

Quantitative Train-of-Four (TOF) Monitoring with Sugammadex:

Essential for Optimizing Patient Outcomes and Saving Costs

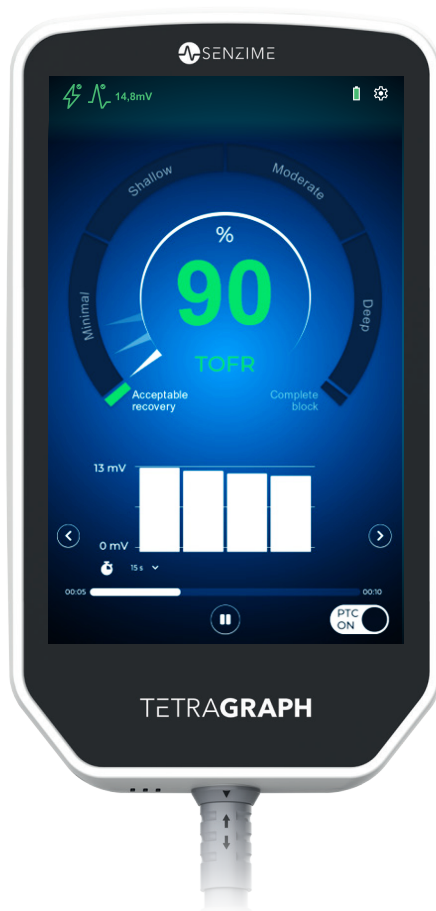
Align with Industry Best Practices

ASA & ESAIC Guidelines:

The American Society of Anesthesiologists (ASA) and European Society of Anaesthesiology and Intensive Care (ESAIC) recommend quantitative neuromuscular monitoring to prevent postoperative residual neuromuscular block (PRNB). This monitoring is critical to confirming full recovery, especially when using reversal agents like sugammadex (Thilen et al, 2024) (Haberkorn et al, 2024).

> Data Highlight:

The incidence of residual neuromuscular blockade (PRNB) in patients without train-of-four (TOF) monitoring can be as high as 33% (Carvalho et al, 2020).



Why Quantitative TOF Monitoring?

PRNB and Reversal Risks

Clinical adherence to quantitative TOF guidelines is designed to eliminate the risk of postoperative residual neuromuscular block (PRNB), which remains a concern even with sugammadex.

Reversal Agent	Monitoring Type	RNMB
neostigmine	none (clinical)	40%
neostigmine	quantitative	0%
sugammadex	none (clinical)	16%
sugammadex	quantitative	0%

Administering sugammadex without proper (quantitative) monitoring is insufficient to reliably prevent residual neuromuscular block (rNMB); sugammadex alone fails to eliminate rNMB. (Domenech et al, 2019) (Kotake, 2013).

> Data Insight:

In moderate block cases—in the absence of quantitative monitoring—rNMB incidence was >2% with sugammadex between 15–60 minutes. In deep block reversal at 10 minutes, sugammadex showed an **11.3% incidence of rNMB**, emphasizing that sugammadex does not guarantee complete recovery (Raval et al., 2020).

Reduced Postoperative Complications

Achieving a train-of-four ratio (TOFR) of >0.90 at OR exit reduces pulmonary complications and improves patient outcomes.

> Data Insight:

Patients who achieved TOFR >0.90 saw a **43% reduction** in postoperative pulmonary complications (including pneumonia, respiratory failure, and reintubation) and a **1-day reduction in hospital length of stay (LOS)** (Weigel et al., 2022).

Risk Factors for Postoperative Delirium (POD)

Residual neuromuscular blockade (NMB) following general anesthesia has been linked to pulmonary complications and hypoxia, both of which are risk factors for POD (Oh et al, 2016).

Precision Dosing:
Optimized Reversal with Quantitative
TOF Monitoring

Dosing Accuracy for Sugammadex:
Quantitative TOF monitoring allows anesthesiologists to tailor sugammadex dosing accurately, minimizing under- or overdosing risks.

> **Data Highlight:**
In a study of 97 patients, **87%** required less sugammadex than the recommended dose, and **13%** required more (Bowdle et al., 2023).

Significant Cost Reduction
Guided by quantitative monitoring, selecting the appropriate reversal agent (neostigmine or sugammadex) can significantly cut costs.

> **Data Highlight:**
A study involving 189 patients revealed that reversing all patients with sugammadex would have resulted in a total cost of USD 19,312 (USD 102 per patient), which is 70% higher than the cost achieved through optimized selective use.

Cost Efficiency with Aliquoting
Aliquoting sugammadex into smaller doses, combined with quantitative TOF, further reduces medication waste and costs.

> **Data Highlight:**
An institution projected annual savings of nearly **\$370,000** by aliquoting sugammadex and confirming adequate recovery without sugammadex in 20% of cases (Haberkorn et al, 2024).

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Financial Advantages:
Reducing Drug Waste and
Streamlining PACU Discharge

Reduction in Drug Wastage
Quantitative TOF enables precise sugammadex dosing.

Decreased PACU Time
Efficient reversal with TOF monitoring shortens PACU discharge times, optimizing turnover and resource allocation.

Increased Efficiency
Cost savings are achievable when the use of sugammadex is selectively guided by quantitative monitoring (Thilen et al., 2024).

> **The Bottom Line**
Quantitative TOF monitoring combined with sugammadex antagonism not only aligns with ASA and ESAIC recommendations but delivers powerful advantages in patient safety, drug savings, and operational efficiency.

Key Benefits At-a-Glance

Benefit	Impact	Reference
Reduced Reversal Drug Cost	70% reduction	Thilen et al., 2024
Annual Sugammadex Savings Potential	\$370,000 with TOF-based dosing	Haberkorn et al., 2024
Pulmonary Complications Reduction	43% lower rate with TOFR >0.90	Weigel et al., 2022
Reduced Hospital LOS	1-day shorter stay	Weigel et al., 2022

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