Post-Anesthesia Care Unit Times in Patients Reversed from Aminosteroid Paralytics with Sugammadex versus Neostigmine and Glycopyrrolate Combination

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Abstract

Neuromuscular blockade (NMB) reversal is vital for anesthesia care to prevent residual blockade, which can lead to respiratory complications and delayed recovery. This quality improvement project evaluated sugammadex, a selective NMB reversal agent, compared to the traditional neostigmine-glycopyrrolate, focusing on postoperative care unit (PACU) times in adult patients undergoing general anesthesia with rocuronium or vecuronium. Evidence from clinical guidelines and studies supported sugammadex's advantages in efficiency, safety, and cost-effectiveness. Implemented at a facility in Dothan, Alabama, the project addressed financial concerns through education, aiming to increase sugammadex utilization. Usage increased modestly by 1.38% (from 434 to 440 cases), reflecting improved provider confidence and highlighting the value of overcoming barriers to enhance patient safety and operating room efficiency.

Introduction

The reversal of neuromuscular blockade (NMB) is a critical facet of anesthesia management. It is necessary to minimize complications associated with residual neuromuscular blockade and facilitate a rapid postoperative recovery. Traditionally, the combination of neostigmine and glycopyrrolate has been the standard of care for NMB reversal. However, sugammadex, a novel gamma-cyclodextrin molecule that irreversibly encapsulates the steroidal neuromuscular blocking medications rocuronium and vecuronium, is beginning to change the status quo (Kaarthik et al., 2019). Sugammadex offers swift and predictable reversal by encapsulating unbound neuromuscular blockers within the plasma; this consequently alters the concentration gradient between the muscle tissue compartment relative to the plasma compartment (Singh et al., 2013). This change in the concentration gradient prompts NMB to shift out of the muscle tissue and into the plasma compartment to achieve equilibrium; the cycle then continues with the sugammadex molecule continuing to encapsulate NMB once within the plasma[5] . Ultimately, this decreases the concentration of the NMB within the neuromuscular junction and leads to a rapid reversal of neuromuscular blockade. As anesthesia providers attempt to improve clinical outcomes and expedite anesthetic recovery, comparing the clinical inner workings of sugammadex and the neostigmine-glycopyrrolate combination has gained significant interest in the anesthesia community.

At a rural community hospital in southeastern Alabama, sugammadex and the combination of neostigmine-glycopyrrolate are used, with sugammadex usage being comparatively more restricted due to its unit cost. Despite the American Society of Anesthesiologists 2023 practice recommendation that Sugammadex be used over neostigmine to avoid residual neuromuscular blockade (Thielen et al., 2023). This clinical practice improvement project was intended to educate the anesthesia providers in this facility on the advantages of using Sugammadex, such as decreased PACU times, more reliable return of neuromuscular function, and how these benefits offset any previously held apprehensions about using Sugammadex over neostigmine-glycopyrrolate. The PICO question, "Do adult patients undergoing general anesthesia who receive rocuronium/vecuronium (P) and who are reversed with sugammadex (I) compared to patients reversed with neostigmine-glycopyrrolate (C) experience shorter PACU times (O)?", is what lead the course of our project. We presented an educational session to the providers regarding the benefits of sugammadex to see if sugammadex usage increases thereafter compared to prior to the session.

Hypotheses

- Educating anesthesia providers on the benefits of sugammadex will increase its usage at a rural community hospital in southeastern Alabama, despite its higher unit cost.
- Sugammadex improves clinical outcomes by reducing PACU times and ensuring a more reliable return of neuromuscular function compared to neostigmine-glycopyrrolate.
- Addressing provider apprehensions about cost through evidence-based education will encourage the adoption of sugammadex in alignment with the 2023 ASA recommendations.

Methods

- The project focused on educating anesthetists at small community hospitals where sugammadex usage was historically restricted and closely monitored.
- A pamphlet was developed to highlight sugammadex's safety, efficacy, reduction in PACU and turnover times, and potential cost savings from fewer postoperative complications. The pamphlet also included the 2023 ASA recommendation for sugammadex use and a link to an anonymous survey.
- Pamphlets were distributed during a breakfast event for anesthetic providers, with additional copies placed in the anesthetic lounge for accessibility.
- An anonymous survey gathered feedback on current sugammadex usage, administrative restrictions, and the pamphlet's influence on provider practices. Participation was voluntary, with an option to skip sensitive questions.
- Retrospective data on sugammadex usage in aminosteroid paralytic cases was collected for one month before and one month after the pamphlet distribution. Patient identifiers were removed to maintain confidentiality, and additional consent was not required.

Results

Following the implementation of educational materials in November 2024, sugammadex usage in aminosteroid paralytic cases increased modestly from 434 cases in October to 440 cases, representing a 1.38% rise. A post-intervention survey provided key insights into provider opinions and practices regarding sugammadex:

- **Access Issues:** 80% of participants felt restricted access to sugammadex before its inclusion in the medication storage system.
- **Monitoring Concerns:** All participants believed their sugammadex usage was monitored, with many carrying an extra vial beyond the one provided.
- **Impact of Education**: Most respondents indicated that evidence-based materials on sugammadex's benefits would likely influence their practice.
- **Practice Trends:** Only 33% of participants reported routinely using sugammadex exclusively as a neuromuscular reversal agent. These findings underscore the need for continued education and system changes to support broader adoption of sugammadex.

Discussion

The facility underwent significant changes in its handling of sugammadex prior to the conclusion of this quality improvement project. Initially, sugammadex was restricted to a single vial per anesthesia provider, requiring handwritten documentation and pharmacy approval for each use. Several months before the project, this process was streamlined, allowing anesthetists to access additional vials via an Omnicell system with electronic documentation, which enhanced accessibility and reduced administrative barriers. Survey data showed 80% of respondents felt restricted in accessing sugammadex before these changes, highlighting improved provider discretion as a likely factor in increased usage.

Following this procedural shift, the project team distributed educational materials emphasizing sugammadex's superior safety profile and its benefits as the standard neuromuscular blockade reversal agent. Despite a modest 1.38% increase in usage post-intervention, the project highlighted the importance of patient safety and cost-effectiveness, such as reducing PACU and operating room times and postoperative complications. However, limitations in data collection, particularly restricted access to paper records, prevented evaluation of whether increased sugammadex use directly correlated with reduced PACU times.

Conclusions

- Sugammadex has transformed anesthetic practices at the facility, allowing for prolonged muscle relaxation without concerns of residual paralysis.
- Initially met with resistance, its benefits—such as reduced operating room times and improved patient safety—have led to widespread acceptance.
- Younger anesthetists and anesthesiologists played a key role in advocating for sugammadex, influencing the broader adoption among their colleagues.
- The facility has established sugammadex as the standard neuromuscular blockade reversal agent, enhancing overall anesthesia care.
- Ongoing education and the use of evidence-based data will support sustained usage and address any concerns from new or existing providers.

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