

A Quality Improvement Project to Reduce Sugammadex Cost and Waste by Using Aliquots and Quantitative Neuromuscular Monitoring

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Introduction & Background

- 8,000 patients per year at Children's Hospital Colorado (CHC) receive sugammadex to reverse rocuronium-induced neuromuscular blockade (NMB).
- Sugammadex is preferred over older medications such as neostigmine, but it is more expensive on a dose per kg basis.¹
- Sugammadex is supplied in single use 200mg/2ml and 500mg/5ml manufacturer vials that must be discarded after each patient use.² As a result, there is significant medication wastage that represents excess cost to the organization and a negative environmental impact.
- To take advantage of the excess medication per vial, sugammadex may be aliquoted into pre-filled syringes.³ Further cost savings may also be achieved when Quantitative Neuromuscular Monitoring (QNM) is used, as it has been shown to reduce sugammadex dosing by accurately assessing depth of neuromuscular blockade.⁴

This aim of this quality improvement project is to reduce sugammadex cost by aliquoting sugammadex from 500mg/5ml vials into 50mg/0.5ml pre-filled syringes and to guide sugammadex dosing with the introduction of routine QNM.

Methodology

- Inclusion criteria: all patients undergoing procedures in the general ORs and cardiac catheterization labs, who required rocuronium and reversal with sugammadex.
- Exclusion criteria: patients expected to remain intubated postoperatively and emergency cases.
- Pharmacy aliquoted sugammadex into 50mg/0.5ml syringes according to USP797 compounding guidelines³ at a cost of \$21.01 per syringe. Standard vials of sugammadex (200mg/2ml) cost \$109.79 each.
- QNM used Senzime Tetragraph™ monitors, with a single use \$27 sensor per case. Providers were encouraged to dose sugammadex based on manufacturer guidelines² but were free to follow clinical judgement.

Results

From October 10th to December 9th, 2022, 203 procedures were included in the analysis. Cost and savings analysis is shown in Table 1. The number of aliquots or vials required for each case was calculated based on the total amount of sugammadex administered, and this was then used to calculate the cost of sugammadex per case. Gross savings was calculated accordingly:

- Aliquot cases – actual sugammadex cost compared to potential cost of using the same amount of drug from a vial.
- Cases not requiring reversal – actual sugammadex cost (\$0) compared to potential cost of administering 2mg/kg of sugammadex from a vial (when QNM not used).
- Vial cases – potential savings calculated by comparing actual sugammadex cost to the potential cost of administering the same amount of drug from aliquots.

Net savings was determined by subtracting the cost of a single pediatric sensor (\$27) from the savings in each case.

Table 1. Sugammadex Cost and Savings Analysis

	Aliquot	Vial	No Reversal Required	Total
Cases	87 (43%)	75 (37%)	41 (20%)	203
Cost of single unit	\$21.01	\$109.79	\$0.00	--
Mean drug per case (mg/kg)	2.52	2.90	0.00	2.1
Mean drug cost per case	\$1.65/kg	\$2.58/kg	\$0.00/kg	\$1.66/kg
Gross savings	\$6,552.04	\$3,458.19	\$4,830.76	\$14,840.99
Net savings	\$4,203.04	\$1,433.19	\$3,723.76	\$9,359.99

Gross savings per case: \$73.11

Net savings per case: \$46.11

Estimated Annual Net Savings (8000 cases/year): \$368,866.60

Discussion

At our institution, utilization of sugammadex aliquots with QNM could result in a net yearly savings of approximately \$370,000. However, actual savings may be different depending on several factors:

- Savings could be significantly higher if insurance companies reimburse sensor cost as QNM becomes the new standard of care.⁵ In that scenario, total annual savings would be approximately \$585,000 based on a gross mean savings of \$73.11 across 8,000 cases.
- A significant cost not accounted for in this study is the QNM monitor capital expenditure, which would be an estimated \$75,000 at CHC. (Approximately 30 monitors at \$2500 each). However, the savings from using QNM far exceeds the cost of devices.
- A limitation of this project is that sugammadex drug wastage was not tracked. Per USP797 compounding guidelines, aliquots require refrigeration at a centralized location. Anesthesia providers typically remove several aliquot syringes in the morning and must discard any unused syringes at the end of the workday. Workflow could be improved to avoid this wastage.

Conclusion

Sugammadex aliquots (50mg/0.5ml) when used in combination with QNM to guide sugammadex reversal dosing, resulted in an estimated \$368,866 annual cost savings at our institution. Aliquots reduce waste, save money and should be used with QNM.

References

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