

Residual neuromuscular blockade in surgical patients: knowledge of the nursing team at the anesthetic recovery

Bloqueio neuromuscular residual em pacientes cirúrgicos: conhecimento da equipe de enfermagem da recuperação anestésica

Bloqueo neuromuscular residual en pacientes quirúrgicos: conocimiento del equipo de enfermería sobre la recuperación anestésica

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ABSTRACT: Objective: To identify the knowledge of the nursing team involved in anesthetic recovery regarding the assessment of residual neuromuscular blockade (RNB) in surgical patients. **Method:** This is a quantitative, cross-sectional study conducted in a private hospital in the state of São Paulo, Brazil. The sample comprised 50 professionals, 18 nurses and 32 nursing technicians, who answered a questionnaire validated by five judges. The collection was carried out from January to March 2022, using the REDCap platform. Descriptive and inferential analyses, central tendency and dispersion measures, Pearson's correlation and Student's t-test were performed, considering a significance level of 5%. The research was conducted in accordance with Resolution 466/2012. **Results:** The average number of correct answers was 43%, 44.4% among nurses and 42.2% among technicians. Six (12%) professionals had already taken some training on neuromuscular blockade and 10 (20%) reported having treated patients with RNB. We observed no statistically significant differences between the average of correct answers of the questions and the length of training and professional performance, specialization, previous experience, or carrying out training. **Conclusions:** We identified deficits in the nursing team's knowledge of the RNB and care during this procedure. The importance of continuing education actions is emphasized, with a view to training professionals to treat this complication and improve the nursing care provided during anesthetic recovery to guarantee patient safety.

Keywords: Neuromuscular blocking agents. Anesthesia recovery period. Postanesthesia nursing. Education, Nursing.

RESUMO: Objetivo: Identificar o conhecimento da equipe de enfermagem que atua na recuperação anestésica acerca da avaliação do bloqueio neuromuscular residual (BNMR) em pacientes cirúrgicos. **Método:** Estudo quantitativo, transversal, realizado em um hospital privado de São Paulo. Amostra composta por 50 profissionais, sendo 18 enfermeiros e 32 técnicos de enfermagem, que responderam um questionário validado por um corpo de cinco juízes. Coleta realizada de janeiro a março de 2022, utilizando-se a plataforma REDCap. Realizadas análises descritiva e inferencial, medidas de tendência central e de dispersão, testes de correlação de Pearson e t-Student, considerando-se nível de significância de 5%. Pesquisa conduzida segundo a Resolução 466/2012. **Resultados:** A média de acertos geral foi de 43%, sendo 44,4% entre enfermeiros e 42,2% entre técnicos. Seis (12%) profissionais já tinham feito algum treinamento sobre bloqueio neuromuscular e 10 (20%) relataram já ter atendido pacientes com BNMR. Não foram observadas diferenças estatisticamente significativas entre a média de acerto das questões e o tempo de formação e atuação profissional, especialização, experiência prévia ou execução de treinamentos. **Conclusão:** O estudo evidenciou déficits de conhecimento da equipe de enfermagem acerca do BNMR e a assistência durante esta intercorrência. Ressalta-se a importância de ações de educação permanente, com vista à capacitação dos profissionais para o atendimento desta complicação e melhoria dos cuidados de enfermagem prestados na recuperação anestésica para garantia da segurança do paciente.

Palavras-chave: Bloqueadores neuromusculares. Período de recuperação da anestesia. Enfermagem em pós-anestésico. Educação em Enfermagem.

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RESUMEN: **Objetivo:** Identificar el conocimiento del equipo de enfermería que trabaja en la recuperación anestésica respecto a la evaluación del bloqueo neuromuscular residual (BNMR) en pacientes quirúrgicos. **Método:** Estudio cuantitativo, transversal, realizado en un hospital privado de São Paulo. Muestra compuesta por 50 profesionales, 18 enfermeros y 32 técnicos de enfermería, quienes respondieron un cuestionario validado por un panel de cinco jueces. Recolección realizada de enero a marzo de 2022, utilizando la plataforma REDCap. Se realizaron análisis descriptivos e inferenciales, medidas de tendencia central y dispersión, pruebas de correlación de Pearson y *t*-Student, considerando un nivel de significancia del 5%. Investigación realizada según Resolución 466/2012. **Resultados:** El promedio global de aciertos fue del 43%, 44,4% entre enfermeros y 42,2% entre técnicos. Seis (12%) profesionales ya habían recibido algún entrenamiento en bloqueo neuromuscular y 10 (20%) informaron haber tratado ya pacientes con BNMR. No se observaron diferencias estadísticamente significativas entre el número medio de respuestas a las preguntas y el tiempo de formación y desempeño profesional, especialización, experiencia previa o ejecución de la formación. **Conclusión:** El estudio destacó déficits de conocimiento entre el equipo de enfermería sobre el BNMR y la asistencia durante este incidente. Se destaca la importancia de acciones de educación continua, con miras a capacitar profesionales para enfrentar esta complicación y mejorar los cuidados de enfermería brindados durante la recuperación anestésica para garantizar la seguridad del paciente. **Palabras clave:** Bloqueantes neuromusculares. Periodo de recuperación de la anestesia. Enfermería posanestésica. Educación en Enfermería.

INTRODUCTION

Neuromuscular Blockers (NMB) are drugs that promote relaxation of skeletal striated muscles, inhibiting nerve impulses at neuromuscular junctions (NMJ). They are used intraoperatively and in intensive care units, facilitating orotracheal intubation (OTI) and surgical site manipulation. Its combination with general anesthesia decreases the dose of other anesthetics and, consequently, the risks of postoperative (PO) respiratory and cardiovascular depression¹⁻³.

NMBs can be classified according to the mechanism of action — as depolarizing and non-depolarizing — and according to the time of action in the body — as short, medium and long duration⁴.

Authors of a Brazilian study evaluated the use of NMB by anesthesiologists and identified that suxamethonium is the main drug chosen in emergency surgery to perform the OTI, due to its rapid action, being the most used rocuronium in elective surgery⁵.

The use of NMB requires great attention in the immediate postoperative period (IPO), as it can cause a series of complications for the patient, making it necessary to monitor neuromuscular reflexes and guarantee the complete recovery of muscle strength through pharmacological reversion^{3,4}.

One of the most recommended forms of neuromuscular monitoring is acceleromyography, using the TOF (train of four) method, in which a sequence of four stimuli is applied to the patient's ulnar nerve and, with the use of monitoring equipment, the thumb movement generated by the stimulus is recorded. The result is expressed as a percentage, calculated by the ratio between the amplitude of the fourth and the first response to the sequence (T4/T1) and a value

of $\text{TOF} \geq 0.9$ is expected, in order to guarantee the patient's complete and safe recovery^{6,7}.

Authors of a study indicated that the monitoring and use of reversal medications are not frequently applied by anesthesiologists, increasing the risk of complications in IPO⁸.

The main complications associated with the administration of NMB are related to the respiratory system, due to Residual Neuromuscular Blockade (RNB), which may lead to muscle weakness; upper airway obstruction; risk of aspiration, associated with impaired laryngeal function; decreased oxygen saturation (O_2); respiratory depression, among other pulmonary complications. Such complications, in turn, may lead to the need for reintubation and to the patient's longer stay in the post-anesthesia care unit (PACU)^{4,8-11}.

The estimate of patients who develop RNB varies; it may reach up to 60%, and is mainly related to the use of non-depolarizing NMB, type of anesthesia, prolonged surgery time, administered dose of NMB, lack of intraoperative monitoring and the use of drugs to reverse the patient's blockage, hypothermia, and hypoxia in the IPO^{9,11}.

In this context, during the patient's stay at the PACU, the care provided by the nursing team requires the attention and qualification of professionals for the effectiveness of care. Thus, nurses and technicians must provide care until the patient's sensory and motor recovery, evaluating hemodynamic changes, signs and symptoms of discomfort, in order to prevent and treat post-anesthetic events^{12,13}.

In addition to the quantitative assessment of the residual blockage using the TOF, performed by the anesthesiologist, the PACU nursing professionals must be able to identify residual paralysis, through the assessment of clinical factors involving the ability to lift and support the head, expose the

tongue, cough and inhale deeply, and apply the Aldrete and Kroulik scale. Nursing care should include the supply of O₂, lateralizing the patient's head, monitoring O₂ saturation, and keeping OTI material available in the event of an emergency¹².

Taking this into consideration, it is relevant to assess the level of knowledge of nurses and nursing technicians who work in the PACU regarding the identification of the RNB and the management of the occurrence. Considering that they are the most active professionals during this period of patient recovery, it is necessary to ensure that they have the necessary support and basis to provide appropriate care¹³.

Thus, this study allows an analysis of the knowledge of nursing professionals in the care of patients undergoing anesthetic recovery, which may support continuing education strategies for the improvement of care practice and favor the prevention of respiratory anesthetic events in the PACU.

OBJECTIVE

To identify the knowledge of the nursing team working in the post-anesthesia care unit regarding the assessment of Residual Neuromuscular Blockade in surgical patients.

METHOD

This is a quantitative, cross-sectional field study conducted in a private, extra-large hospital in the state of São Paulo, Brazil, with 706 beds and two Surgical Centers (SC), which together have 35 operating rooms and 41 recovery beds.

After approval of the project by the Surgical Patient Management and the institution's Research Ethics Committee, via *Plataforma Brasil* [Brazil Platform] database (CAAE 48070821.7.0000.0071, Opinion 4.839.405), in accordance with Resolution 466/2012, of the National Health Council, data were collected at the PACU of the two SC, where more than 2 thousand patients are treated each month.

The nursing team that works at the PACU in the first SC is composed of two nurses and four nursing technicians, and the team working in the second SC has two nurses and five nursing technicians on duty. In addition to these professionals, other employees who work in the operating room (OR) also provide assistance at the PACU, according to the size of the sector.

The sample was defined by convenience, including 50 professionals from the nursing team, 18 nurses and 32 nursing

technicians, according to the following inclusion criteria: nursing professionals who provide direct care to patients in the PACU with at least one year of experience in the sector; nurses and technicians who work in the OR and also in the PACU. As exclusion criteria, nurses and nursing technicians who were on vacation or leave of absence during the data collection period were considered.

Data collection was performed from January to March 2022, using an instrument developed by the authors and subdivided into three parts:

- Part I – Characterization of the sample (age, biological sex, professional category, length of training, specialization, time working in the sector, and work shift);
- Part II – Knowledge assessment (type and function of NMB, monitoring of NMB, general aspects of RNB, and nursing assessment and interventions);
- Part III – Professional experience (training on RNB and patient care with RNB in the PACU).

This instrument was validated by a group of five judges experts in surgical center and anesthetic recovery, with more than two years of experience and having a graduate degree in related fields as a minimum degree. The questions were analyzed as for clarity, relevance, pertinence, and comprehensiveness, and were scored on a Likert scale ranging from 1 to 5 points. Changes were suggested and made regarding the divisions of the questionnaire items, the titles of the questions, and the clarity of the alternatives. After being validated by the five judges, the instrument was inserted into the Research Electronic Data Capture (REDCap) platform to operationalize the data collection.

The professionals were approached individually, at the workplace, at the most convenient time for the participant, presenting the proposal and the objectives of the study. Those who agreed to participate were provided with the Informed Consent Form to be read and signed in two copies, one by the participant and the other by the researchers. After signing the form, the questionnaire was completed, via REDCap, in the presence of the first author.

The collected data were analyzed statistically, using descriptive and inferential analysis. For numerical variables, the measures of central tendency (mean, median, quartiles, highs and lows) and dispersion (standard deviation) were calculated. The categorical variables were described using absolute and relative frequencies, presented in tables and/or frequency graphs.

Statistical tests were performed to evaluate relationships and comparisons between variables. To compare the means of numerical variables (average of correct answers of the questions versus length of training and professional performance, specialization, having previous experience or carrying out training), the parametric Pearson's correlation and Student's t-test were applied. The level of significance adopted for all tests was 5%.

RESULTS

A total of 50 nursing professionals working at the PACU participated in the study, including 18 (36%) nurses and 32 (64%) technicians. All nurses were women and, among the technicians, 21 (42%) were women and 11 (22%) were men. The age ranged from 20 to 64 years, with an average of 37.3 years among nurses and 36.1 years among technicians. There was a predominance of professionals working in the afternoon shift, 55.6% of nurses and 53.1% of technicians.

Regarding length of training, most professionals graduated between 1 and 10 years ago, with an average training time of 6.1 years for nurses and 7.2 for technicians. The professionals' average time working in the sector was 5.6 years for nurses and 7.6 years for technicians.

Among the 18 nurses, 13 (72.2%) had a specialization degree. Of the 11 specialties mentioned, only three nurses had a Graduate Degree in Surgical Center, Anesthetic Recovery, and Sterile Processing Department.

Regarding the knowledge assessment of the nursing team, the mean number of correct answers for the 12 questions was 43%. Considering the professional category, nurses had an average of 44.4% and technicians 42.2%, and we observed no statistically significant difference between the categories (Table 1).

The questionnaire contains eight single-answer and four multiple-choice questions. For single-answer questions, those with the highest percentage of correct answers involve the NMB Classification (52%) and the complications that RNB can cause (54%). Among the multiple-choice questions, in

general, few professionals selected all the correct alternatives. In addition, when asked about NMB drugs, the number of professionals with no correct answers prevailed.

When asked about the function and classification of NMB, the highest percentage of correct answers was in relation to the classification, reaching 72.2%, on the part of nurses. Regarding the other questions in this category, none were more than 50% correct (Table 2).

Regarding the way NMB was monitored, no question was more than 50% correct. Among the participants, 38.9% of the nurses and 31.2% of the technicians selected the correct option that indicates TOF as objective monitoring (Table 3).

In the category of questions involving the RNB, we identified a greater number of correct answers by both professional categories when asked about the observed complications. Regarding the factors contributing to the RNB, no professional selected 100% of the correct alternatives, obtaining correct answers between one and three alternatives (Table 4).

Regarding the knowledge of nursing evaluation and interventions concerning the RNB, we verified that only the nurses were 100% correct on both questions. The other participants selected correct answers between one and three alternatives (Table 5).

In addition to knowledge assessment, questions about training and previous experience were investigated. Only 12% of the professionals reported having carried out some training on RNB, including three nurses and three nursing technicians. Of these, only one professional carried out the training outside the research institution.

Regarding previous experience, 20% of employees reported having provided care to patients with RNB, including three nurses and seven nursing technicians. When asked about their conduct in the event that the patient had RNB, 14 answers were identified by the participants: "Communicate anesthesiologist/medical team" (7 answers), "Maintain continuous oxygenation" (3 answers), "Perform monitoring and observation" (2 answers), "Perform ventilation using a Bag Valve Mask (Ambu bag)" (1 answer), and "Activate Code Yellow"

Table 1. Correct answers by professional category (n=50).

Professional category	Correct answers (%)				
	Minimum	Mean	SD	Maximum	p-value*
Nurses	25	44.4	17.91	83.3	0.667
Nursing technicians	8.33	42.2	17.54	79.2	

*Student's t-test. SD: standard deviation

(1 answer). It should be noted that 36 participants did not list what conducts they adopt upon the occurrence of the RNB.

The inferential analysis was performed comparing the number of correct answers to all questions with length of training and time working in the sector, using the Pearson's correlation (Table 6), and also with specialization, previous

experience, and previous training using the Student's t-test (Table 7). We observed no statistically significant differences between the number of correct answers and the selected variables, but the average number of correct answers was higher among those with specialization, previous experience, and training (Table 7).

Table 2. Correct answers in the category "Type and function of Neuromuscular Blockers" (n=50).

Questions	Professional category			
	Nurse		Nursing technician	
	n	%	n	%
1. What is the function of Neuromuscular Blockers in anesthesia?				
Correct answers	06	33.3	15	46.9
2. In what type of anesthesia are Neuromuscular Blockers used?				
Correct answers	08	44.4	14	43.7
3. Among the drugs, which are Neuromuscular Blockers?				
0% correct answers	08	44.4	12	37.5
100% correct answers	03	16.7	01	3.1
4. Regarding the classification of Neuromuscular Blockers, it is correct to state:				
Correct answers	13	72.2	13	40.6
5. Check the alternative containing non-depolarizing Neuromuscular Blocker reversal medications:				
Correct answers	05	27.8	16	50.0

Table 3. Correct answers in the category "Neuromuscular Blockage Monitoring" (n=50).

Questions	Professional category			
	Nurse		Nursing technician	
	n	%	n	%
6. Neuromuscular blockade can be objectively monitored in the intraoperative period by means of:				
Correct answers	7	38.9	10	31.2
7. What form of monitoring can be used by the anesthesiologist to identify the complete reversion of the neuromuscular blockade?				
Correct answers	6	33.3	10	31.2

Table 4. Correct answers in the category "General aspects of the RNB" (n=50).

Questions	Professional category			
	Nurse		Nursing technician	
	n	%	n	%
8. On the main complications observed in Residual Neuromuscular Blockage (BNMR):				
Correct answers	09	50.0	18	56.2
9. On the most appropriate method for identifying Residual Neuromuscular Blockage (RNB) in the post-anesthesia care unit (PACU) by the nursing team:				
Correct answers	04	22.2	09	28.1
10. Among the factors that may contribute to the Residual Neuromuscular Blockage (RNB):				
0% correct answers	-	-	-	-
100% correct answers	-	-	-	-

Table 5. Correct answers in the category “Nursing Evaluation and Interventions” (n=50).

Questions	Professional category			
	Nurse		Nursing technician	
	n	%	n	%
11. What are the clinical criteria that comprise the assessment of Residual Neuromuscular Blockage (RNB) in the post-anesthesia care unit (PACU)?				
0% correct answers	5	27.8	6	18.7
100% correct answers	1	5.6	–	–
12. What nursing interventions should be used before the RNB?				
0% correct answers	–	–	2	6.2
100% correct answers	5	27.8	–	–

Table 6. Statistical measures of the correlations between rate of correct answers versus length of training and time working in the sector (n=50).

Variables	Pearson's Correlation	
	r value	p-value
Length of training	-0.096	0.509
Time working in the sector	-0.023	0.873

Table 7. Statistical measures of the correlations between rate of correct answers versus specialization, previous experience and training (n=50).

Variables	Student's t-test			
	N	Mean	SD	p-value*
Specialization (n=18)				
Yes	13	47.8	19.5	0.215
No	05	35.8	9.6	
Previous experience				
Yes	10	43.3	19.9	0.947
No	40	42.9	17.2	
Training				
Yes	06	50.0	21.2	0.302
No	44	42.0	17.0	

DISCUSSION

In this study, we showed that both professional categories obtained an average of correct answers below 50%, with no major differences between them, which demonstrates the fragility of knowledge of the subject, evidencing the need for training and qualification of the nursing team.

When analyzing questions about the function of neuromuscular blockade and the type of anesthesia in which NMBs are used, we identified that less than half of the professionals were able to respond correctly, relating to other types of anesthetic blockage or regional anesthesia. Moreover, there was a low percentage of correct answers when asked about the NMB drugs and their reversal medications.

Respiratory complications are the main adverse anesthetic events observed in the IPO and pose a high risk of mortality to the patient. One of the many factors that can cause these complications is the lack of NMB reversion, causing RNB¹⁴⁻¹⁶. The frequent occurrence of these events may be related to the high number of correct answers to the question regarding the complications caused by the RNB.

Considering the low number of correct answers regarding the function and type of anesthesia in which NMBs are used, it is evident that the lack of knowledge is associated with the non-identification of neuromuscular blockade as responsible for muscle relaxation, but with other anesthetic blockage functions. Poor knowledge of basic concepts in anesthesia, such as the differentiation of the types of anesthesia and blockages, affects nursing practice and care, jeopardizing patient safety and may lead to the occurrence of adverse events and underreporting of such events¹⁷.

In view of the importance of objective neuromuscular monitoring in order to identify RNB, studies conducted in Brazil, the United States of America, and other countries demonstrate its low adherence by anesthesiologists. The low rate of correct answers regarding monitoring demonstrates the lack of knowledge of the use of the TOF monitor by professionals, showing its little use in the daily routine of the SC. In addition, many professionals responded to the evaluation of clinical criteria as the most appropriate method for identifying RNB. However, in the literature, the subjective

assessment is considered ambiguous, and the gold standard to guarantee the recovery of adequate respiratory function is the value of $\text{TOF} \geq 0.9^{3,5,18}$.

By analyzing the questions about RNB that address the contributing factors, the clinical criteria that compose its assessment, and the nursing interventions, the low percentage of correct answers to all the correct alternatives indicates the knowledge gap of professionals in carrying out their role in identifying and intervening in cases of RNB.

A study conducted in 2019, whose authors highlight the impact of complications caused by RNB on the increase in postoperative hospitalization requiring intensive care, supports the need for professional qualification in understanding the importance of adequate pharmacological reversal of neuromuscular blockade and its objective monitoring, in order to avoid such complications¹⁹.

In Brazil, general anesthesia, sedation, and anesthetic blockades are private practices of anesthesiologists, in accordance with Law 12,842/2013²⁰. However, the role of the perioperative nursing team, together with anesthesiologists, is essential in the post-anesthetic period to identify various complications, such as RNB, evaluating signs and symptoms, applying the Perioperative Nursing Care Systematization (PNCS) and providing appropriate care to the surgical patient. The training and empowerment of knowledge in anesthesia, together with the use of the tools available at the time of patient evaluation, enable to act in a more assertive and safe manner, preventing adverse events^{17,21}.

Although not implemented in Brazil, the practice of anesthesiologist nurses is gaining ground in other countries such as the USA, Australia, and Switzerland, among others. Furthermore, it is possible to find specialization focused on anesthesia and guidelines for the practice of nurses in this area²².

We found no standards in the literature that define the use of the TOF monitor as the exclusive practice of anesthesiologists in Brazil, which raises the hypothesis that nurses do not manipulate it due to lack of training or availability of services. However, Resolution 2,174/2017, of the Brazilian Federal Council of Medicine, recommends that in all surgeries in which NMB is used during the anesthetic act, muscle relaxation should be monitored with specific equipment²³.

The presented data indicate that few nurses in the sample completed Graduate Studies in a Surgical Center and Anesthetic Recovery. Although the difference was not statistically significant ($p > 0.05$), we found that, in this sample, the average percentage of correct answers among specialist

nurses was higher than among non-specialists (47.8 and 35.8%, respectively).

The Brazilian Association of Surgical Center, Anesthesia Recovery, and Sterile Processing Department Nurses (*Associação Brasileira de Enfermeiros de Centro Cirúrgico, Recuperação Anestésica e Centro de Material e Esterilização* – SOBECC) recommends that nurses working in SC and PACU be specialists¹², a factor that represents a quality indicator in the SC unit and enables nurses with specialized knowledge to work in the perioperative setting.

When evaluating length of training and time working in the sector, the data show that most of the research professionals graduated or started working in the sector in a relatively recent period (between 1 and 10 years ago), which did not seem to correlate with their performance in the questionnaire, considering that, when performing the statistical tests correlating the number of correct answers versus the time working in the sector or length of training, there was no significant difference ($p > 0.05$). However, a study indicates that greater professional experience reflects the quality of care, knowledge, and competence of the nursing team²⁴.

The same can be observed when evaluating the training carried out by professionals and the previous experiences with RNB cases. The difference between the rates of correct answers was not statistically significant, but the sample from this study shows a higher percentage of correct answers among those who carried out some training (50%) or documented their experiences (43.3%). We also observed that the standard deviations were high, which indicates results that greatly vary in the percentage.

Nonetheless, by identifying that a small number of employees reported having carried out training on neuromuscular blockade, the discussion about the need for professional training is emphasized. It is proposed that nursing institutions and associations encourage professionals to seek specializations and promote continuing education actions, recommended in health services, for better team performance, in addition to improving quality of care and patient safety, in order to reduce adverse events^{25,26}.

However, it is worth noting that this is a small sample, obtained by convenience, and that the literature is still scarce on the subject of evaluating the knowledge of nursing professionals regarding RNB. Thus, the importance of developing new research evaluating the impact of professional education and the difference in knowledge performance after continuing education actions is highlighted.

CONCLUSIONS

This study enabled to assess deficits in the knowledge of nurses and nursing technicians who work in anesthetic recovery concerning neuromuscular blockers and residual neuromuscular blockade. The average rate of correct answers showed the possibility of intervention through training and qualification of the team. It should be noted the importance of resuming basic concepts in anesthesia, considering that these professionals are the protagonists in postoperative care, preventing complications and ensuring better patient outcomes.

Contributions to perioperative nursing

The present research brings to light an innovative and necessary topic, considering the safety of surgical patients submitted to neuromuscular blockade. It is proposed that institutions encourage their professionals in the search for knowledge and specialization and promote permanent education

for their employees, on a frequent basis and based on recent scientific evidence.

We highlight the relevance of expanding research related to the knowledge of nursing professionals who work in the operating room regarding anesthesia, principles of monitoring and management of complications, thus allowing them to obtain subsidies that evidence the continuing education needs of professionals, for qualified and effective daily perioperative nursing practice.

CONFLICT OF INTERESTS

The authors declare no conflicts of interest.

AUTHORS' CONTRIBUTIONS

LRB: Conceptualization, Investigation. CSL: Project administration, Supervision. RC: Writing – review & editing, Supervision.

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