



Compliance with Intraoperative Neuromonitoring and its Influence on Sugammadex Dosing

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Introduction

- Current ASA guidelines define intraoperative neuromonitoring documentation as a quantitative standard of care for all surgical patients receiving neuromuscular blocking agents
- Train of four (TOF) is the most reliable tool for measuring blockade as well as calculating dosing for reversal of neuromuscular blockade
- TOF documentation is associated with lower rates of residual neuromuscular blockade (RNMB) and fewer postoperative adverse events
- Sugammadex re-dosing after initial reversal is indicative of inadequate NMB reversal and is the most objective data point associated with RNMB
- Survey question: In adult elective robotic laparoscopic surgical patients requiring neuromuscular blockade, is the incomplete documentation of intraoperative neuromonitoring (TOF) associated with a higher incidence of sugammadex redosing?
- Research question: Will the implementation of a TOF documentation reminder in the intraoperative record improve compliance of TOF documentation with anesthesia providers at a large level 1 trauma center? Will the subsequently reduce the incidence of sugammadex redosing?

Methods

- Inclusion criteria**
- Adult surgical patients (age 18-60 years old)
 - Robotic and laparoscopic surgeries only at Albany Medical Center
 - Receiving general anesthesia requiring neuromuscular blockade
 - Elective surgeries only
 - ASA score 3 or less
- Exclusion criteria**
- Any patient with documented neuromuscular disease
 - ASA score 4 or greater
 - Emergent cases
- Phase I: Retrospective pre-intervention survey** (June 1, 2025 through August 31, 2025)
Implementation of EPIC macro documentation compliance reminder (January 5, 2026)
 • “Document Train of four if NMB administered”
 • Queued to appear as a documentation alert 60 minutes after induction
- Phase II: Retrospective post-intervention assessment** (January 12, 2026 through February 28, 2026)

Theory

- The Implementation Climate Scale (ICS) is a validated tool developed to assess whether an organization is supportive of the implementation of an evidence-based into their institutional framework.
- ICS complements the implementation of a new interface to promote compliance with the standard of practice regarding TOF documentation and sugammadex redosing.

Results

Phase I: Pre-intervention survey (June 1, 2025-August 31, 2025)

- Given that the ASA defines TOF documentation as the standard of anesthesia practice for properly dosing sugammadex, it would not be unreasonable to expect that documentation completion appears in every anesthesia record where NMB is used (100% completion of documentation).
- A power analysis determined that sufficient sample size = 194 subjects
- TOF documented only in 29% of cases prior to NMB reversal (sugammadex) being administered, suggesting that sugammadex reversal doses were likely estimated rather than calculated.

Phase II: Post-intervention assessment (January 12, 2026-February 28, 2026)

- TOF documentation prior to NMB reversal improved significantly from 29% to 50% post-intervention ($p=0.0000053141$)
- No significant change in mean reversal-to-extubation time post-intervention ($p=0.134328$)
- No significant change in the rate of sugammadex redosing post-intervention ($p=0.703168298$)
- Post-hoc analysis determined observed sample sizes were appropriately powered (99.1%)

Phase 1 – Summary Table

Category	Subcategory	TOF Documented	TOF Not Documented	Redosed Sugammadex
Gender	Male	24	58	2
	Female	62	206	10
Age	18–20	2	6	0
	21–30	8	22	3
	31–40	21	54	3
	41–50	28	61	2
	51–60	27	64	4
ASA	1	2	13	0
	2	46	108	7
	3	38	86	5
Totals		86	207	12

Phase 1 – Outcomes Summary

TOF documented	Reversal to extubation	Anesthesia stop to PACU d/c	Reintubation?	Sugammadex redosed?
Yes (n=86)	11.59 min	77.34 min	0	2.32% (2/86)
No (n=207)	12.84 min	69.55 min	0	4.83% (10/207)
Total (n=293)				4.09% (12/293)

Phase 2 – Summary Table

Category	Subcategory	TOF documented	TOF Not documented	Redosed Sugammadex
Gender	Male	30	38	1
	Female	63	55	8
Age	18–20	2	2	0
	21–30	20	13	0
	31–40	22	21	2
	41–50	20	33	2
	51–60	29	24	5
ASA	1	13	8	0
	2	51	52	7
	3	29	33	2
Totals		93	93	9

Phase 2 – Outcomes Summary

TOF documented	Reversal to extubation	Anesthesia stop to PACU d/c	Reintubation?	Sugammadex redosed?
Yes (n=93)	10.94 min	127.87 min	0	2.15% (2/93)
No (n=93)	11.40 min	155.86 min	0	7.53% (7/93)
Total (n=186)				4.83% (9/186)

Strengths & Limitations

Strengths

- Institutional quality control initiative. No IRB approval necessary.
- Minimal risk: no direct intervention/personal interaction
- No informed consent required
- Data safely deidentified and stored on secure Y-drive on institutions network
- HIPAA guidelines maintained
- Potential for overall savings in institutional costs

Limitations

- Risk of mishandling patient data
- Provider access to TOF equipment
- QC initiative institution specific- results may not be generalizable

Discussion

- Implementing a documentation reminder in EPIC improved institutional compliance with standard of practice for intraoperative neuromonitoring
- Completion of TOF documentation improved post-intervention
- Rate of sugammadex redosing decreased as TOF documentation improved
- Inconsistencies with PACU documentation limited extent of sub-analysis
- Multiple factors may influence PACU discharge times
- Future research may wish to consider multimodal approach to implementing documentation reminders for anesthesia providers
- Consider broadening data to evaluate surgeries beyond robotics/laparoscopic
- Multicenter data investigation may provide more generalizable results



References

