ELECTRIC SCALPEL USAGE AND RELATED SAFETY MEASURES: INTEGRATIVE REVIEW

O uso do bisturi elétrico e cuidados relacionados: revisão integrativa

Uso del bisturí eléctrico y cuidados relacionados: revisión integradora

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ABSTRACT: Objective: To analyze scientific evidence on the use of electric scalpel and precaution measures related to the use of this equipment. **Method:** An integrative review was developed from April to May 2016, by searching the following databases: PubMed (digital archive created by the National Library of Medicine), *Biblioteca Virtual em Saúde* and Google Scholar. The search was conducted by using the following descriptors: *bisturi elétrico* and electric scalpel. **Results:** The search strategy resulted in six studies that covered the following themes: risks associated with the use of electric scalpel, knowledges of the health team about the use of electric scalpel and nursing role in preventing risks related with electrocoagulation. **Conclusion:** There is a need to adopt strategies for improving the knowledge of nurses and nursing assistants in regards to the safety of patients submitted to electrocoagulation.
Keywords: Perioperative nursing. Nursing, team. Electrocoagulation.

RESUMO: Objetivo: Analisar evidências científicas sobre a utilização do bisturi elétrico e os cuidados relacionados ao uso desse equipamento. **Método:** Revisão integrativa da literatura realizada em abril e maio de 2016 nas bases de dados PubMed (arquivo digital produzido pela *National Library of Medicine*), Biblioteca Virtual em Saúde (BVS) e Google Acadêmico. Para o levantamento de artigos, foram utilizados os descritores não controlados: bisturi elétrico e *electric scalpel*. **Resultados:** A estratégia de busca permitiu a análise de seis artigos que abordaram três temas principais: riscos associados ao uso do bisturi elétrico, conhecimento da equipe em relação ao uso do bisturi elétrico e papel do enfermeiro na prevenção de riscos associados à eletrocirurgia. **Conclusão:** Conclui-se que é necessário implementar ações para que enfermeiros e técnicos de enfermagem adquiram um nível adequado de conhecimentos e habilidades relacionados à segurança do paciente submetido à eletrocirurgia.
Palavras-chave: Enfermagem perioperatória. Equipe de enfermagem. Eletrocoagulação.

RESUMEN: Objetivo: Analizar evidencias científicas sobre el uso de bisturí eléctrico y la atención relacionada con el uso de este equipo. **Método:** Revisión integradora de la literatura llevada a cabo en abril y mayo de 2016, en las bases de datos PubMed (archivo digital producido por el National Library of Medicine), Biblioteca Virtual en Salud y Google Scholar. Para la búsqueda de los artículos se utilizaron los descriptores: bisturi elétrico e electric scalpel. **Resultados:** La estrategia de búsqueda permitió el análisis de seis artículos que abordaron tres temas principales: Riesgos asociados con el uso del bisturí eléctrico; Conocimiento del personal sobre el uso el bisturí eléctrico; y Papel de la enfermera en la prevención de los riesgos asociados a la electrocirugía. **Conclusión:** Se concluye que acciones deben ser implementados para que enfermeros y técnicos en enfermería adquieran un nivel adecuado de conocimientos y habilidades relacionados con la seguridad de los pacientes sometidos a la electrocirugía.
Palabras clave: Enfermería perioperatoria. Grupo de enfermería. Electrocoagulación.

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INTRODUCTION

The first surgical centers have emerged linked to the history and evolution of medicine. In ancient times, the procedures were predominantly conducted in body areas where it was not necessary to open cavities because typically these procedures were conducted in the external tissue and extremities[1]. With the scientific development of surgical medicine in the mid-sixteenth century, three major challenges inherent to the surgical procedure have emerged: pain, infection, and bleeding[2].

As a bleeding control measure during surgery, the first electric scalpel was developed in 1920 in the United States. This instrument promoted tissues desiccation and hemostasis by means of a radio frequency current that passes through a portion of the human body producing electrodesiccation and electrocoagulation. This discovery enabled a significant reduction in the risk of bleeding in surgical procedures when compared to the use of manual scalpel[1].

In 1968, the electrosurgery was revolutionized by the isolated generator technology, which dramatically reduced the hazards of the current division and alternate site burns[3]. Since then, there is an increasing demand for in-depth knowledge of the interventions and surgical instruments and equipment, owing to the speed and complexity of the advances in surgical procedures. Among these advances are minimally invasive surgeries, the various changes in previously recommended practices, and promotion of guidelines and best practices related to the operating room[4].

Technological innovations have also been implemented in the manufacture of new electric scalpel models. The electric scalpels used in the past worked with a return system called neutral plate, in which the electric current is removed from the equipment. Modern electric scalpels have a monitoring system for the return electrode, in which the electric current returns to a generator. In this type of device, if the plate is disconnected while using the equipment, the generator cuts the current, which minimizes the possibility of burns in patient's skin[4].

Perioperative nursing care is essential to promote the patient well-being and safety in surgical procedures. The term "perioperative nursing" implies a systematic and dynamic process. The nursing staff ensure that patients receive professional care, which should be established based on scientific evidence, by means of the patient care planning and identification of required nursing interventions[4].

In view of these considerations and the perception that nurses do not always have the knowledge and skills to handle new technological devices, we consider relevant to investigate the literature content on the usage and care related to electric scalpels.

In 2014, a literature review was carried out to investigate scientific evidence on the nursing care in the intraoperative period related to the use of electric scalpel[5]. However, the study requires detailed information about its methodological characteristics, such as information sources, research period, and descriptors applied. Thus, we consider that a new integrative review on the use of electric scalpel is necessary and that this type of study contributes to the professional practice through the integration and dissemination of evidence, which are not always accessible to healthcare professionals.

OBJECTIVE

To analyze scientific evidence on the use of electric scalpel and on the nursing care related to the use of this equipment.

METHOD

This is an integrative review on the use of electric scalpel and related nursing care, which used a methodological framework containing five stages: problem formulation, data collection, data evaluation, data analysis and interpretation, and presentation of results[6].

For the problem formulation, the following guiding question was elaborated: What does literature show on the usage and care related to the use of electric scalpel? Data were collected during April and May 2016.

Data collection consisted in the search for scientific articles published in the last five years (2011–2016), focusing on the guiding question, published in Portuguese, English, and French, and indexed in PubMed (digital archive produced by the *National Library of* Medicine), *Biblioteca Virtual em Saúde* (BVS), and Google Scholar. Uncontrolled descriptors used for the search were *bisturi elétrico* and electric scalpel.

Only articles published in the last five years were chosen, which aimed at including recent and updated data from studies on the topic of interest. The choice of the inclusion criterion related to language – Portuguese, English, and French – was made because of language-related matters. The flowchart of the data collection and of the papers included in final sample of this review is shown in Figure 1.

For the data collection, an instrument specifically designed for this study was applied. This instrument was filled out with the following information, which was obtained by the reading of each article: study identification (title, authors, region where the study was carried out, and year of publication), type of journal, and methodological characteristics of the study (study type, objective, results, and major implications and level of evidence).

Evidence levels were rated on a scale of I to VII, as follows:

I. Systematic review with meta-analysis of randomized controlled clinical trials;
II. Randomized controlled clinical trial;
III. Nonrandomized clinical trial;
IV. Cohort study and well-delineated case – control;

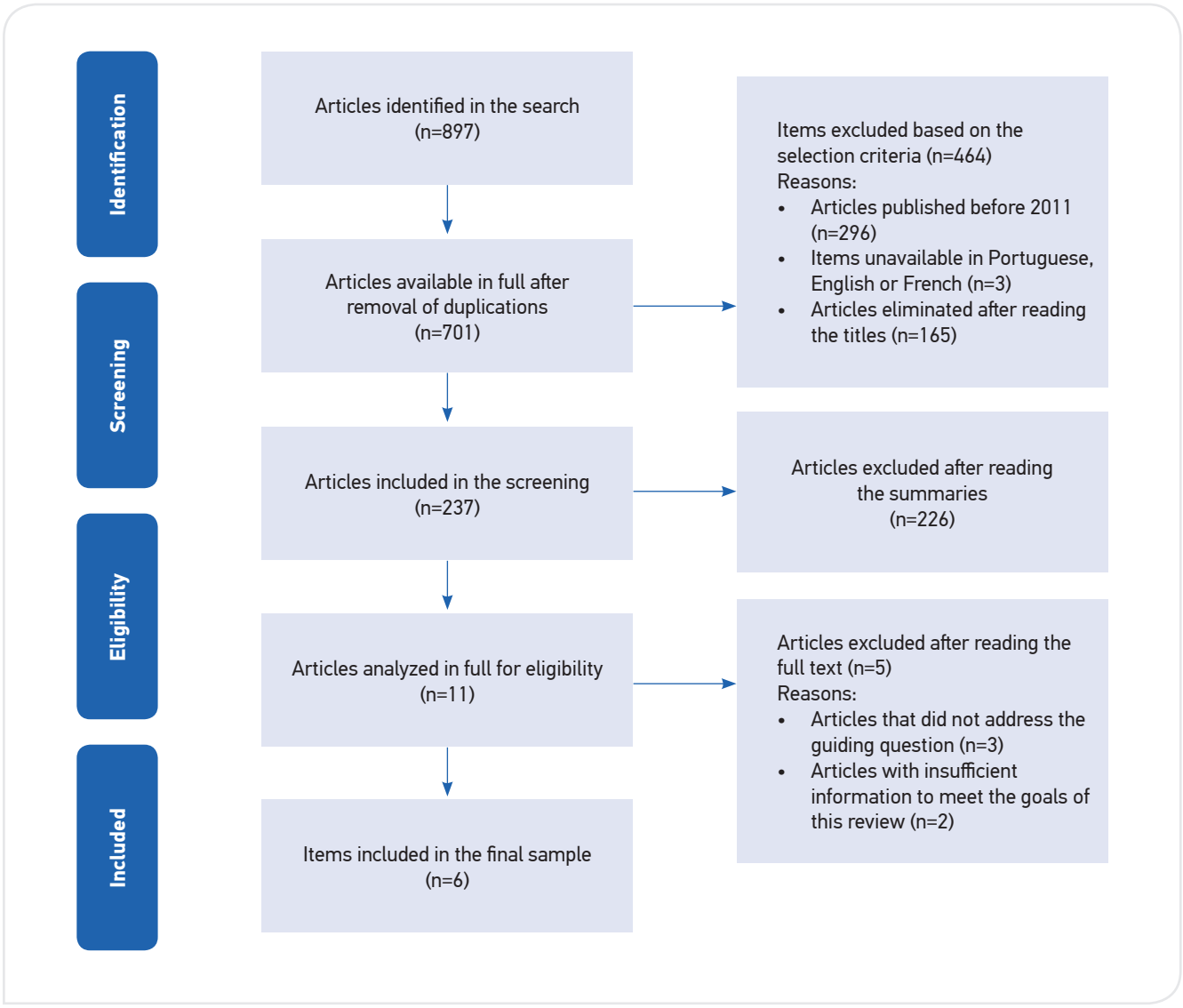

Figure 1. Flow chart of the search process for scientific articles.

V. Systematic or integrative review of quantitative and qualitative descriptive studies;
VI. Quantitative or qualitative descriptive study and
VII. Opinion of authorities and/or expert committee reports[7].

The classification of the selected articles according to the level of evidence is recommended for any literature review study, as it enables to determine the confidence in the use of the results arising from these studies and reinforces the conclusions concerning the current knowledge status on the investigated subject[8].

Data evaluation was carried out by an in-depth reading of the selected articles and by the identification of the key elements that could answer the guiding question of the integrative review. Analysis and interpretation of data was carried out through the critical assessment of the selected studies, in which the results of the different studies were compared and conclusions and implications from this critical analysis were identified. The results are presented descriptively in a table that summarizes the characteristics and major implications of the selected studies.

RESULTS

Table 1 shows the main characteristics of the studies included in the integrative review.

Among the six selected papers, three were review studies (level of evidence V) and three were descriptive studies (level of evidence VI), and two of which were case studies. The most frequent publication year was 2012, with three studies in total. The other studies were published in 2014, 2010, and 2009. Each study was published in a different journal and all studies, except one, were published in Brazilian journals.

Based on the critical analysis of the articles included in the review and its implications, three main themes have been identified: risks associated with the use of electric scalpel, team knowledge on the use of electric scalpel, and nurse's role in preventing the risks associated with electrosurgery.

DISCUSSION

The literature review identified a majority of "integrative review" and "case reports" study types. These study types had the level of evidence V[7], considering the methodological framework used. This result indicates the need to invest in the development of studies with more robust methodologies in the field of surgical nursing. These studies may help to improve the level of scientific evidence on this subject. Despite this weakness, the selected studies contain important concepts and information to answer the main question of this review, and therefore have been adopted. The main themes identified from the review of the selected articles and its implications are presented and discussed below.

Risks associated with the use of electric scalpel

Risk factors identified in one study include the time of exposure to electric current, the area exposed (highlighting an increased risk when the dispersion plate is not fully adhered to the patient's skin), and the use of monopolar system (in this type of equipment, the electric current transmitted by the active electrode passes through a larger body area of the patient before finding the dispersive electrode)[13].

Other risk factors identified in a literature review were the elective procedures scheduling, the lack of communication between the nursing and medical teams, and lack of knowledge of professionals about functioning, usage, and care required for the safe use of electric scalpel[9].

An environment rich in oxygen, which is a combustible substance, associated with the use of devices capable of providing ignition such as electric scalpel, was also identified as a risk factor for incidents in the intraoperative period[9,11].

The lack of knowledge of the professionals on the system linked to the electric scalpel and its correct functioning was appointed as another risk factor in two studies[2,5]. Both studies report the existence of deficiencies in continuing education and training of nurses and nursing technicians who work in the operating room.

The prevention of complications inherent to the surgical anesthetic procedure is a crucial role of nurses, who are responsible for the planning and implementation of interventions to minimize risks and ensure privacy and security for the surgical patient[14].

It is worth mentioning that the patient stay in the operating room should be considered itself a risk factor for skin lesions, as it is related to several factors such as inadequate

Table 1. Categorization of articles included in the integrative review (n=6). Sobral (CE), Brazil, 2016.

Authors/year/ type of study	Journal	Objectives	Main results	Key findings	Level
Afonso Carvalho & Oliveira/2014/ Integrative review[5]	Rev Invest Enferm	To verify to which extent the knowledge of the nursing team on the use of electric scalpel influences patient safety, and to identify risk factors and prevention of accidents.	Ineffective communication among members of the surgical team was indicated as an intensifying factor for the occurrence of complications and for the risk of incidents in the surgical environment.	It is necessary to adopt measures to promote patient safety in the operating room, such as implementation of a meeting of the multidisciplinary team before the surgical procedures and the use of continuing education measures for professionals concerning preventive measures and actions in case of fire.	V
Brito & Galvão/2009/ Integrative review[9]	Rev Gaúcha Enferm	To search and evaluate the scientific knowledge produced on nursing care related to the use of electrosurgery in the intraoperative period.	The study indicated that the technical and scientific knowledge is imperative for nurses working in the surgical context. The evidence of the study supports the implementation of policies and procedures to promote the safety of the surgical patient.	The conclusion of the study indicates the need to implement actions that contribute to the improvement of nursing care quality in the perioperative period.	V
Almeida et al. 2012/Case Study[10]	Rev Bras Anestesiol	To report a case of fire in a surgery facility during a blepharoplasty in which oxygen was administered through a nasal catheter.	Authors indicated the occurrence of fire in the operating room as a reflection of the importance of continuing education actions for surgeons, nursing assistants, and technicians regarding the composition of surgical materials. Authors also connected the incident to the requirement of maintaining O_2 sources distant during the use of electric scalpel, to the knowledge on appropriate use of antiseptics, and ignition mechanisms that trigger a fire. In the case described, the fire was caused by the ignition mechanism.	The study led to the conclusion that the first step for preventing fire in the surgical field is the constant reminder of the possibility of fire. All professionals working in the operating room should pay attention to this possibility, especially anesthetists, surgeons, and nursing assistants and technicians.	VI
Parra, Giannasttasio & Diniz/2012/ Quantitative study[2]	Rev SOBECC	To identify the knowledge of nursing professionals in the operating room as the use of electric scalpel.	Among the results, the authors indicate that although the use of electric scalpel is frequent in the operating room, there was effective training for only 54% of the professionals. 72% of respondents were unaware of specific care to patients with pacemakers who need to use the electric scalpel.	The authors concluded that there are gaps in training of nursing teams regarding the use of electric scalpel and it is necessary to adopt measures to minimize such gaps.	VI
Khales et al./2012/ Case study[11]	Ann burns Fire Disasters	To describe the measures taken in cases of skin burns to patients caused by electric scalpel.	The authors describe cases of burns caused by electric scalpel and report: (1) the inexistence of complications of underlying diseases as a result of the burns suffered by patients; (2) the extension of hospital stay in four cases; and (3) the provision of psychological support to all patients.	The authors concluded that the burn by electric scalpel plate is a rare, but serious, accident owing to the depth of the lesion, to its location, and especially because it is caused during a surgery. The management of the burn should be carried out in a specialized environment and the prevention is the best action to avoid this type of accident.	VI
Afonso et al./2010/ Integrative review[12]	Arq Bras Cir Dig	To discuss aspects related to the proper use of electrocautery.	The authors offered a number of recommendations related to the use of electrocautery and recommended the use of insulating devices on the table and in the arms and legs support.	The authors concluded that it is essential for the multidisciplinary team to know the basics of electrosurgery to minimize the risk of accidents.	V

surgical positioning, failures in adornments withdrawal, risk of developing pressure ulcers, and risk of burns from electrical equipment or chemical substances[7]. Again, it is imperative that health professionals are aware of such risk factors so they can promote patient safety.

Team knowledge on the use of electric scalpel

A survey focused on the current knowledge of operating room nurses about the system linked to the electric scalpel and its correct functioning. The study found significant deficiencies in the training of these professionals, as only 54% received effective training on the use of electric scalpel, and 72% were not aware of specific care for pacemaker patients[2].These results indicate the urgency of implementing continuing education actions for the professionals working in the operating room, such as courses and periodic training. A study developed with surgeons from 19 UK hospitals found that the knowledge of the surgeons on patient's safety improved significantly after participating in a training program. It was also found that attitudes related to error analysis, improvement of patient's safety, and the ability to influence other professionals to promote patient's safety improved significantly in the post-training period compared to the pre-training period[14].

It is worth mentioning that the nurse should focus on the use of electric scalpel, mainly because it is widely used. Technological advances are accompanied by the need for ongoing training and update of the nursing team in order to build technically and scientifically grounded knowledge for a quality care to surgical patients.

Nurse's role in the prevention of risks associated with electrosurgery

The role of the nurse was the main subject of one of the studies included in this review. The authors of this study highlighted the following precaution procedures that should be performed by nurses: the use of aqueous antiseptic solution instead of alcohol (because alcohol is a flammable solution); the electric scalpel power adjustment to a level that do not produce sparks; placing surgical cloths as far as possible from heat sources; the rational use of oxygen, which should only be administered to patients at risk of hypoxemia and giving preference to well-adapted nasal glasses; and effective communication among members of the health team in order to prevent incidents related to the use of electric scalpel[5].

The importance of nursing care plan in the intraoperative period should be highlighted. This plan should include the assessment of risks associated with surgical procedure and include diagnosis and nursing interventions focused on these risks. The operating room is designed to provide a safe therapeutic environment to the patient, but this is only possible when the patient needs are identified and fulfilled. Thus, it is nurse's responsibility to recognize and minimize potential environmental hazards involving the patient or members of the surgical team during all phases of the surgical care[15].

Nurses have a significant role in promoting best practices in the operating room, including the correct use of the electric scalpel and the implementation of measures to avoid accidents related to the use of this equipment. For being in the front line of care, nurses are in an ideal position to inform and advise other team members in relation to such practices aimed at patient safety, to oversee the use of the equipment, and to adopt the necessary security procedures in the surgical environment.

Although the nurse is in front of the line of care, prevention of accidents related to the use of electric scalpel and other incidents is a result of teamwork. Learning from mistakes is essential, such as occurred in the incident that was reported in one study[10] and this is also a recommendation of the patient safety program Comprehensive Unit-based Safety Program (CUSP). This program, originally designed for intensive care units (ICUs), emphasizes the collaboration among members of the healthcare team to minimize incidents in hospitals. This program is already under test in operating rooms in the USA. Authors of a study observed a significant and steady increase in the scores that measure patient safety culture, and a decrease in the replacement rate of nurses in the unit from 27 to 0% in a period of three years after the implementation of CUSP in a surgical center[16].

The findings of this review can be used by nurses, teachers and hospital managers – especially of surgical units – to acquire updated knowledge about the care related to the use of electric scalpel and to disclose results of research on attitudes and practices of nurses related to the use of such equipment.

According to the studies, gaps in the acquisition of knowledge and training for proper and safe handling of

electric scalpel serve as a warning for the need of a greater investment in the actions for continuing education of health professionals. This integrative review can also serve as a source of information for the development of training, preparation of manuals and guidelines, or for the elaboration of policies in the near future, to promote best practices in the use of electric scalpel. Such actions are necessary to improve the quality of the care provided and to ensure the safety of the patient.

Limitations

This integrative review has some limitations. First, the reduced number of studies included in the final sample has limited the research findings. This limitation was expected owing to the specificity of the research theme and the scarcity of publications on the subject under study. Second, among the studies analyzed, only three were developed in practical application scenarios (and one is a case report the generalization of which is restricted). The lack of studies related to knowledge and practice of nurses in the operating room with respect to the handling and supervision of the use of surgical equipment should be highlighted. Finally, the search strategy adopted a limited use of keywords and databases. This may have caused the exclusion of potentially relevant studies and some papers of difficult access. In addition, studies with negative results are not usually published and can be accessed only by specific searches in the gray literature (documents produced by ministries, government agencies, private organizations, and academic institutions), which were not part of the search strategy adopted in this review.

CONCLUSION

This study allowed identifying evidence in the scientific literature concerning the risks associated with the use of electric scalpel and the necessary care to minimize these risks. The studies included in the review highlighted the importance of communication among members of the multidisciplinary team to develop joint prevention actions related to electrosurgery which are capable of minimizing the risks associated with surgical procedures. We also concluded that actions must be implemented so that nurses and nursing technicians can acquire an appropriate level of knowledge and skills related to safety of patients undergoing electrosurgery.

REFERENCES

1. Possari JF. Centro cirúrgico: planejamento, organização e gestão. 4ª ed. São Paulo: Iátria; 2009.
2. Parra RLC, Giannasttasio MB, Diniz TRZ. O conhecimento dos circulantes de sala sobre a utilização do bisturi elétrico. Rev SOBECC. 2012;17(4):24-32.
3. Oliveira BC, Pirovano RSV. Educação continuada para os profissionais de enfermagem em centro cirúrgico. In: 9° Congresso Brasileiro de Enfermagem em Centro Cirúrgico, Recuperação Anestésica e Centro de Material e Esterilização. Anais... São Paulo: SOBECC; 2009. p. 100.
4. Rothrock JC. Cuidados de enfermagem ao paciente cirúrgico. 13ª ed. Rio de Janeiro: Elsevier; 2007.
5. Afonso FIS, Carvalho MSLE, Oliveira LMN. O papel do enfermeiro na prevenção de complicações associadas à prática da eletrocirurgia. Revista Investigação em Enfermagem. 2014;9:76-80.
6. Galvao CM, Sawada NO, Trevizan MA. Revisão sistemática: recurso que proporciona a incorporação das evidências na prática da enfermagem. Rev Latino-Am Enfermagem. 2004;12(3):549-56. doi: 10.1590/S0104-11692004000300014
7. Ursi ES. Prevenção de lesões de pele no perioperatório: revisão integrativa da literatura [Dissertação]. Ribeirão Preto: Universidade de São Paulo; 2005.
8. Polit DF, Beck CT. Using research in evidence-based nursing practice. In: Polit DF, Beck CT (Eds.). Essentials of nursing research. Methods, appraisal and utilization. Philadelphia: Lippincott Williams & Wilkins; 2006. p. 457-94.
9. Brito MFP, Galvão CM. Os cuidados de enfermagem no uso da eletrocirurgia. Rev Gaúcha Enfermagem. 2009;30(2):319-27.
10. Almeida CED, Curi EF, Brezinscki R, Freitas RCD. Incêndio no centro cirúrgico. Rev Bras Anestesiol. 2012;62(3):435-8.

11. Khales A, Achbouk A, Belmir R, Cherkab L, Ennouhi MA, Ababou K, et al. Brulure par plaque de bistouri electrique: a propos de quatre Cas. Ann Burns Fire Disasters. 2010;23(3):151-4.

12. Afonso CT, Silva AL, Fabrini DS, Afonso CT, Côrtes MGW, Sant'Anna LL. Risco do uso do eletrocautério em pacientes portadores de adornos metálicos. ABCD Arq Bras Cir Dig. 2010;23(3):183-6. doi: 10.1590/S0102-67202010000300010

13. Galvão CM, Sawada NO, Rossi LA. A prática baseada em evidências: considerações teóricas para sua implementação na enfermagem perioperatória. Rev Latino-Am Enfermagem. 2002;10(5):690-5. doi: 10.1590/S0104-11692002000500010

14. Arora S, Sevdalis N, Ahmed M, Wong H, Moorthy K, Vincent C. Safety skills training for surgeons: A half-day intervention improves knowledge, attitudes and awareness of patient safety. Surgery. 2012;152(1):26-31.

15. Monahan FD, Sands JK, Neighbors M, Marek JF, Green-Nigro CJ. Enfermagem médico-cirúrgica: perspectivas de saúde e doença. 8ª ed. Loures: Lusociência; 2010.

16. Timmel J, Kent PS, Holzmueller CG, Paine L, Schulick RD, Pronovost PJ. Impact of the Comprehensive Unit-based Safety Program (CUSP) on safety culture in a surgical inpatient unit. Jt Comm J Qual Patient Saf. 2010;36(6):252-60.