Quantitative Neuromuscular Blockade Monitoring: A Change Project

Scott Allsup

&

Erica Riley

The authors declare that he and she have no relevant or material financial interests that relate to the research described in this presentation

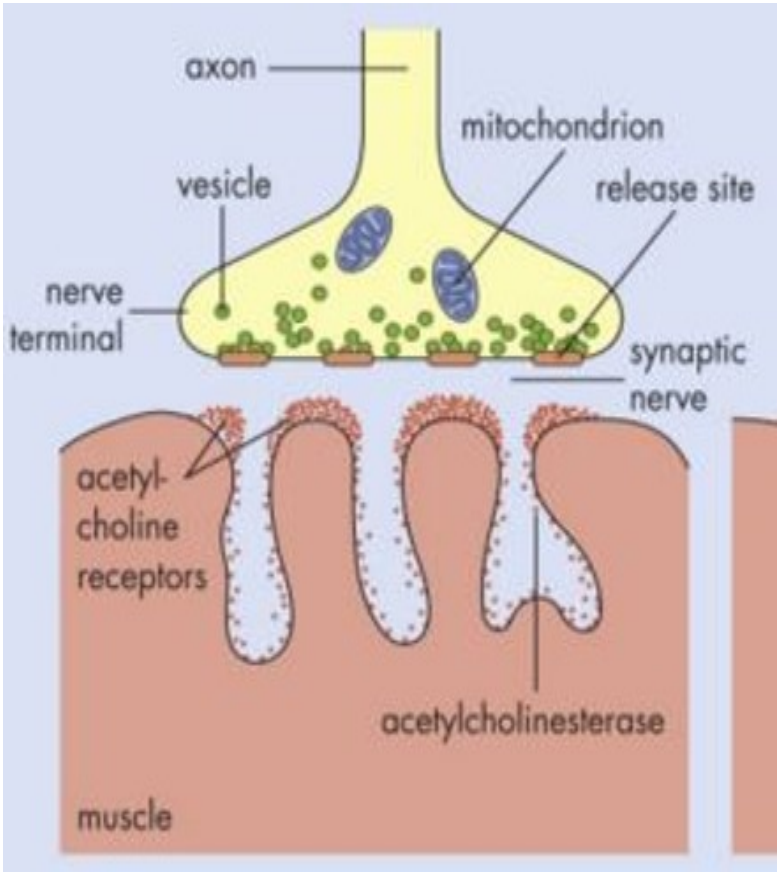
Objectives

- Explain the incidence and clinical implications of residual neuromuscular blockade
- Describe current evidence-based recommendations for monitoring and reversal of neuromuscular blockers
- Discuss methods to overcome barriers to implementation of a practice-change initiative to promote quantitative neuromuscular monitoring

Background

Neuromuscular Blockade

- Neuromuscular blocking agents (NMBAs) interact with nicotinic acetylcholine (ACh) receptors at the neuromuscular junction (NMJ)
- NMBAs cause paralysis by either mimicking or competing with ACh
- The degree of blockade can be measured using a conventional qualitative train-of-for (TOF) monitor, or a quantitative TOF monitor



https://healthsaline.com/tensilon-test.html

Qualitative Monitoring

- Qualitative monitoring techniques include: TOF, Double-burst stimulation (DBS), and tetany
- Qualitative devices rely on the clinician to subjectively interpret the strength of the response they observe
- Providers cannot accurately determine recovery between 0.4-0.9 TOF ratio (TOFR)

https://bellmedical.com/nerve-stimulators-from-bell-medical

Thilen, S. R., & Bhananker, S. M. (2016). Qualitative Neuromuscular Monitoring: How to Optimize the Use of a Peripheral Nerve Stimulator to Reduce the Risk of Residual Neuromuscular Blockade. Current Anesthesiology Reports, 6, 164–169.

Quantitative Monitoring

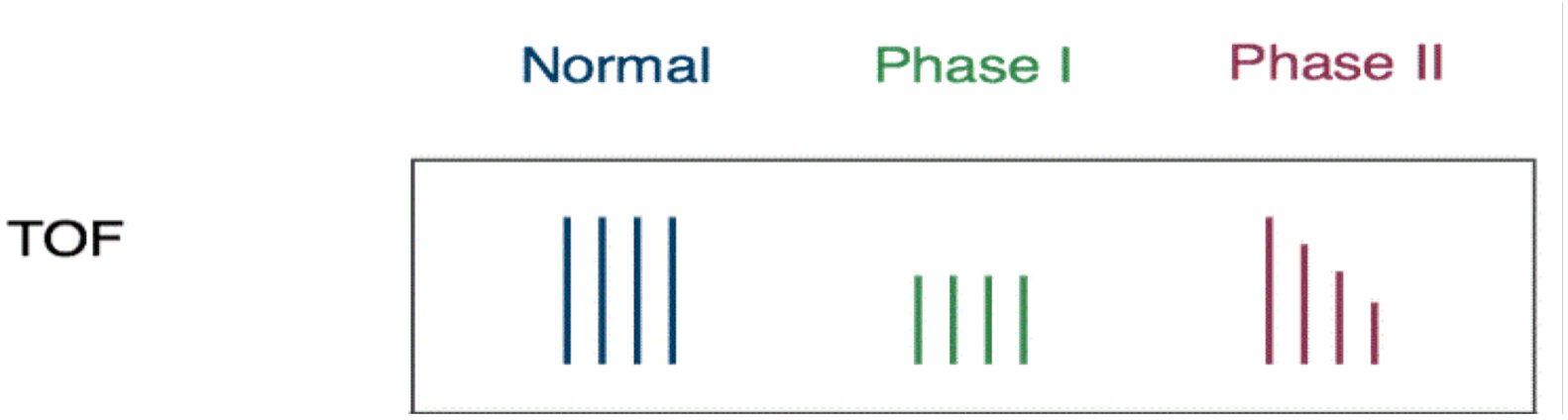
https://bellmedical.com/nerve-stimulators-from-bell-medical

- Different types of quantitative monitors rely on technology such as mechanomyography (MMG) or acceleromyography (AMG), as with the Stimpod™
- Quantitative monitoring devices provide an objective numerical value of the TOF count and ratio
- Because of the superior accuracy of quantitative TOF monitors their use is recommended over qualitative TOF monitors

Naguib, M., et al. (2018). Consensus Statement on Perioperative Use of Neuromuscular Monitoring. *Anesthesia & Analgesia*, *127*(1), 71–80. doi: 10.1213/ane.0000000000002670

Residual Blockade

- Residual neuromuscular blockade is defined as a TOFR of less than 0.9
- Residual blockade can lead to complications such as:
  - airway collapse, hypoxemia, prolonged PACU stays, and decreased patient satisfaction



https://www.apexanesthesia.com/lessons/pharmacology-ii/

Barash, P.G., Cullen, B. F., Stoelting, R.K., Cahalan, M., & Stock, M.C., Ortega, R. (2013). Clinical anesthesia, (7th ed.). Philadelphia, PA: Lippincott, Williams and Wilkins.

Incidence

- Residual blockade occurs in 20-60% patients receiving a NMBA
- Approximately 60% of clinicians reported monitoring blockade routinely
- The incidence of critical respiratory events in patients with residual neuromuscular blockade is 51% compared to 16% in those who achieved full recovery

Murphy, G.S., et al. (2008). Residual neuromuscular blockade and critical respiratory events in the postanesthesia care unit. *Anesth Analg,* 107:130-137

Change Project Background

Demographics

- Community hospital in urban setting
- Level 1 Trauma Center
- 18 OR suites
- Private anesthesia group consisting of ~50 CRNAs and MDAs
- Three existing Stimpod™ quantitative TOF monitors available
- Variety of provider experience

Organizational Need

- Key stakeholders identified a lack of utilization of existing quantitative monitors
- Leadership-driven plan to phase out old qualitative monitors
- Motivation to incorporate evidence-based monitoring into standard practice
- Desire to identify and overcome barriers to change

Barriers

Global

- Delay in adoption of evidence-based recommendations
- Reluctance to change
- Knowledge gap

Facility- specific

- Limited access to monitors
- Awareness of existence
- Location of monitors

Baillard, C., Clec'h, C., Catineau, J., Salhi, F., Gehan, G., Cupa, M., & Samama, C. M. (2005). Postoperative residual neuromuscular block: A survey of management. *British Journal of Anaesthesia*, *95*(5), 622–626. https://doi.org/10.1093/bja/aei240

Project Objectives

- Survey the current culture regarding neuromuscular monitoring
- Identify barriers to change
- Provide specific education based on barriers
- Increase knowledge of evidence based practice
- Promote an increase in utilization
- Demonstrate increase in provider use

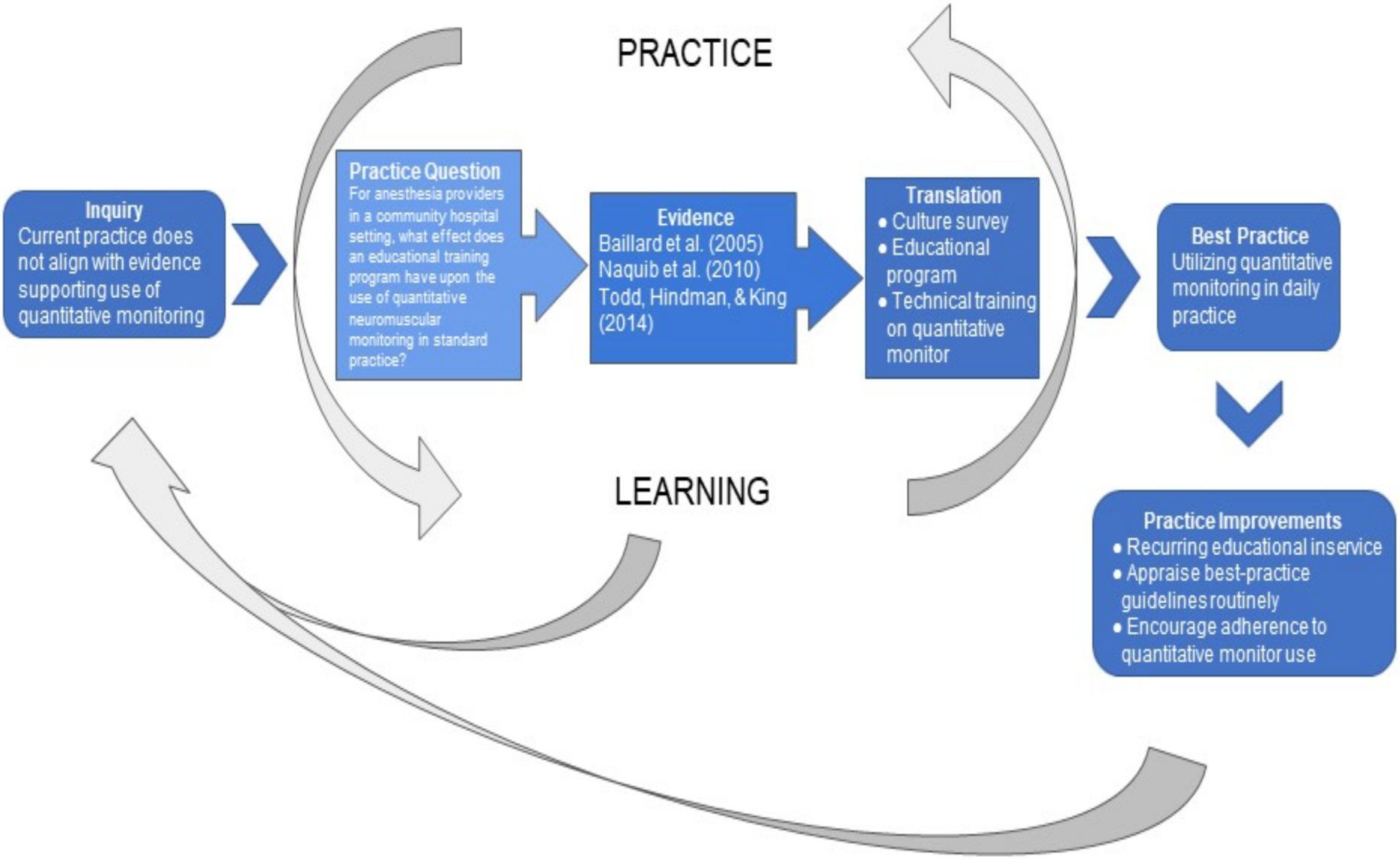
Theoretical Model

Critical Theory

- Studies based on critical theory seek to change the practices of those who hold beliefs that are contradictory to their actions
- This theory was used in a preceding study with the goal of increasing quantitative monitor usage

Polit, D. & Beck, C. (2018). *Essentials of Nursing Research. Appraising evidence for nursing practice.* (9th ed.).Philadelphia, PA: Wolters Kluwer.

Johns Hopkins Nursing Evidence-Based Model



Implementation of Evidence Based Practice

Pre-Survey

Goals

- Identify gaps in knowledge
- Evaluate culture regarding neuromuscular monitoring
- Identify barriers to use of quantitative monitors

Distribution

- Created using Qualtrics survey-creating tool
- Distributed via email to members of anesthesia group
- Two-week response window allotted

Responses

- 30 respondents

Education

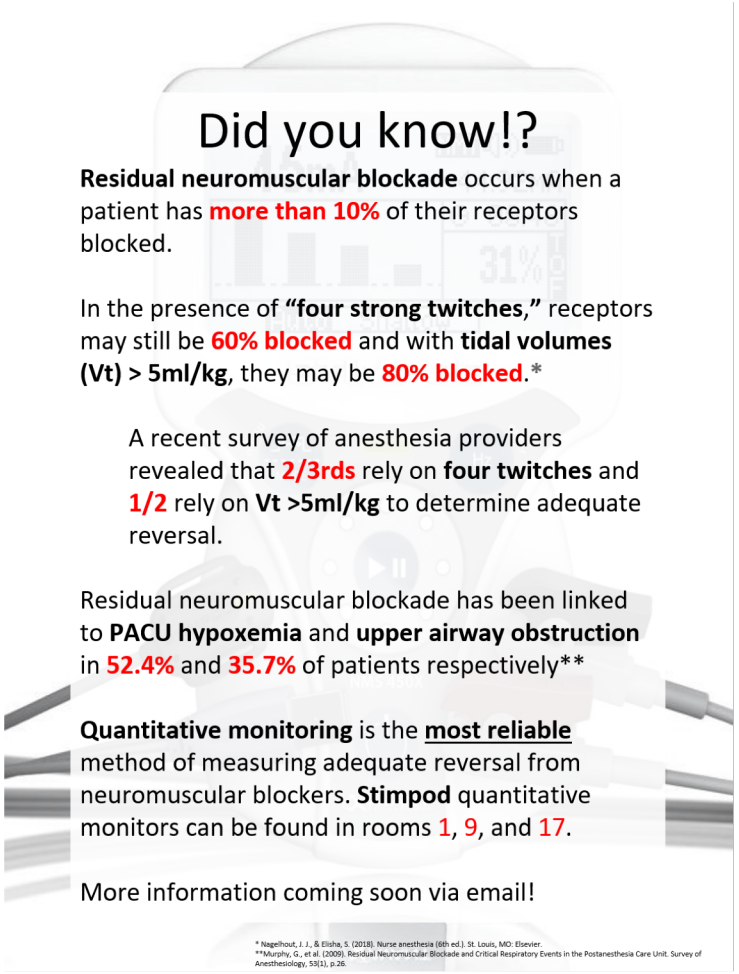
- Stimpod™ representative
- One-page flyer
- Narrated Powerpoint presentation
- Individual demonstrations with SuperUsers

Stimpod™ Representative

- Provided presentation and hands-on demonstration to leadership at monthly board meeting
- Individual demonstrations at primary facility

One-Page Flyer

- Displayed in high-traffic areas of OR
- Distributed electronically along with PowerPoint presentation
- Provided key information regarding monitoring practices and recommendations



PowerPoint Presentation

- Voice-over narration
- Provided background of the existing problem
- Compared the types of monitoring devices
- Described the function and limitations of qualitative monitoring devices
- Provided basic instructions on how to use the Stimpod™ quantitative monitor
- Recommendations for practice

Individual Demonstrations

- Super-users provided one-on-one live demonstration during cases
- Allowed opportunity to clarify perceived barriers to use
- Offered strategies to limit misuse and assuage misconceptions
- Provided guidance regarding clinical management

Post-Survey

Goals

- Evaluate the impact of educational initiatives
- Compare knowledge base after educational initiatives were implemented
- Assess any change in practice that may have occurred

Distribution

- Electronically distributed to anesthesia group

Responses

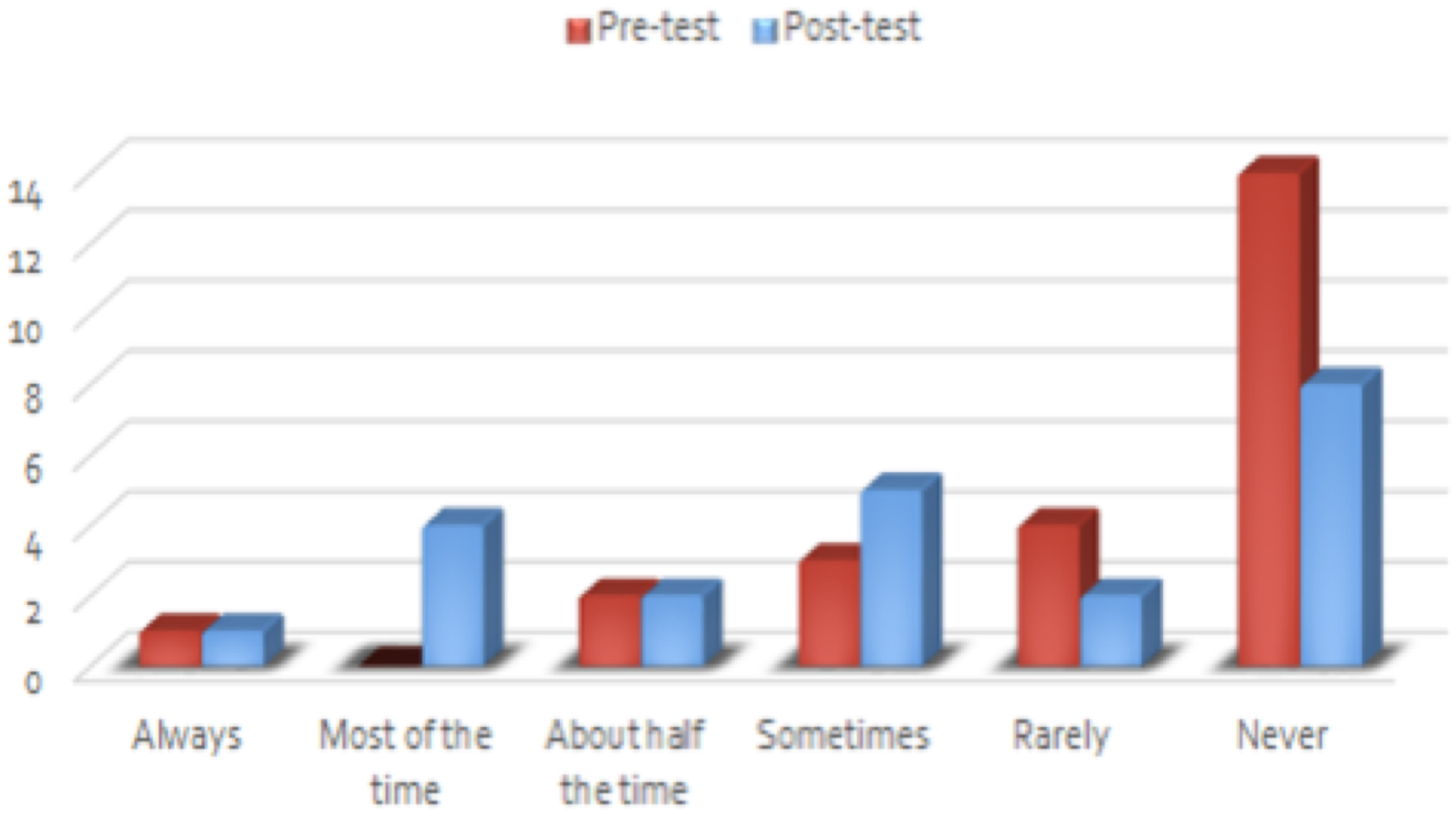
- 24 respondents

Results

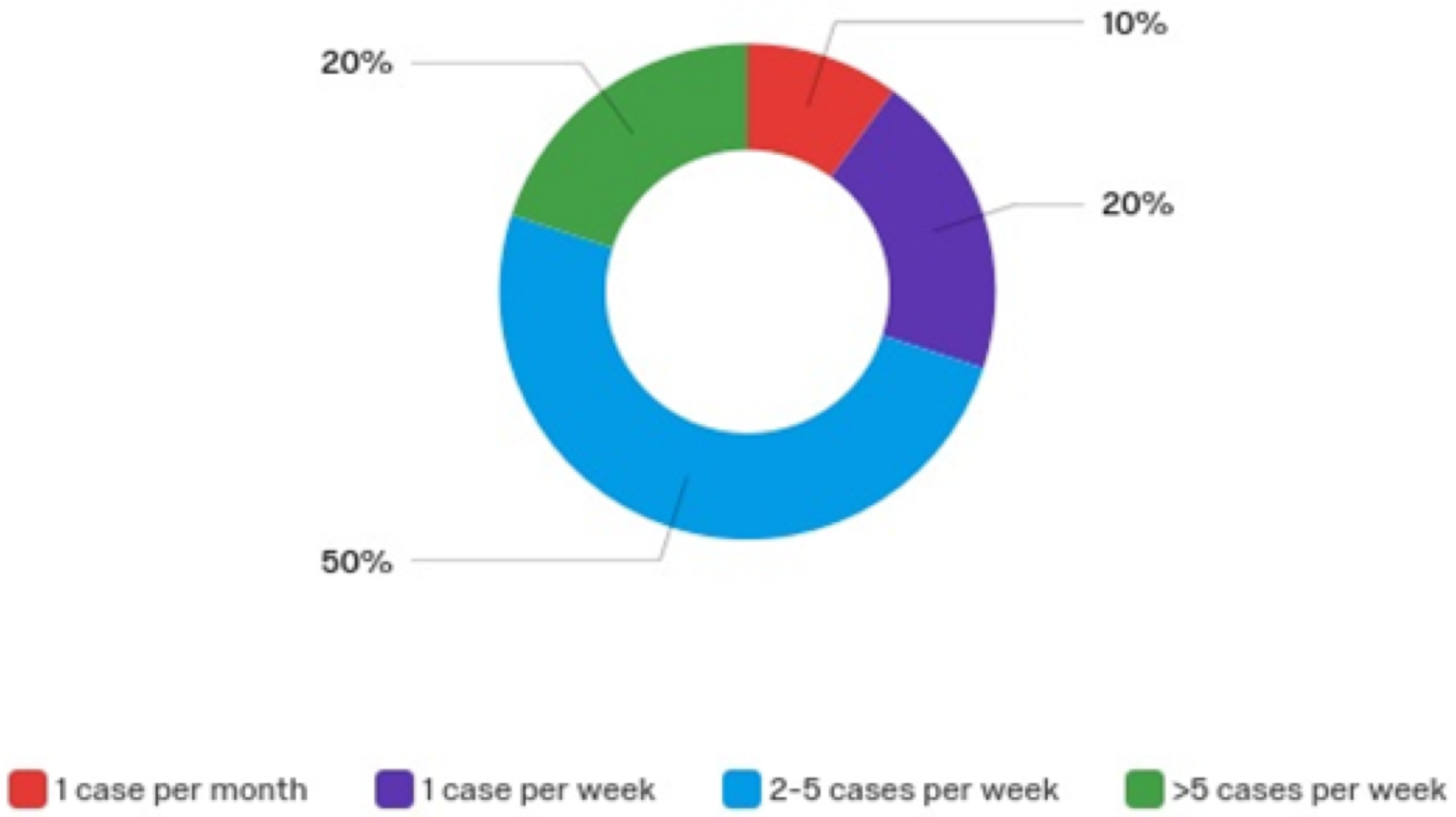
Pre- vs Post-Survey Results

- Pre-survey: 11 questions
- Post-survey: 16 questions
  - The post-survey contained questions from pre-survey to allow for direct comparison
- Qualtrics “Expert Review” tool used to ensure clarity of survey questions

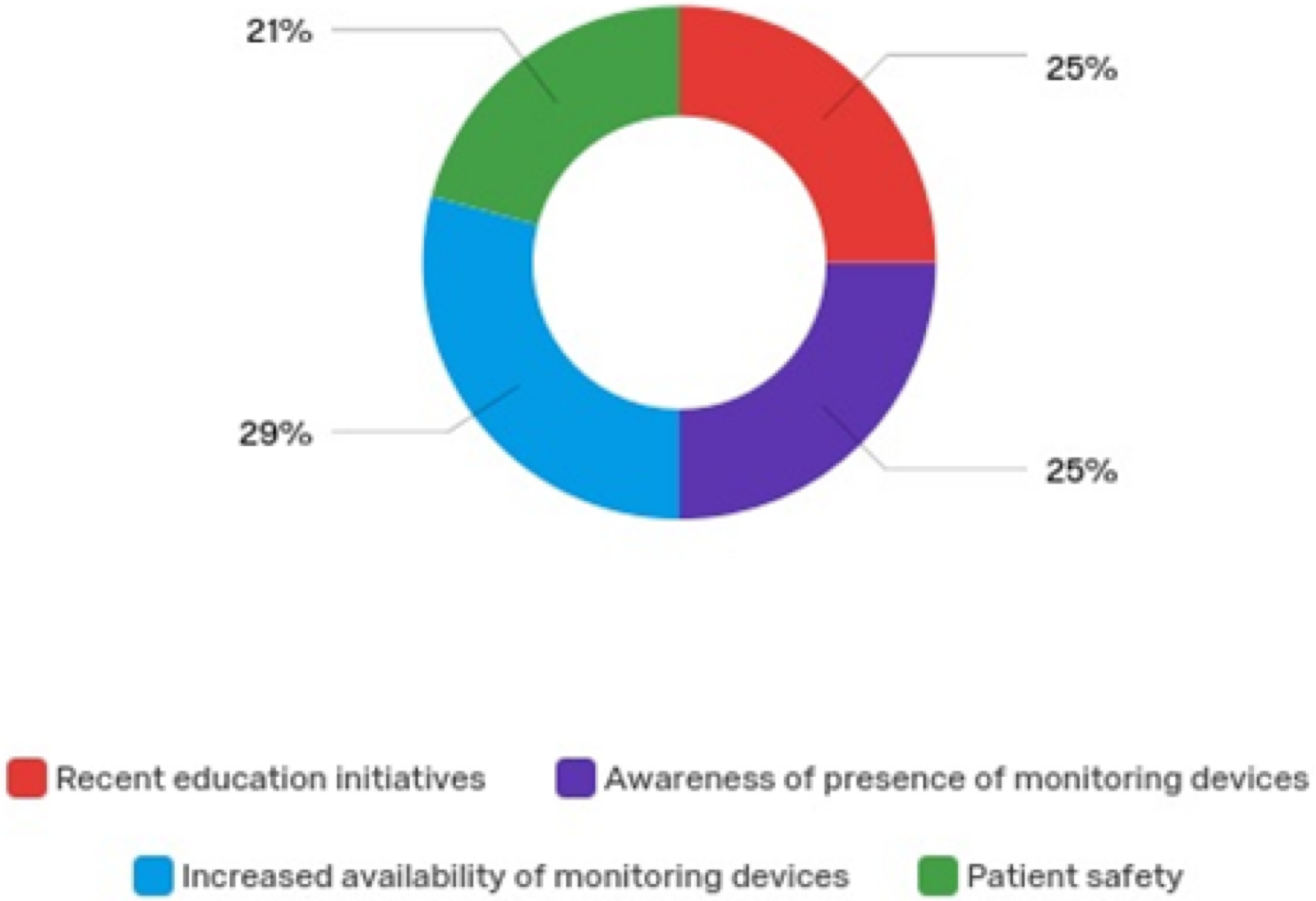
How often do you use a quantitative TOF monitor in your current practice?



How much has your usage increased on average?



What prompted you to increase usage of quantitative TOF monitoring?



Discussion

Clinical Impact

- Improved awareness of the existence of quantitative monitoring devices and their functionality
- Increased utilization of evidence-based monitoring practices
- More accurate monitoring of neuromuscular blockade
- Several respondents expressed the superiority of quantitative monitoring over conventional qualitative TOF monitors
- Demonstrated the use of multiple interventions may improve utilization of quantitative train-of-four monitors

Project Sustainability

- Key stakeholders are invested in the continued utilization of devices
- More monitors were purchased during the course of the implementation phase which increased the availability and usage of monitoring devices
- Future study opportunities may further improve adherence to device utilization
- Current healthcare trend to provide reimbursement based on provider quality metrics

Lessons Learned

- Promote on-going communication with stakeholders
- Offer CEUs to encourage participation in educational initiatives
- Conduct more large-group training sessions for anesthesia providers
- Identify those who participated in both the pre- and post-test surveys to allow for direct comparison
- Specifically identify and address the concerns of those who are less likely to use the device

Questions?

Thank You!

References

APEX Anesthesia Review. (2018). Neuromuscular Blockers. Retrieved from https://www.apexanesthesia.com/lessons/pharmacology-ii/

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