Neuromuscular Blockade Monitoring: Qualitative Versus Quantitative

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PROBLEM

Anesthesia providers primarily utilize peripheral nerve stimulators to assess neuromuscular function in surgical cases where akinesia is desired by neuromuscular blocking medications.

When anesthesia providers solely utilize qualitative peripheral nerve stimulator count measurements, an over or underestimation of neuromuscular blockade depth can result, contributing to post-operative residual muscle weakness.

The goal of this project was to increase the knowledge base of a group of student nurse anesthetists at the Adventist University of Health Sciences on qualitative versus quantitative measures in neuromuscular blockade monitoring, while identifying the superiority of quantitative monitoring.

LITERATURE REVIEW

As current studies show, there is a discrepancy between the use of qualitative measurement techniques (subjective) and quantitative values (objective).

The current standard of practice for an adequate recovery of muscle strength is a train-of-four ratio of at least 0.9, measured at the adductor pollicis muscle. To obtain this measurement via a qualitative assessment of sight and tactile feel is difficult and entirely subjective– leading to discrepancies in neuromuscular strength assessment amongst anesthesia providers (Lien and Kopman, 2014).

Quantitative monitoring is employed utilizing various technological advances where mechanical devices display a train-of-four ratio to the provider after the evoked potential is generated and is measured objectively.

Accurate monitoring is important because residual neuromuscular blockade after reversal is a common occurrence and is associated with:

- hypoxia
- aspiration
- atelectasis
- decrease in patient satisfaction
- increase in post-anesthesia recovery unit stays
- over and/or under-dosing of reversal agents

(Lien & Kopman, 2014; Murphy et al., 2011)

With continually improving technology, research has shifted to suggest that quantitative measurements supersede the conventional qualitative measurements (Murphy, Szokol, Avram, Greenberg, Marymont, Vender, Grady, Landry & Gupta, 2011). However, not every institution has adopted this practice, including the U.S. Anesthesia Partners (USAP) of Florida, where the Adventist University of Health Sciences Nurse Anesthesia Program students train.

METHODS

- Pre-tests and posttests were utilized as the research instrument to gather the information and consisted of 10 multiple-choice questions.
- The pre-test was administered prior to project implementation to assess the knowledge base of the participants in regards to train-of-four ratios, qualitative versus quantitative assessments, best practices and provider implications.
- A PowerPoint presentation was then administered to educate on those topics.
- After the PowerPoint presentation, a posttest, duplicate of the pre-test, was administered.
- The data was then statistically analyzed to assess for post-test improvements.

RESULTS

Pre and Post-test Results
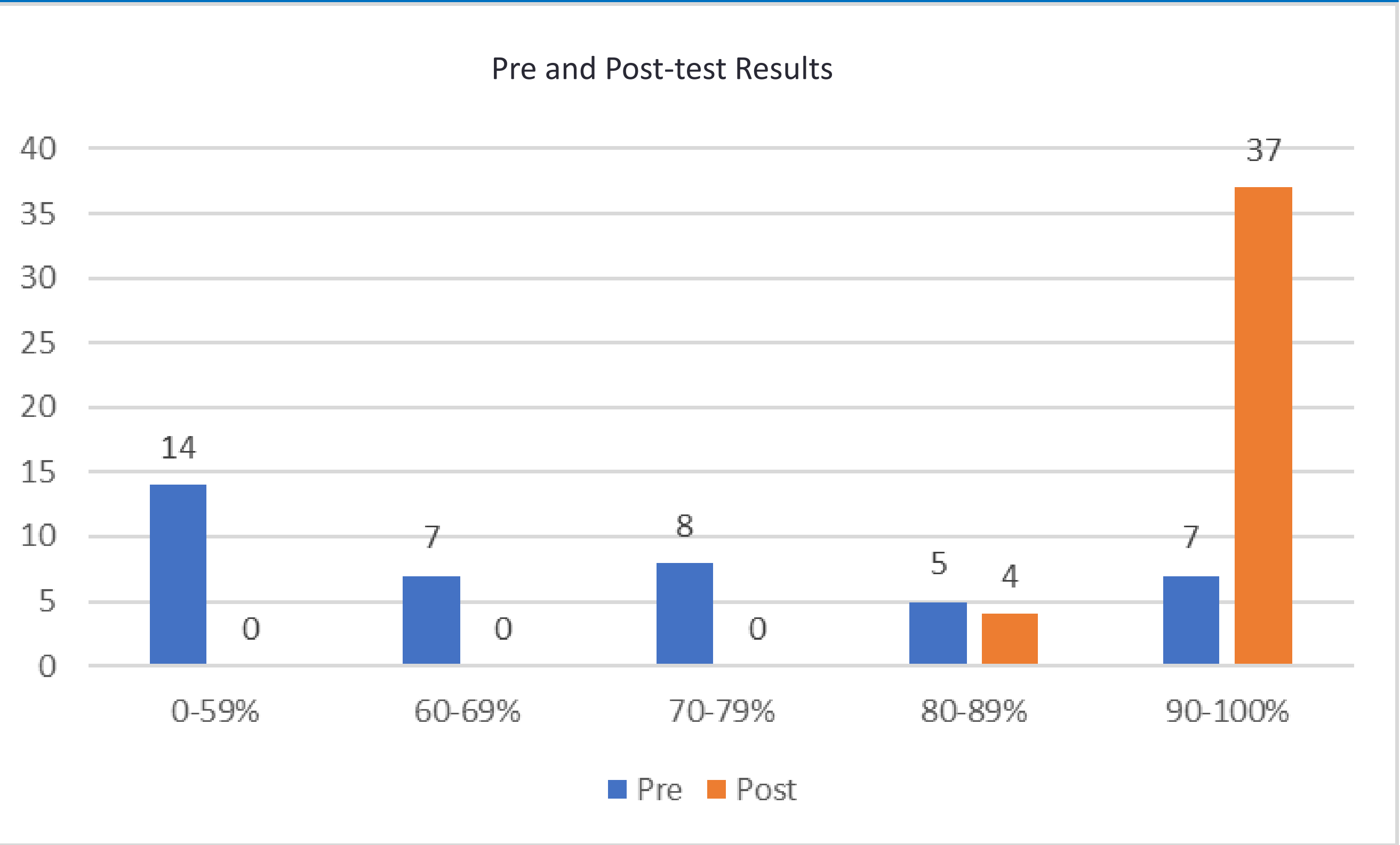
Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre-Test	.3732	41	.15170	.02369
	Post-Test	.7439	41	.18035	.02817

References upon request

ANALYSIS & CONCLUSIONS

- The scores increased comparatively between the mean pre-tests and the mean posttests, and the data was statistically significant with a confidence interval of 95%, p value < 0.05, and a t value of -10.499.
- The mean pre-test scores were 39%, with a standard deviation of 15%, and the mean post-test scores were 74%, with a standard deviation of 18%.
- The increase in mean scores from the pre-test to the post-test was 37%. The obtained t value is -10.499 (p < .001).
- This means that the presentation was effective in increasing the knowledge base of the participants.
- The goal of this study was effectively achieved, as evidenced by the significant increase in mean post-test scores.

Paired Samples Test

		Paired Differences				
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference	
					Lower	Upper
Pair 1	Pre-Test - Post-Test	-.37073	.22610	.03531	-.44210	-.29937

t	df	Sig. (2-tailed)
-10.499	40	.000

FINDINGS

- Since a statistical significance was found, it can be concluded that the PowerPoint presentation was effective in increasing the knowledge base of the participants and may lead to better neuromuscular monitoring in the future.
- Implications for practice include the need for further education on neuromuscular blockade monitoring, specifically the superiority of quantitative measurement tools.
- These implications for practice and effects play an important role in post-operative patient outcomes.

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- Adventist University of Health Sciences Nurse Anesthesia Program study participants