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ORIGINALES

Evaluation of educational interventions and knowledge of the Nursing team in the use of electrosurgery

Avaliação de intervenções educativas e conhecimento da equipe de enfermagem no uso de eletrocirurgia

Evaluación de intervenciones educativas y conocimientos del equipo de enfermería en el uso de la electrocirugía

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ABSTRACT:

Objective: To evaluate the effect of educational interventions on the Nursing team's knowledge and applicability of electrosurgery.

Material and Method: A quasi-experiment, with pre- and post-tests in a single group developed in the operating room of a Brazilian tertiary-level university hospital. It was developed in seven stages, with the application of a semi-structured questionnaire to assess the participants' knowledge. The participants were exposed to two educational interventions (lecture, dialogue and video-lesson) and, after each intervention, they were evaluated for knowledge retention. Indicators of the application of the electrosurgery unit during surgical procedures were also evaluated.

Results: Four nurses and 28 nursing technicians participated in the study. The nurses had prior knowledge of the theme on most of the topics. Among the nursing technicians, there was an improvement in the “equipment check” and “electrodispersive plate positioning” items.

Conclusions: The professionals presented good theoretical performance but the same is not evidenced in the practice because they are reluctant to having a practice different from the theory. Research of this nature is timely because it provides managers with a possibility to propose projects for continuous improvement of perioperative assistance.

Keywords: Electrosurgery; surgicenters; biomedical technology; health human resource training; nursing.

RESUMO:

Objetivo: Avaliar o efeito de intervenções educativas no conhecimento e aplicabilidade de eletrocirurgia da equipe de enfermagem.

Material e Método: Quase-experimento, com pré e pós-testes em um único grupo desenvolvido no centro cirúrgico de um hospital universitário terciário brasileiro. Foi desenvolvido em sete etapas, com aplicação de questionário semi-estruturado para avaliação do conhecimento dos participantes. Os participantes foram expostos a duas intervenções educativas (aula expositiva, dialogada e vídeo aula) e após cada uma das intervenções, foram avaliados quanto a retenção do conhecimento. Também foram avaliados indicadores da aplicação da unidade de eletrocirurgia durante os procedimentos cirúrgicos.
Resultados: Participaram do estudo quatro enfermeiros e 28 técnicos de enfermagem. Os enfermeiros apresentaram conhecimento prévio do tema na maioria dos tópicos. Entre os técnicos de enfermagem, observou-se melhora nos itens checagem do equipamento e posicionamento da placa eletrodispersiva.
Conclusões: Os profissionais apresentaram um bom rendimento teórico, porém o mesmo não fica evidente na prática pois os profissionais relutam em ter uma prática diferente da teoria. Pesquisas dessa natureza são oportunas pois proporcionam aos gestores uma possibilidade de propor projetos de melhoria contínua da assistência perioperatória.

Palavras-chave: Eletrocirurgia; centros cirúrgicos; tecnologia biomédica; capacitação de recursos humanos em saúde; enfermagem.

RESUMEN:
Objetivo: Evaluar el efecto de las intervenciones educativas en el conocimiento y la aplicabilidad de la electrocirugía del equipo de enfermería.
Material y método: Cuasiexperimento, con evaluaciones antes y después en un solo grupo, llevado a cabo en el centro quirúrgico de un hospital universitario terciario brasileño. Se realizó en siete etapas, se aplicó un cuestionario semiestructurado para evaluar los conocimientos de los participantes. Los participantes fueron expuestos a dos intervenciones educativas (clase expositiva, dialogada y video clase) y después de cada intervención se evaluó la retención de conocimientos. También se evaluaron indicadores de la aplicación de la unidad de electrocirugía durante los procedimientos quirúrgicos.
Resultados: Participaron del estudio 4 enfermeros y 28 técnicos en enfermería. Los enfermeros tenían conocimientos previos sobre el tema de la mayor parte de los tópicos. Los técnicos en enfermería, mejoraron en los ítems verificación del equipamiento y colocación de la placa.
Conclusiones: Los profesionales presentaron un buen desempeño teórico pero el mismo no se refleja en la práctica porque los profesionales son reacios a realizar prácticas que no coincidan con la teoría. La realización de este tipo de investigaciones es conveniente porque les permite a los gestores la posibilidad de proponer proyectos para una mejora continua de la asistencia perioperatoria.

Palabras claves: Electrocirugía; centros quirúrgicos; tecnología biomédica; capacitación de recursos humanos en salud; enfermería.

INTRODUCTION

Electrosurgery units can be found in almost all operating rooms, being used in more than 80% of the procedures. Electrosurgery allows surgeons to dissect tissues and achieve rapid hemostasis. However, difficulties in predicting the effects of the combinations of electrical current magnitude, heat generation, and patient-related factors can lead to serious complications[1].

A number of studies indicate that electrosurgery can cause harms to the patient, including surgical burns, operating room fires, interference with pacemakers and intestinal injuries[2-4]. Another survey identified that 15.9% of the incidents during surgical procedures are related to equipment, and the use of electrosurgery is often associated with risks that can influence the result of the procedure[5].

The problem linked to insufficient training in the use of technologies in the operating room can contribute to the occurrence of these adverse events. In 2016, the *Emergency Care Research Institute* (ECRI) published a list of the top ten health technologies hazards, where the fifth place was for insufficient training of professionals

in operating room technologies. Such a situation can result in usage errors that lead to surgical complications, which may require additional treatment and even cause serious injuries or death to the patient[6].

Safety training in the use of electrosurgery is mainly obtained informally in the operating room, where knowledge of its use is by transfer of information between peers or by industry-sponsored events using its own proprietary material[2]. Lack of preparation for equipment use has been reported in the Nursing team. A research study that aimed at assessing the level of mastery of new technologies by surgical center nurses found that 75.8% of this professional category reported being unprepared, with 54.5% presenting unsatisfactory mastery of new technologies in this unit[7].

The electrosurgery unit must be used as safely as possible, which comes from prior theoretical and practical knowledge by the team present in the operating room, since it is a practice with strong dependence on individual and health team performance[8-9].
In this direction, a number of studies reinforce the need for training the professionals in the use of electrosurgery[10-12]. The research underscores the importance of a mandatory training program that addresses the entire theory of electrosurgery as well as the practical use of the equipment.[1].

Given the above, the objective of this study is to evaluate the effect of educational interventions on the knowledge and applicability of electrosurgery in the Nursing team.

MATERIAL AND METHOD

Study design

A quasi-experimental study of the before-and-after type.

Scenario

The study was developed in the surgical center of a Brazilian tertiary-level university hospital with 322 beds. The center has nine rooms and performs approximately 800 surgeries/month, of different sizes.

Population

The population consisted of the Nursing team (nurses and nursing technicians).

Selection criteria

The members of the Nursing team who did not participate in all the stages established in this research were excluded.

Data collection

Three instruments were used.

Instrument 1 - Observation script of the electrosurgery unit application, based on the AORN (2015) recommendations evaluating 5 indicators[13]: Indicator 1 - Plate positioning - It should be as close as possible to the surgical site, with no risk of antiseptic flowing into the electrodispersive plate. For example, during surgeries in the abdominal region, it can be placed on the vastus lateralis of the thigh. The plate should not be positioned over bony prominences, scar tissue, hair, tattoos, potential pressure points, or areas distal to the tourniquets. The dispersive electrode should only be placed after definite positioning of the patient. Indicator 2 - Plate size - It should be suitable for the patient according to their characteristics (neonatal, infant, pediatric and adult). In the case of a single-use dispersive electrode, it cannot be cut and/or bent and full contact with the skin must be guaranteed. Indicator 3 - Trichotomy - Excess hair must be removed/trimmed so that it does not interfere with the contact between the single-use dispersive electrode and the patient's skin. Indicator 4 - The Circulating nurse must indicate on the form itself whether or not the electrosurgery unit was used, as well as the type (monopolar/bipolar) and place for positioning the electrodispersive plate. Indicator 5 - Equipment check - Before starting the surgical procedure, the Circulating nurse shall verify if the equipment is connected to the correct energy source, its operation, if the equipment's sound is audible and if the plugs (pen/electrodispersive plate) are fitting properly.

Instrument 2 - Sociodemographic questionnaire with general data of the participants (age, gender, profession, time working in the operating room and previous training regarding the use of the electrosurgery unit).

Instrument 3 - Multiple-choice questionnaire to identify the health professionals' level of knowledge regarding the electrosurgery unit application, consisting of seven questions with only one correct alternative. The following topics were evaluated: dispersive plate positioning, human tissue with better conductivity for electrical current, need for insulating devices between patient and metals, care for patients with tattoos, proper plate connection, and effects of the electrical current for patients and tissues.

Data collection comprised 7 stages, developed from January 2017 to January 2019, namely:

Stage 1: Direct observation of the surgical procedures with different sizes and specialties for 30 days in the morning and afternoon periods in order to measure the indicators proposed in instrument 1.

Stage 2: Initially, the participants completed instrument 2. Subsequently, training of the professionals was carried out through a didactic class and multimedia resources in relation to the use of the electrosurgery unit, positioning of the dispersive plate, electrical conductivity in the tissue, need for insulating devices between the patient and metals, care related to patients with tattoos and skin lesions, proper plate connection, different electrosurgery modalities (monopolar and bipolar), and good practices recommended by the AORN in relation to the electrodispersion plate, to the patient and to the equipment. In this stage, the participants also completed instrument 3, before and after the training.

Stage 3: Direct observation for 20 days in the morning and afternoon periods of surgical procedures, randomly chosen from the surgical schedule of the day, in order to measure again the indicators proposed in instrument 1.

Stage 4: Conducted two months after the professionals' training, in which instrument 3 was applied for a new assessment of the participants.

Stage 5: Conducted four months after the lecture and dialogue-based class, it consisted in direct observation of surgical procedures for 30 days in the morning and afternoon periods in order to measure again the indicators proposed in instrument 1.

Stage 6: Conducted six months after the lecture and dialogue-based class, in which the Nursing team professionals were invited to participate in a new training session with the presentation of a video-lesson with the same content presented in the lecture and dialogue-based class. Instrument 3 was completed again before and after the video-lesson.

Stage 7: It consisted of the observation of surgical procedures using the electrosurgery unit, carried out 12 months after presenting the video-lesson to the research participants who were part of the unit's Nursing team.

The data collection procedures were planned based on a study carried out in 2006 that also used different educational strategies in research on knowledge and practices among hospital Nursing professionals[14].

The choice for the time intervals to carry out the different stages was taken on the basis that spaces would be needed in the process, so that the observation system of the intervention effects would portray the actions of the professionals within the work dynamics of the surgical center, allowing to assess if there was a change in the professionals' behavior or not[14,15].

Data analysis and treatment

The data were organized by double typing in a spreadsheet in *Microsoft Excel Windows* version 7. To compare the adequacy rates of the indicators for plate positioning, plate size, trichotomy, completion of the item related to the use of electrosurgery in the safe surgery protocol and equipment check between the different phases, a generalized linear model with Binomial distribution with identity binding function was proposed. The generalized linear models class is an extension of the traditional linear model which allows the population mean to be dependent on a linear predictor through a nonlinear linkage function and allows the probability distribution of the response variable to be any member of the exponential family (Normal, Binomial, Poisson and Gamma Distribution)[16]. The same model was used to compare the correct answer rates of each question between the phases, with the addition of a random effect due to the same person being analyzed during the different phases.

Ethical aspects

The research project was submitted to the Research Ethics Committee of the Ribeirão Preto Nursing School at the University of São Paulo and to the Ethics Committee of the participating institution, being approved with number CAAE 64850917.4.00005393

RESULTS

The result will be presented in 2 parts: analysis of the different educational methodologies proposed for knowledge assimilation; and analysis of the observation of the indicators regarding compliance recommended by the AORN.

Part 1

A total of 32 professionals working in the surgical center participated in the study: four nurses and 28 nursing technicians. As for time in the profession, expressed in months, the mean was 32.8 (standard deviation [SD]: 9.4) for nurses and 102 (SD: 52.3) for nursing technicians. The mean working time in the operating room in months was 12 (SD: 9.4) for nurses and 88.5 (SD: 59.9) for technicians. There was predominance of females for both technicians with 21 (75.00%) and nurses with 3 (75.00%). Regarding previous qualification/training, two (50.00%) in the category of nurses and 19 (67.90%) in the category of nursing technicians stated that they had this type of information.

Analysis of the questionnaires according to the professional category of the participating nurses

Four nurses participated in the training (n=4). The descriptive analysis in Table 1 showed that most of the participants already had prior knowledge of the theme and that they took part in all the study phases.

Table 1 - Description of the nurses' correct answer rates in relation to the questionnaire. Brazil, 2019.

Variable	Before the lecture (n=4)	After the lecture (n=4)	2 months after training (n=4)	Before the video-lesson (n=4)	After the video-lesson (n=4)
Question 1 *Plate positioning*					
Correct answers	3 (75%)	4 (100%)	4 (100%)	4 (100%)	4 (100%)
Incorrect answers	1 (25%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Question 2 *Better conductivity tissue*					
Correct answers	2 (50%)	4 (100%)	3 (75%)	4 (100%)	4 (100%)
Incorrect answers	2 (50%)	0 (0%)	1 (25%)	0 (0%)	0(0%)
Question 3 *Use of insulating devices*					
Correct answers	3(75%)	4 (100%)	4 (100%)	4 (100%)	4 (100%)
Incorrect answers	1(25%)	0 (0%)	0 (0%)	0(0%)	0(0%)
Question 4 *Plate position on tattoos*					
Correct answers	3 (75%)	4 (100%)	4 (100%)	4 (100%)	4 (100%)

Incorrect answers	1 (25%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Question 5					
Dispersive electrode contact					
Correct answers	4 (100%)	4 (100%)	4 (100%)	4 (100%)	4 (100%)
Question 6					
Adverse events					
Correct answers	4 (100%)	4 (100%)	3 (75%)	4 (100%)	4 (100%)
Incorrect answers	0 (0%)	0 (0%)	1 (25%)	0 (0%)	0 (0%)
Question 7					
Effects of radio frequency current					
Correct answers	4 (100%)	4 (100%)	3 (75%)	4 (100%)	4 (100%)
Incorrect answers	0 (0%)	0 (0%)	1 (25%)	0 (0%)	0 (0%)

It can be observed that there was no pattern of improvement in knowledge in the group of nurses, which can be understandable, as this was already high in this group of participants.

Nursing technicians

In relation to the result obtained, during the training and using different types of strategies in the population of nursing technicians, an improvement is verified in the response pattern to the questionnaire applied in different phases, in some questions, as shown in Table 2.

Table 2 - Description of the correct answer rates of the nursing technicians in relation to the questionnaire. Brazil, 2019.

Variable	Before the lecture (n=28)	After the lecture (n=28)	2 months after training (n=28)	Before the video-lesson (n=28)	After the video-lesson (n=28)
Question 1					
Correct answers	19 (67.86%)	26 (92.86%)	24 (85.71%)	24 (85.71%)	25 (89.29%)
Incorrect answers	9 (32.14%)	2 (7.14%)	4 (14.29%)	4 (14.29%)	3 (10.71%)
Question 2					
Correct answers	8 (28.57%)	22 (78.57%)	18 (64.29%)	16 (57.14%)	23 (82.14%)
Incorrect answers	20 (71.43%)	6 (21.43%)	10 (35.71%)	12 (42.86%)	5 (17.86%)
Question 3					
Correct answers	25 (89.29%)	27 (96.43%)	27 (96.43%)	26 (92.86%)	27 (96.43%)
Incorrect answers	3 (10.71%)	1 (3.57%)	1 (3.57%)	2 (7.14%)	1 (3.57%)
Question 4					
Correct answers	15 (53.57%)	27 (96.43%)	28 (100%)	28 (100%)	28 (100%)
Incorrect answers	13 (46.43%)	1 (3.57%)	0 (0%)	0 (0%)	0 (0%)
Question 5					
Correct answers	26 (92.86%)	28 (100%)	28 (100%)	27 (96.43%)	27 (96.43%)
Incorrect answers	2 (7.14%)	0 (0%)	0 (0%)	1 (3.57%)	1 (3.57%)
Question 6					

Correct answers	25 (89.29%)	28 (100%)	28 (100%)	27 (96.43%)	28 (100%)
Incorrect answers	3 (10.71%)	0 (0%)	0 (0%)	1 (3.57%)	0 (0%)
Question 7					
Correct answers	25 (89.29%)	26 (92.86%)	26 (92.86%)	24 (85.71%)	26 (92.86%)
Incorrect answers	3 (10.71%)	2 (7.14%)	2 (7.14%)	4 (14.29%)	2 (7.14%)

A comparison of the correct answers between the phases for questions one and two was performed, with the data presented in Table 3.

Table 3 - Comparison of the correct answer rates for questions one and two using the generalized linear model with Binomial distribution. Brazil, 2019.

	QUESTION 1				QUESTION 2			
Comparison	**Estimated difference**	**Confidence interval (95%)**		**p-value**	**Estimated difference**	**Confidence interval (95%)**		**p-value**
Before the lecture - After the lecture	-25	-43.85	-6.15	0.01	-50	-71	-29	<0.01
Before the lecture - 2 months after training	-17.86	-35.16	-0.56	0.04	-35.71	-58.32	-13.11	<0.01
Before the lecture - Before the video-lesson	-17.86	-32.04	-3.67	0.01	-28.57	-52.53	-4.61	0.02
Before the lecture - After the video-lesson	-21.43	-42.09	-0.76	0.04	-53.57	-78.78	-28.37	<0.01
After the lecture - 2 months after training	7.14	-6.6	20.89	0.31	14.29	-4.79	33.36	0.14
After the lecture - Before the video-lesson	7.14	-6.6	20.89	0.31	21.43	0.76	42.09	0.04
After the lecture - After the video-lesson	3.57	-12.02	19.17	0.65	-3.57	-24.53	17.39	0.74
2 months after training - Before the video-lesson	0	-9.9	9.9	0.99	7.14	-9.8	24.08	0.41
2 months after training - After the video-lesson	-3.57	-19.17	12.02	0.65	-17.86	-37.79	2.07	0.08
Before the video-lesson - After the video-lesson	-3.57	-19.17	12.02	0.65	-25	-41.04	-8.96	<0.01

Comparing the adequacy rate of the response pattern to question one in the different phases, a 25-percentage-point (pp) improvement is verified in the adequacy rate between before and after the lecture. Observing the confidence interval, it is verified that there was a difference from before the lecture for all phases until after the video-lesson, that is, understanding in relation to the scalpel plate correct positioning was improved. When comparing to after the lecture, it is verified that knowledge was maintained. Therefore, for question one, it can be considered that the lecture was sufficient, with no need for other educational strategies.

Comparing the adequacy rate of the response pattern for question number two in the different phases, there was a significant improvement in prior knowledge, as this was 50 pp when the before and after the lecture phases were compared. However, the response pattern was not maintained between the phases, having worsened between the lecture and the video-lesson. The application of the video-lesson was responsible

for improving the response pattern in 25 pp.

With regard to questions three and seven, there was already prior knowledge and this was maintained throughout the study.

It was not possible to compare the adequacy rates involving questions four, five and six by the generalized linear model with Binomial distribution due to non-variability of the answers. In this case, it was decided to proceed with the McNemar test, comparing pairs of phases when possible. Table 4 presents the results.

Table 4 - Description of the adequacy rates of the nursing technicians' answers to questions four, five and six using the McNemar test. Brazil, 2019.

Question	Comparison	p-value
4	Before the lecture vs After the lecture	<0.01
	After the lecture vs 2 months after training	0.32
5	Before the lecture vs After the lecture	0.16
	2 months after training vs Before the video-lesson	0.32
6	Before the lecture vs After the lecture	0.08
	2 months after training vs Before the video-lesson	0.32
	Before the video-lesson vs After the video-lesson	0.32

It is noticed that, in question 4, there was an improvement in knowledge after the lecture, and it remained constant two months after the training. For the other questions, there was already prior knowledge and it was maintained throughout the study.

Table 5 - Description of the correct answer rates in the different phases. Brazil, 2019

Variable	Before the intervention (n=103)	After the intervention (n=65)	4 months after the intervention (n=104)	1 year after the video-lesson intervention (n=101)
Plate positioning				
Adequate	32 (31.07%)	29 (44.62%)	43 (41.35%)	44 (43.56%)
Inadequate	71 (68.93%)	36 (55.38%)	61 (58.65%)	57 (56.44%)
Plate size				
Adequate	100 (97.09%)	63 (96.92%)	104 (100%)	101 (100%)
Inadequate	3 (2.91%)	2 (3.08%)	0 (0%)	0 (0%)
Proper trichotomy				
Adequate	103 (100%)	65 (100%)	104 (100%)	99 (98.02%)
Inadequate	0 (0%)	0 (0%)	0 (0%)	2 (1.98%)
Completion of the item related to the use of electrosurgery in the safe				

surgery protocol				
Adequate	99 (96.12%)	63 (96.92%)	103 (99.04%)	99 (98.02%)
Inadequate	4 (3.88%)	2 (3.08%)	1 (0.96%)	2 (1.98%)
Equipment check				
Adequate	1 (0.97%)	31 (47.69%)	76 (73.08%)	85 (84.16%)
Inadequate	102 (99.03%)	34 (52.31%)	28 (26.92%)	16 (15.84%)

Regarding the observation of the indicators concerning the compliance recommended by the AORN, Table 5 shows that the indicators for plate size, proper trichotomy and adequate completion of the item related to the use of electrosurgery in the safe surgery protocol already had compliance rates above 90% in the period prior to the intervention. The equipment check indicator had a greater impact after the intervention and plate positioning also improved, but adequacy did not reach 50%.

Comparison of the compliance rate of the indicators between the phases

Plate positioning

Table 5 shows an improvement in the compliance rate for this indicator. However, according to the generalized linear model with Binomial distribution, there is no evidence of statistical difference and, when comparing all phases, the p-value was greater than 0.05. However, this does not mean that the data has no clinical relevance.

Plate size

In relation to the size of the plate, this was already adequate in the phase prior to the intervention and, according to the generalized linear model, there is no evidence of statistical difference and, when comparing all phases, the p-value was greater than 0.05.

Proper trichotomy

In the trichotomy indicator it is observed that before, during and after training, this did not change because there was already an established standard and it was maintained throughout the study.

Completion of the item related to the use of electrosurgery in the safe surgery protocol

This indicator also shows that the compliance rate was already above 95% before the intervention and it was maintained throughout the study.

Equipment check

Table 5 shows that there was a relevant improvement in relation to the equipment check indicator. Table 6 presents the comparison of the compliance rate for this indicator between the phases.

Table 6 - Comparison of the compliance rate regarding equipment check between the phases according to the generalized linear model with Binomial distribution. Brazil, 2019

Comparison	Estimated difference	Confidence interval (95%)		p-value
Before - After the intervention	-46.72	-59.01	-34.43	<0.01
Before - 4 months later	-72.11	-80.84	-63.37	<0.01
Before - 1 year later	-83.19	-90.56	-75.82	<0.01
After the intervention - 4 months later	-25.38	-40.22	-10.55	<0.01
After the intervention - 1 year later	-36.47	-50.54	-22.39	<0.01
4 months later - 1 year later	-11.08	-22.19	0.03	0.05

It is observed that there was an improvement in the compliance rate of equipment check between all the different study phases.

DISCUSSION

The surgical center, representing an environment of great complexity, brings together a technological expressive device. Therefore, following this development, the occurrence of undesirable events is identified, which has required the adoption of good practices related to the different procedures performed in that space, in a context of greater surgical safety.

Electrosurgery is a practice routinely experienced during the intraoperative period, which requires technical-scientific knowledge of the equipment and its procedures, ensuring effective and safe use of this technology. To this end, the entire health team must undergo constant updates, in order to guarantee the surgical patient the best possible condition in terms of physical, functional and emotional integrity.

The professionals' lack of preparation regarding the applicability of the electrosurgery unit is considered a risk factor for the occurrence of adverse events[17].

Thus, a study revealed that constant training of the professionals is indispensable, improving the attention given to this type of technology and the need to devise and implement protocols[9].

In this study, it was possible to identify that most of the participants had already received prior training on the use of electrosurgery, although not specific during the daily practice. The nurses already had previous knowledge and obtained 100% of correct answers in most of the questions, even in the period prior to the intervention. However, the nursing technicians presented an increase in the percentage of correct answers after the training and after the video-lesson. It is noteworthy that the electrosurgery unit is used daily in surgical procedures and the Circulating nurse is the one who operates it, in this case, the nursing technicians.

According to a study, the greater the knowledge about the associated risks, forms of prevention and proper use, the greater the probability of surgical success[9]. The authors also warn that the use of the electrosurgery unit raises a bioethical issue: its practice is necessary, but it must be performed with the greatest possible safety, which

comes from prior theoretical and practical knowledge on the part of the team present in the operating room.

For the nursing technicians category, knowledge acquisition was evident, as the percentages of correct answers always improve after each educational intervention; however, it was possible to identify a difficulty in long-term memorization, meaning that it is necessary to have more than one type of approach several times.

According to AORN recommendations[13] the electrodispersive plate must be placed as close as possible to the surgical site, as distance can demand an increase in energy, which in turn can cause injuries to the patient.

However, it was verified that, despite their good theoretical performance, in the practice, the professionals did not show any improvement in adherence to all the indicators. Proper plate positioning, to avoid burns, presented compliance rates below 50% in all the study phases.

During the research, it was noticed that the nursing technicians persisted in positioning the plate on the patient's calf, considering it to be a practice that minimizes the occurrence of burns, as it prevents flow of antisepsis fluid through it. However, they did not consider the need to increase energy, which could be as harmful as such. This is a paradigm to be broken, that is, transposition of theoretical knowledge into practice.

A paradigm represents a standard to be followed in the scientific or social sphere. In the scientific community, it includes shared beliefs, values, techniques and theories, being influenced by prevailing cultural, political, economic and social factors[18].

Education in health must provide professionals with improvement of their abilities and skills, seeking to fulfill their responsibilities, and also ensure care with least probability of adverse events[19].

Thus, in addition to providing knowledge, training must allow for the transfer of learning, which consists in the generalization of new knowledge for work and is defined, for measurement purposes, as the effective application, in the work context, of the knowledge acquired during instructional actions. In its essence, the concept of knowledge transfer includes the issue of changing the way of performing the work activities based on the learning that took place during the training events. The focus is on the degree of application of the knowledge learned and on the ability of this transfer to influence the participant's subsequent performance[20].

In the Brazilian reality, most of the hospitals still use metal plates. In the hospital institution under study, the use of two models was verified, with metallic electrodispersion plates for the vast majority of the procedures, and the most complex and prolonged surgeries were selected, such as cardiac, neurological and some plastic ones, for the use of disposable plates.

It is to be considered that the recommendations issued by the AORN serve as a guide for the Nursing professionals who work in the surgical center, and they must be adapted according to the characteristics of each institution. In the operating room, the Circulating nurse is responsible for positioning the electrodispersive plate on the patient, which is why solid preparation for performance becomes essential,

considering relevant aspects for Nursing care, due to the responsibilities inherent to their performance.

The work environment interferes with the quality and safety of the care provided to the patient and is related to the technology used and to the facilities and services available, in addition to the actions developed by the professionals. Moreover, the investment in their training is directly linked to the quality standards that are intended to be achieved in the institutions.

For the surgical center environment, which concentrates highly specialized human and technological resources, generally not available in other areas of the hospital, providing complex and sophisticated care, it becomes fundamental to consider the need for prepared professionals, minimizing the risks that pose threats to the patients' safety and integrity.

We recommend developing professional training strategies and promoting education through specialized training, considering the specificities and the workers' previous experiences of training.

The results evidenced that the nurses presented high rates of learning compliance. Interestingly, they are young professionals with limited time in the profession (32 months) and also limited time working in the operating room (12 months). It must be considered that they are the ones who assume care leadership and that, therefore, verifying their preparation and qualification for handling electrosurgery contributes an important guidance potential in relation to the category of nursing technicians and surgical instrumentators, who presented mean values of 9 years in the profession and of 8 years working in the unit.

Both the teaching strategies used and the post-tests for the assessment and observation of compliance with the selected indicators and good practices in the handling of electrosurgery proved to be adequate to achieve the objectives proposed in this study. Different learning stimuli were used during the training in order to work with the process of acquiring and retaining knowledge, skills and attitudes, from the perspective of the long-term effects of training.

The elaboration of the video-lesson on the theme and its availability for the surgical center unit in which the research was developed constituted a differential contribution to the future development of new training to be carried out by the unit itself.

Permanent Education in health has been pointed out as a great advantage capable of reaching workers in service, promoting changes in their work processes, mobilizing their skills and developing other technical and personal aptitudes in the performance of their functions, with a view to greater qualification[21].

It is considered that the study brings contributions to the knowledge corpus in perioperative Nursing, as well as to the management practices of the Nursing services, from the perspective of nurses adopting managerial tools such as planning, evaluation and in-service education, permeating work qualification and the implementation of protocols and procedures with a focus on patient safety in the surgical environment and on the professionals who work in this care setting.

CONCLUSIONS

When evaluating the effect of educational interventions on the electrosurgery knowledge and applicability of the nursing technicians, it was verified that the return in terms of knowledge retention can be considered very good because they managed to improve their knowledge regarding the execution of this procedure. In relation to the nurses, prior knowledge about the theme was found in some specific training topics, corroborating the response pattern.

The quality indicators with better compliance rates after the training were equipment check and electrodispersive plate positioning. However, this last indicator still deserves greater attention from the Nursing professionals.

The educational interventions used proved to be feasible, although they failed to sensitize the professionals to change the place for positioning the electrodispersive plate. It is necessary to seek supporting strategies, whether innovative or not, in order to provide a break in paradigms since, although there has been assimilation/fixation of the acquired knowledge, in some cases it was found that nursing technicians are reluctant to position the electrodispersion plate as close as possible to the surgical site.

Research studies of this nature are timely because they allow managers to propose projects for continuous improvement of perioperative care, involving the entire team of professionals, since quality in health must be understood as the sum of joint efforts in the search for effective, safe and humanized results.

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