible Provider

The provider signed in at time of earliest extubation

Inclusion/Exclusion Criteria

Inclusions

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

- Atracurium
- Cisatracurium
- Pancuronium
- Rocuronium
- Vecuronium

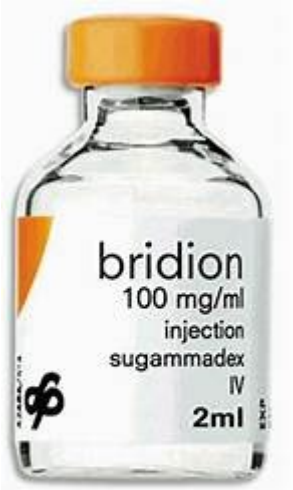
Exclusions

- ASA 5 and 6 cases.
- Patients that were not extubated in the immediate postoperative period.
- Patients not given NMBs.
- Cardiac surgery with or without pump (CPT: 00560, 00561, 00562, 00563, 00567, 00580)
- Cases performed by cardiac surgical service: MPOG concept 80005.

Success Criteria

- Documentation of a Train of Four count (1, 2, 3, or 4), sustained tetany, or TOF ratio provided by acceleromyography AFTER last dose or stopping of infusion of neuromuscular blocker and before earliest extubation.

- A Train of Four value of ‘0’ is accepted for cases in which Sugammadex is administered for reversal.



Sugammadex, which reverses the muscle-relaxing effects of rocuronium and vecuronium, is marketed in 70 other countries as Bridion.

Reversal Administered
NMB-02

NMB 02

Description - Administration of Neostigmine, Sugammadex, and/or Edrophonium *before extubation* for cases with non-depolarizing neuromuscular blockade.

Exclusions

- ASA 5&6
- Patients who remain intubated in the immediate postop period
- Patients who do not receive NMBs
- Cardiac Surgery
- Cases where patient (age > 12) receive defasciculating doses of
  - Vecuronium ≤ 1mg
  - Cisatracurium ≤ 2mg
  - Rocuronium ≤ 10 mg

NMB 02 - Success Criteria

EXISTING

- Documentation of Neostigmine or Sugammadex before earliest extubation **OR**
- For patients < 12yo, At least two hours exists between last dose of NMB and extubation (three hours for Patients ≥ 12yo) **OR**
- An acceleromyography ratio of ≥ 0.9 documented after last dose of NMB and before earliest extubation.

PROPOSED

Documentation of reversal before earliest extubation

OR

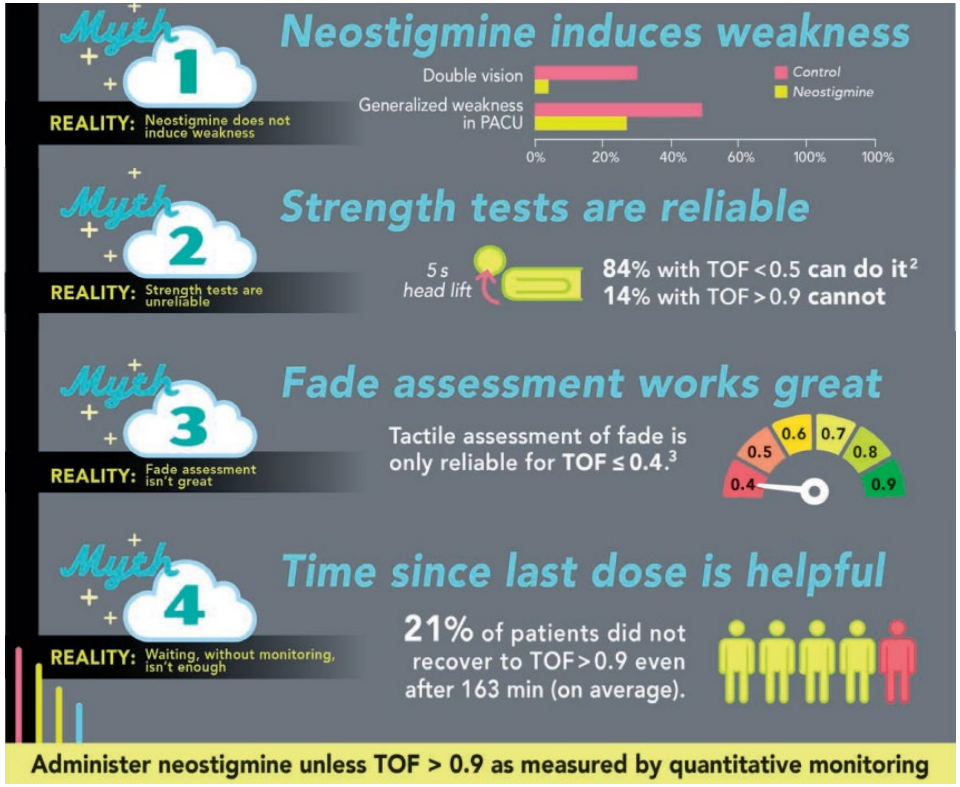
An acceleromyography ratio of ≥ 0.9 documented after last dose of NMB and before earliest extubation.

PERIOPERATIVE MEDICINE

Neostigmine Administration after Spontaneous Recovery to a Train-of-Four Ratio of 0.9 to 1.0

A Randomized Controlled Trial of the Effect on Neuromuscular and Clinical Recovery

Glenn S. Murphy, M.D., Joseph W. Szokol, M.D., Michael J. Avram, Ph.D., Steven B. Greenberg, M.D., Torin D. Shear, M.D., Mark A. Deshur, M.D., Jessica Benson, B.S., Rebecca L. Newmark, B.A., Colleen E. Maher, B.S.



Murphy et al, 2018

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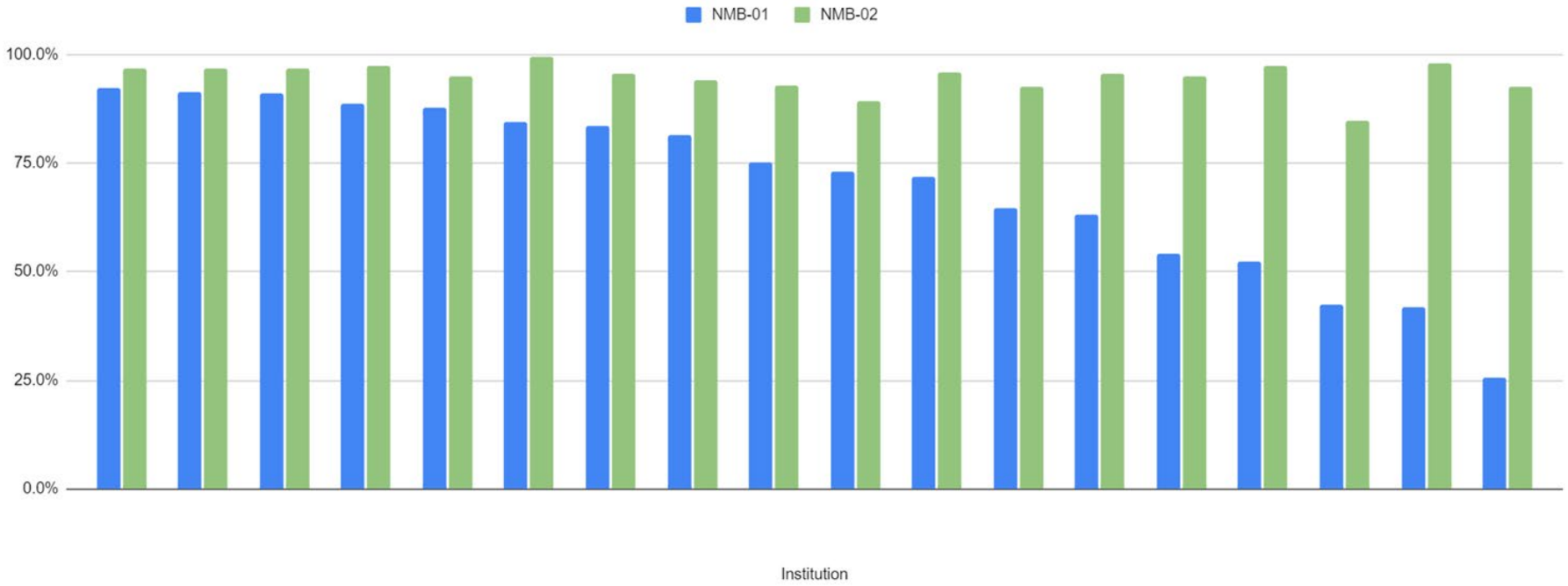
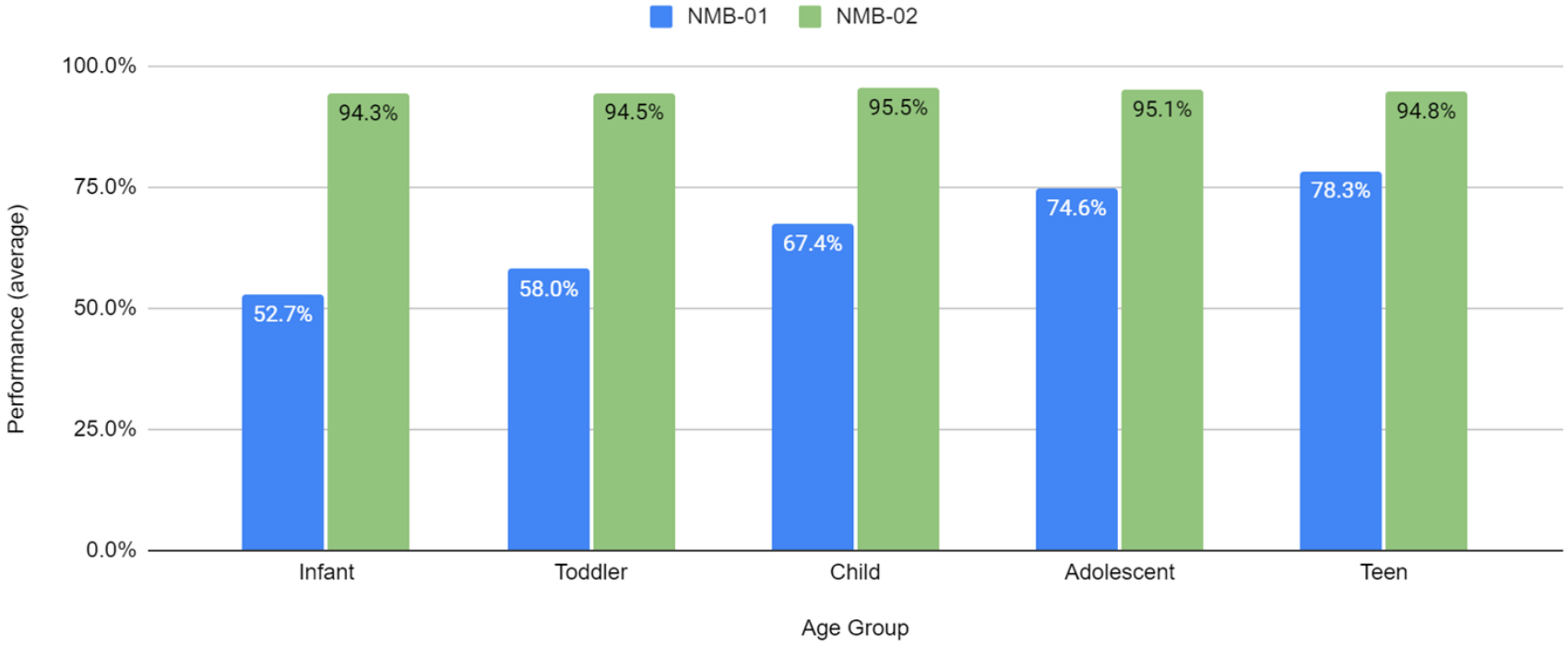
NMB-01 and NMB-02 (Patients < 18y)

June 2020 - July 2021



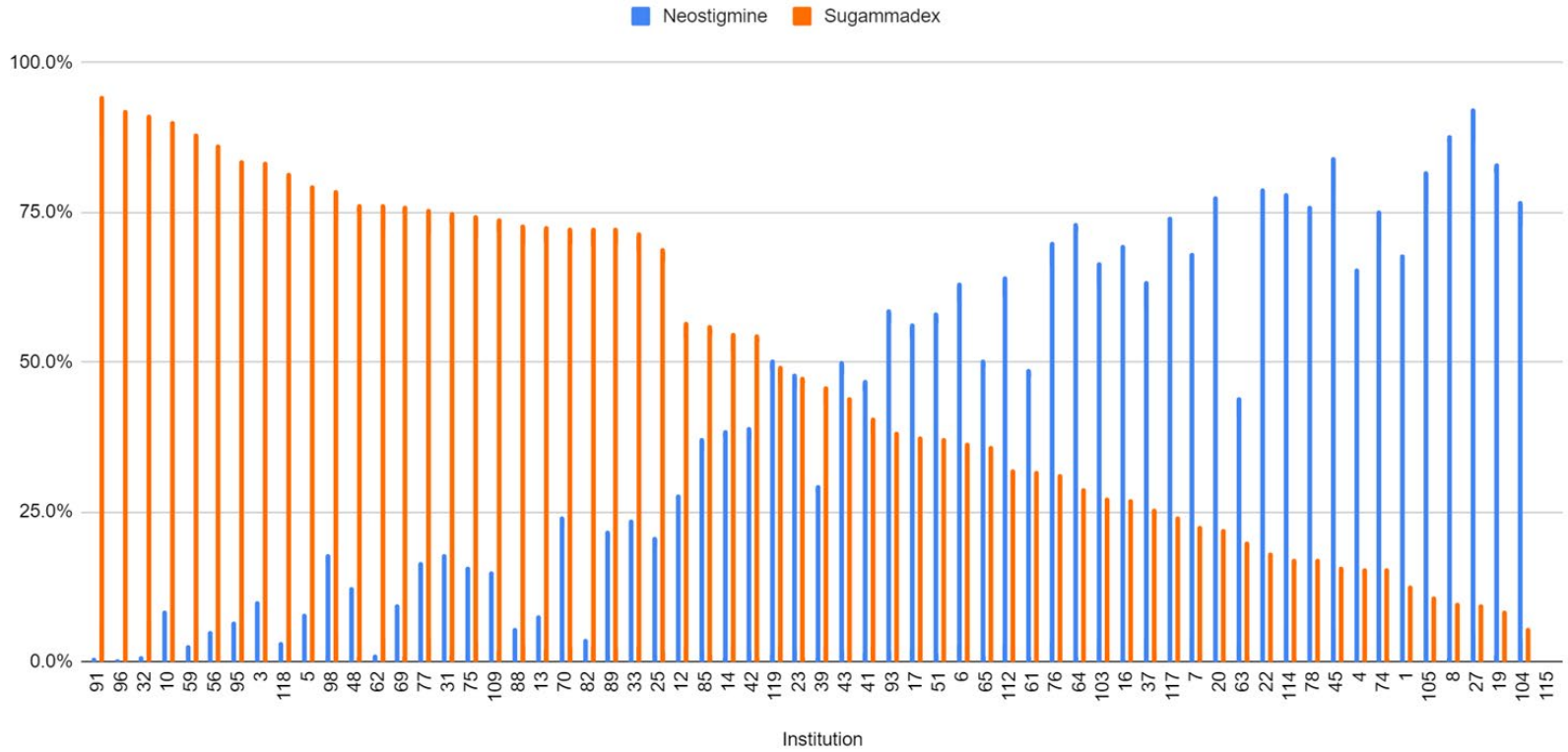
TOF Monitoring vs. NMB Reversal by Age Group

MPOG Peds Institutions (June 2020-July 2021)

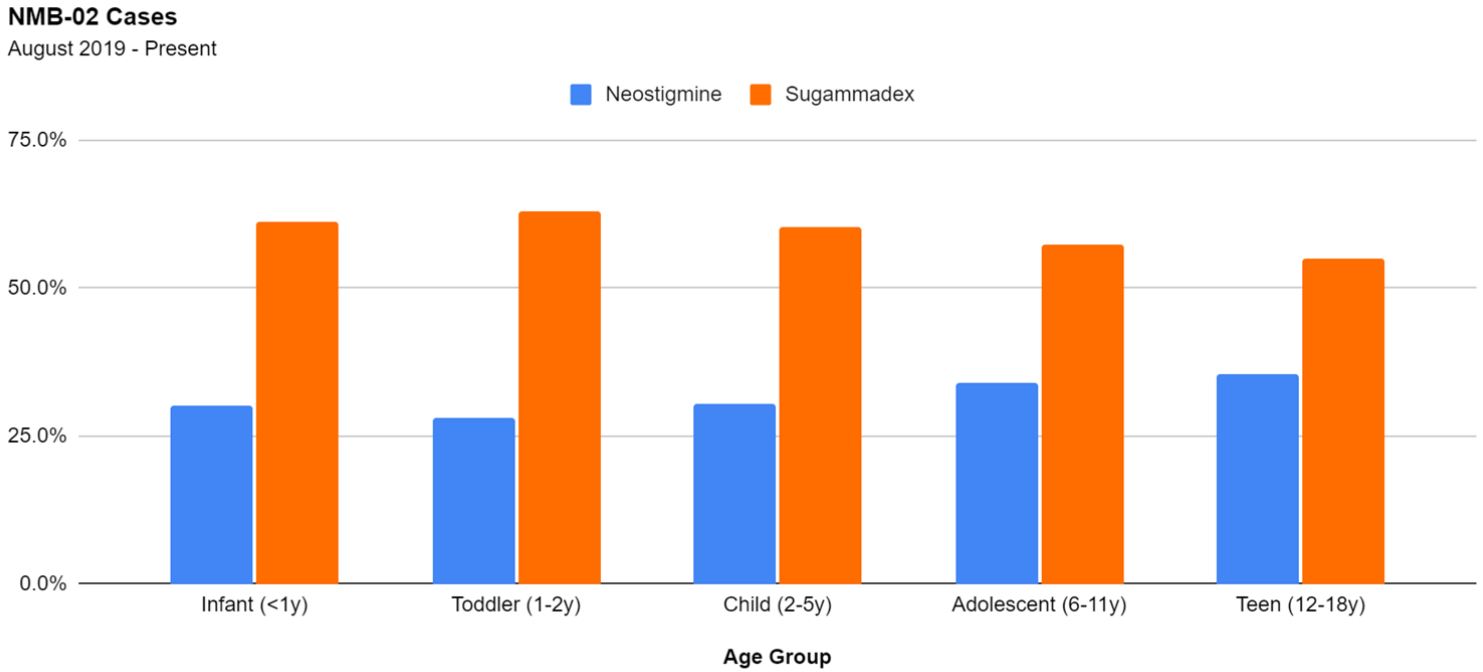


Sugammadex or Neostigmine across MPOG?

NMB-02 cases, Patients <18y



Sugammadex or Neostigmine across MPOG?



New Proposed Measure
NMB-03

Background

- The effective dose of rocuronium is reduced in infants compared to children
  - TAIVAINEN, T., MERETOJA, O.A., ERKOLA, O., RAUTOMA, P. and JUVAKOSKI, M. (1996), Rocuronium in infants, children and adults during balanced anaesthesia. Pediatric Anesthesia, 6: 271-275.

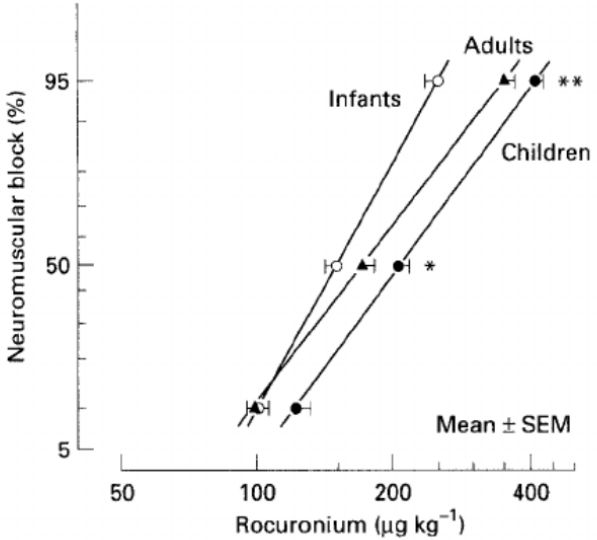
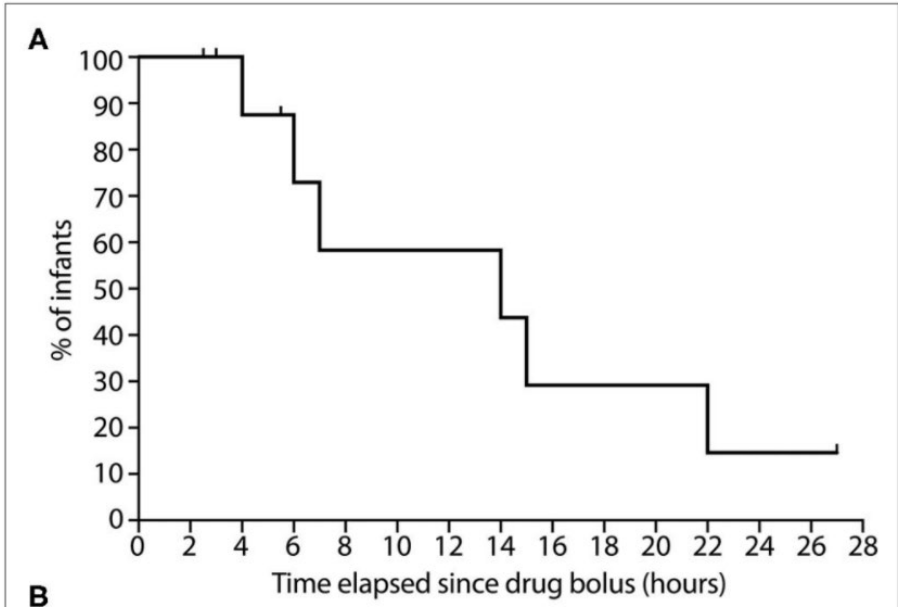


Figure 1
Cumulative dose-response curves of rocuronium in infants (○), children (●), and adults (▲) during balanced anaesthesia. Infants' curve is significantly left and children's curve significantly right from the curve of adults. * denotes $P<0.05$ between infants and children. ** denotes $P<0.05$ between all three goups. (ANOVA and Scheffe F-test).

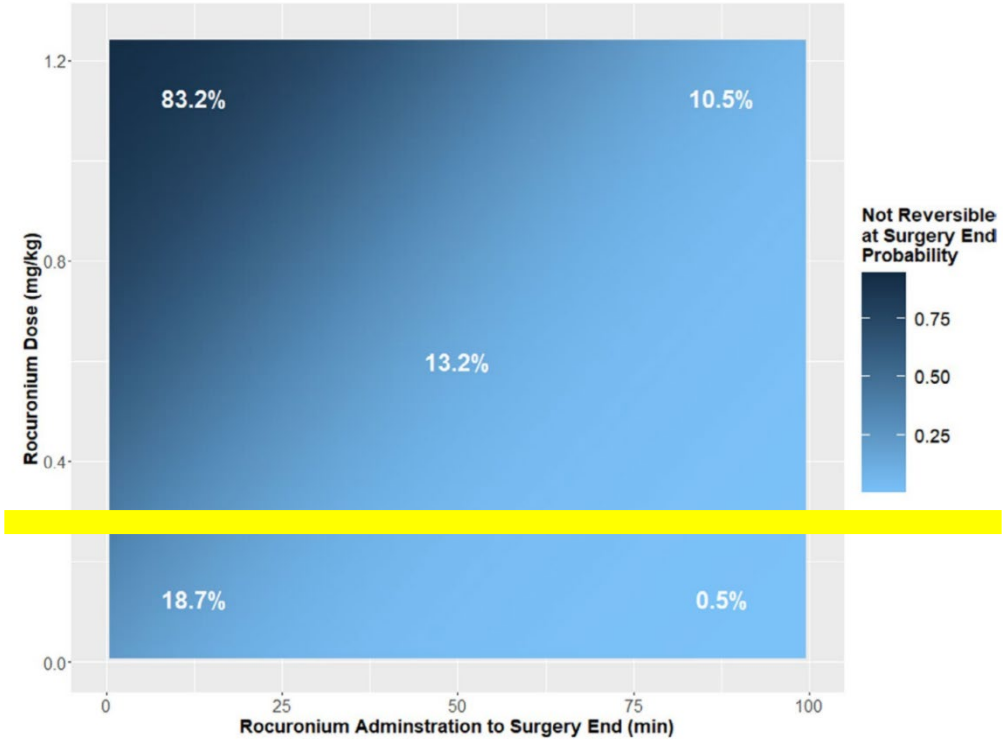
Background

- High dose rocuronium (1.5 mg/kg) may have markedly prolonged duration
  - Soffer OD, Kim A, Underwood E, Hansen A, Cornelissen L, Berde C. Neurophysiological Assessment of Prolonged Recovery From Neuromuscular Blockade in the Neonatal Intensive Care Unit. Front Pediatr 2020;8:580.



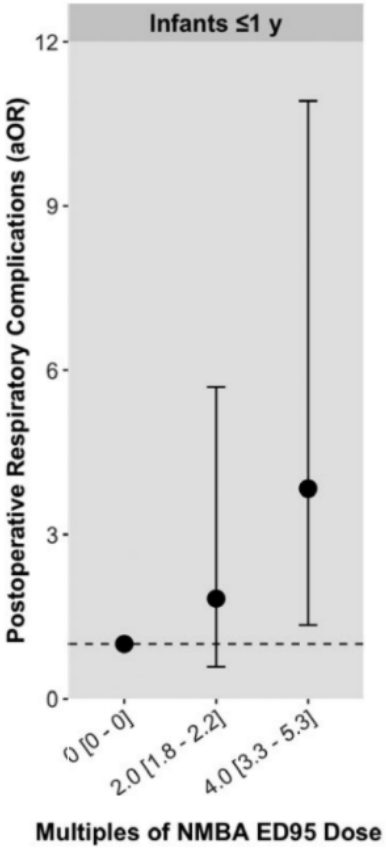
Background

- High rocuronium dosing in infants has been associated with prolonged anesthesia time
  - Gilbertson LE, Fiedorek MC, Fiedorek CS, Trinh TA, Lam H, Austin TM. Prolonged neuromuscular block after rocuronium administration in laparoscopic pyloromyotomy patients: A retrospective bayesian regression analysis. Paediatr Anaesth 2021;31:290–7.



Background

- High rocuronium dosing in infants has been associated with postoperative respiratory complications
  - Scheffenbichler FT, Rudolph MI, Friedrich S, Althoff FC, Xu X, Spicer AC, Patrocínio M, Ng PY, Deng H, Anderson TA, Eikermann M. Effects of high neuromuscular blocking agent dose on post-operative respiratory complications in infants and children. Acta Anaesthesiol Scand 2020;64:156–67.



Background

- Sugammadex is not a panacea
  - Renew JR, Tobias JD, Brull SJ. The Time to Seriously Reassess the Use and Misuse of Neuromuscular Blockade in Children Is Now. Anesth Analg 2021;132:1514–7.
  - Lorinc AN, Lawson KC, Niconchuk JA, Modes KB, Moore JD, Brenn BR. Residual Weakness and Recurarization After Sugammadex Administration in Pediatric Patients: A Case Series. A A Pract 2020;14:e01225.
  - Carollo DS, White WM. Postoperative Recurarization in a Pediatric Patient After Sugammadex Reversal of Rocuronium-Induced Neuromuscular Blockade: A Case Report. A A Pract 2019;13:204–5.
  - APSF Postoperative recurarization after sugammadex administration due to the lack of appropriate neuromuscular monitoring: https://www.apsf.org/article/postoperative-recurarization-after-sugammadex-administration-due-to-the-lack-of-appropriate-neuromuscular-monitoring-the-japanese-experience/

Existing dosing recommendations - Smith's 9th edition

TABLE 7.10

Suggested Standard Intubating IV Doses of Commonly Used Relaxants in Infants and Children

	Infants (mg/kg)	Children (mg/kg)
Succinylcholine	3	1.5–2
Cisatracurium	0.1	0.1–0.2
Atracurium	0.5	0.5
Rocuronium [a]	0.25–0.5	0.6–1.2
Pancuronium	0.1	0.1
Vecuronium	0.07–0.1	0.1

See text for source data.

a Low-dose rocuronium (0.3 mg/kg) allows tracheal intubation after 3 minutes during inhalational anesthesia in children, but then is easily antagonized in about 20 minutes. Large-dose rocuronium (1.2 mg/kg) may be used as a substitute for succinylcholine for rapid intubation in children in less than one minute.

Proposed measure: NMB-03-peds

- **Description:** Percentage of infant cases that receive appropriate initial dosing of non-depolarizing neuromuscular blocking drugs (NMB) intraoperatively.
- **Measure Type:** Process (informational)
- **Measure Time Period**: Anesthesia Start → Earliest Extubation
- **Success Criteria:** The first dose of neuromuscular blocker is less than the thresholds below, during the measure time period:
  - Cisatracurium: dose ≤ 0.2 mg/kg
  - Atracurium: dose ≤ 0.5 mg/kg
  - Rocuronium: dose ≤ 1 mg/kg
  - Pancuronium: dose ≤ 0.1 mg/kg
  - Vecuronium: dose ≤ 0.1 mg/kg

Open Discussion

Next Steps...

- We will incorporate your feedback and update the NMB metrics as needed
- Next Subcommittee meeting: **December 15th @ 1p EST**
    - Discussion: TEMP-03 (Postoperative Hypothermia)