

# NURSING CARE IN ELECTROSURGERY: INTEGRATIVE REVIEW

*Assistência de enfermagem no uso da eletrocirurgia: revisão integrativa*

*El cuidado de enfermería en el uso de la electrocirugía: una revisión integradora*

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**ABSTRACT: Objective:** To identify the scientific knowledge produced under the care of nursing related to the use of electrosurgery in the intraoperative period. **Method:** Integrative review based on the databases: Latin American and Caribbean Health Sciences Literature (LILACS), PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and in the virtual library *Scientific Electronic Library Online (SciELO)*, using the descriptors “electrosurgery”, “nursing care” and “enhanced recovery after surgery”, correlated by the Boolean operator *and*, in Portuguese, English, Spanish and French. Of the 213 studies we found, seven composed the sample. We used the *Interface de R pour les Analyses Multidimensionnelles de Textes et de Questionnaires (IRAMUTEQ)* software, through methods of lexical analysis and similitude. For the analysis of methodological quality, we applied the scientific level of evidence, according to recommendations from the Agency for Healthcare Research and Quality (AHRQ). **Results:** The publications of 2010 to 2012 stand out, with level of evidence V, indexed in LILACS and CINAHL. In the word cloud, we observed the following terms had higher relative frequency: “patient” (n=14); “surgical risk” (n=12); “electrosurgery” (n=10); “nurse” (n=8); “knowledge” (n=6); “care” (n=6); and “prevention” (n=5). After the similitude analysis, we identified the semantic range of more frequent words. **Conclusion:** There are a few studies in the literature with significant information to aggregate knowledge and build new analyses.

**Keywords:** Electrosurgery. Nursing care. Enhanced recovery after surgery.

**RESUMO: Objetivo:** Identificar o conhecimento científico produzido sobre os cuidados de enfermagem relacionados ao uso da eletrocirurgia no período intraoperatório. **Método:** Revisão integrativa, realizada nas bases de dados Literatura Latino-Americana e do Caribe em Ciências da Saúde (LILACS), PubMed, *Cumulative Index to Nursing and Allied Health Literature (CINAHL)* e na biblioteca virtual *Scientific Electronic Library Online (SciELO)*, por meio dos descritores “eletrocirurgia”, “cuidados de enfermagem” e “recuperação pós-cirúrgica melhorada”, correlacionados pelo operador booleano *and*, nos idiomas português, inglês, espanhol e francês. Dos 213 estudos encontrados, sete compuseram a amostra. Utilizou-se o *software Interface de R pour les Analyses Multidimensionnelles de Textes et de Questionnaires (IRAMUTEQ)*, por meio dos métodos de análise lexical e de similitude. Para a análise da qualidade metodológica, aplicou-se o nível de evidência científica, segundo recomendações da *Agency for Healthcare Research and Quality (AHRQ)*. **Resultados:** Destacam-se publicações entre 2010 e 2012, com nível de evidência V, indexadas nas bases de dados LILACS e CINAHL. Verificaram-se, na nuvem de palavras, termos com maior frequência relativa: “paciente” (n=14); “risco cirúrgico” (n=12); “eletrocirurgia” (n=10); “enfermeiro” (n=8); “conhecimento” (n=6), “cuidado” (n=6) e “prevenção” (n=5). Feita a análise de similitude, identifica-se um leque semântico de palavras mais frequentes. **Conclusão:** Evidencia-se escassez de estudos, na literatura, com informações significativas para agregação de conhecimentos e construção de novos trabalhos.

**Palavras-chave:** Eletrocirurgia. Cuidados de enfermagem. Recuperação pós-cirúrgica melhorada.

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**RESUMEN: Objetivo:** Identificar el conocimiento científico producido sobre la atención de enfermería relacionada con el uso de electrocirugía en el período intraoperatorio. **Método:** Revisión integradora, realizada en las bases de datos LILACS, PubMed, CINAHL y en la biblioteca virtual SciELO, a través de los descriptores Electrocirugía, Atención de enfermería y Recuperación posquirúrgica mejorada, correlacionados por el operador booleano *and*, en portugués, inglés, español y francés. Siete de los 213 estudios encontrados compusieron la muestra. Se utilizó el *software* IRAMUTEQ, mediante los métodos de análisis léxico y de similitud. Para el análisis de la calidad metodológica se aplicó el nivel de evidencia científica, según las recomendaciones de la *Agency for Healthcare Research and Quality* (AHRQ). **Resultados:** Destacan las publicaciones entre 2010 y 2012, con nivel de evidencia V, indexadas en las bases de datos LILACS y CINAHL. En la nube de palabras se encontró términos con mayor frecuencia relativa: Paciente (n=14); Riesgo quirúrgico (n=12); Electrocirugía (n=10); Enfermero (N=08); Conocimiento (N=6), Atención (N=6) y Prevención (n=5). Se identifica un rango semántico de palabras más frecuentes a partir del análisis de similitud. **Conclusión:** Se demostró la escasez de estudios en la literatura, con información significativa para la agregación del conocimiento y la construcción de nuevas obras.

**Palabras clave:** Electrocirugía. Atención de enfermería. Recuperación mejorada después de la cirugía.

## INTRODUCTION

Electrosurgery, or diathermy, consists of a surgical procedure which uses electric currents of high-frequency polarity in biological tissues, by handling a dielectric material for therapeutic purposes, such as dieresis and/or hemostasis. This is an old practice that has been improving throughout time, with the advances in technology<sup>1</sup>.

Electrosurgery is considered to be a routine practice, widely used in operating rooms (OR). It brings several benefits and ensures higher quality in perioperative care. However, even with the advances in technology, there are often complications in the surgery environment, presenting potential risks for the patient, the surgery staff and the entire multidisciplinary team<sup>2</sup>.

Concerning the main complications related to the use of diathermy, the following stand out: smoke inhalation, burns, interferences in the electric field and in pacemakers. Burns are one of the most frequent complications among patients who undergo this procedure<sup>3</sup>.

Therefore, the literature points out that the lack of communication between the members of the surgery staff and the insufficient knowledge about the use of electric equipment in surgery are predisposing factors to the increased risk of major complications related to the procedure. It is important to emphasize that the safe procedure reflects on the quality of care provided to the patient, and performed by the surgery staff in the pre, intra and postoperative periods, in order to reduce possible damage, sequelae and adverse events<sup>2</sup>.

In the surgery staff, nursing stands out as to the quality of care and reduction of common risks in the perioperative period, by providing systematized care that enables the

control and planning of strategies to guarantee complete, continuous, safe and humanized care to the patients. Besides, these lead to a considerable reduction in possible errors in the staff in general. The possibility of a direct approximation with the patient favors the evaluation of conducts and proper instruction in all surgical periods<sup>3,4</sup>.

Even though the importance and size of the theme be internationally recognized, there are only a few studies addressed to nursing care in the use of electrosurgery. This study is a result of the discipline “Special Topics: theoretical notions of nursing in an operating room and Central of Material and Sterilization”.

## OBJECTIVE

To identify, in the literature, the scientific knowledge produced under the care of nursing related to the use of electrosurgery in the intraoperative period.

## METHOD

This is an integrative review whose method allows to gather and analyze scientific studies published in the literature in a systematic and broad manner, composing the synthesis of results without changing its epidemiological affiliation, relating them to build new knowledge<sup>5</sup>.

The study was carried out between October and November, 2020, by four students attending the eighth period of the Nursing Course of a federal institution, advised by two professors. It was conducted in the discipline:

“Special Topics: theoretical notions of nursing in an operating room and Central of Material and Sterilization”, in the 2020.3 semester, in the virtual modality due to the Coronavirus pandemic.

Regarding the stages of the integrative review, there are similarities with the several models presented in the scientific literature: the used model was composed of six stages:

- Definition of the theme of interest;
- Construction of the guiding question;
- Crossing of the selected descriptors, correlated using the Boolean operator “and” in the selected databases;
- Selection of articles related to the theme, which met the inclusion criteria;
- Selection of the information extracted after reading the existing articles in the databases<sup>6</sup>.

For the demonstration of the study question, we used the patient intervention, comparison, outcomes (PICO) strategy. This strategy allows the correlate definition of the necessary evidence to create the clinical research question, which potentializes the recovery of evidence in the databases, focuses the target of the study and prevents unnecessary searches. In this strategy, P=patient or problem, I=intervention, C=comparison or control, O=outcomes<sup>7</sup>. It is important to mention that the third element, that is, comparison, was not used in this study. The result was the following guiding question: which items of nursing care are related to the use of electrosurgery in the intraoperative period described in the scientific literature?

The selection and search of studies was independent and double-blind, carried out by two authors, in order to prevent study bias and ensure the scientific quality and reliability of the findings in the literature. The results were compared, and the differences were solved by consensus or with the inclusion of a third reviewers, in order to favor the consistency of the selection and the analysis of the studies. The following databases were consulted: Latin American and Caribbean Health Sciences Literature (LILACS), PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and in the virtual library *Scientific Electronic Library Online (SciELO)*.

The descriptors and their combinations, correlated by the Boolean AND, were used in Portuguese, English, Spanish and French: “electrosurgery” (“eletrocirurgia”; “electrocirurgia”; “électrochirurgie”), “nursing care” (“cuidados de enfermagem”; “atención de enfermería”; “soins infirmiers”), “perioperative nursing” (“enfermagem perioperatória”; “enfermería

perioperatoria”; “soins infirmiers périopératoires”), “enhanced recovery after surgery”; (“recuperação pós-cirúrgica melhorada”; “recuperación mejorada después de la cirugía”; without translation).

The inclusion criteria were: texts available in full; in the referred languages; online; and published in the past 11 years (2009-2020). We excluded repeated articles in the databases and literature considered to be gray. We used an adaptation of the *Preferred Reporting Items for Systematic Reviews and Meta-Analyses* (PRISMA) model (Figure 1) for the presentation of the stages of article selection.

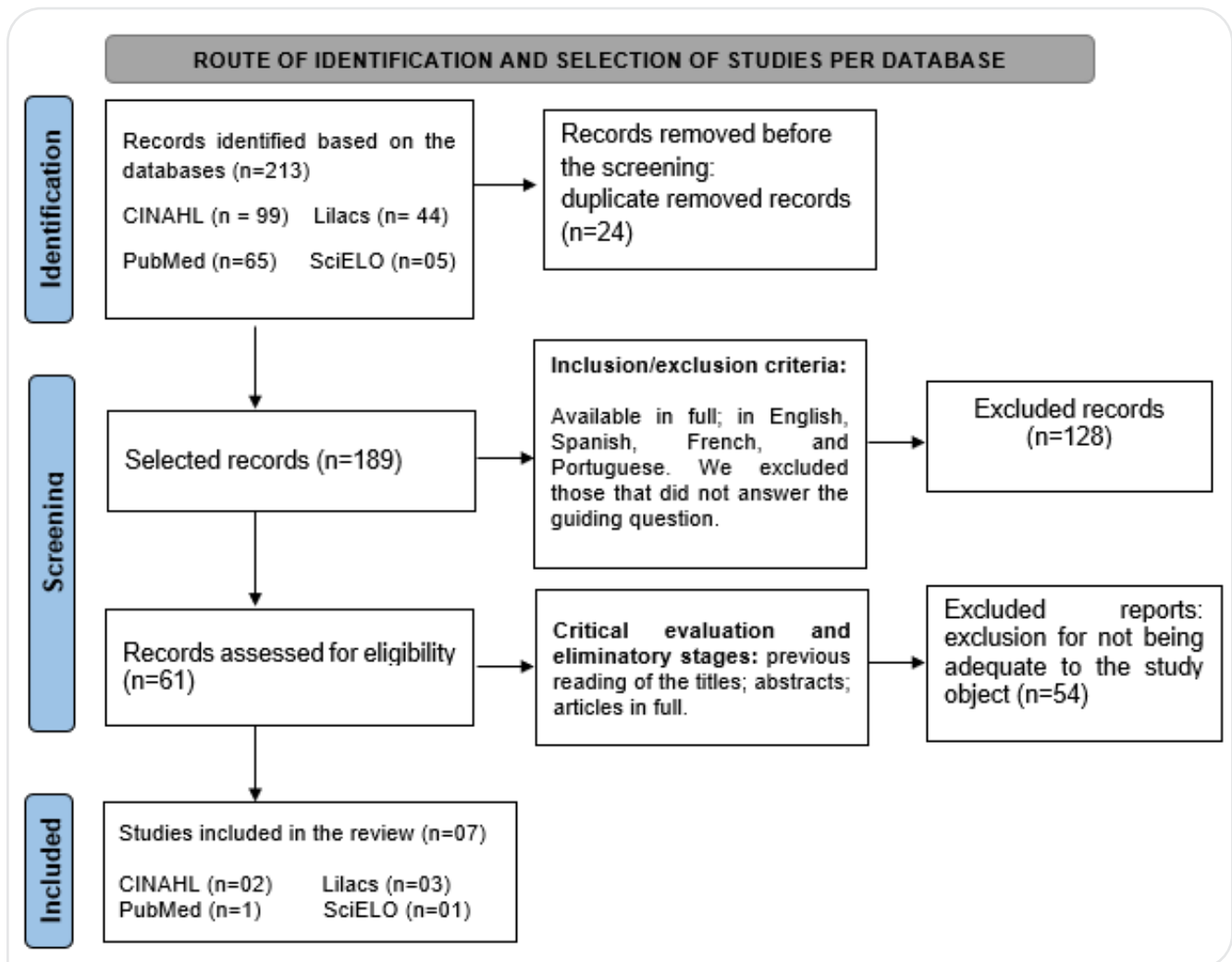
For the extraction of information from the final sample of articles, we used an instrument with data related to title, authors, language, year of publication, method, level of scientific evidence (SE), study objectives and main conclusions.

In order to increase the possibilities of analysis, the final considerations of the selected articles were used as text corpus and submitted to processing in *Interface de R pour les Analyses Multidimensionnelles de Textes et de Questionnaires* (IRAMUTEQ). This software organizes the distribution of vocabulary in an easily understandable manner, besides being visually clear<sup>8</sup>.

In the text analysis performed by IRAMUTEQ, we separated the corpus in a single file, divided in seven initial text units (UCI); twenty segments were withheld, and 60.34% of the corpus was used. Afterwards, the results were presented considering two aspects of analysis: lexical analysis – word cloud method –, and similitude analysis.

Besides, for the analysis of methodological quality, we used the model of levels of scientific evidence from the *Agency for Healthcare Research and Quality* (AHRQ), according to the following classification:

- level I: meta-analysis of multiple controlled studies;
- level II: individual study with experimental design;
- level III: study with near-experimental design as an analysis without randomization with a single pre and post-test group, temporal series or case-control;
- level IV: study with non-experimental design, such as correlational and qualitative descriptive study or case studies;
- level V: case reports or data obtained in a systematic manner, of verifiable quality, or data of program evaluation;
- level VI: opinion of respectable authorities, based on the clinical competence or on the opinion of expert committees, including interpretations of information that is not based on research<sup>9</sup>.



**Figure 1.** Flowchart of identification, screening and selection of the scientific production, adapted from the *Preferred Reporting Items for Systematic Reviews and Meta-Analyses*.

The data were analyzed, synthesized and presented in tables, word cloud and similitude tree. For the construction of an integrative review, we considered and respected the ethical aspects in the aforementioned stages.

## RESULTS

Seven articles composed the final sample of the study, of a universe of 213, extracted from different journals and according to the eligibility criteria. Chart 1 shows the bibliometric characterization of the articles, composed of: number/author/year/language, title, method, database and LE.

It is possible to identify the prevalence of publications in 2010 and 2012, level of evidence V, indexed in LILACS and CINAHL. There are five articles in Portuguese, and two in English. Regarding the research methods, they include: integrative review, narrative, and studies of descriptive and exploratory design.

Chart 2 summarizes the objective, the main results and the conclusion of each article of this integrative review.

It is observed that, in Chart 2, the verbs of the objectives were all different to describe the thematic, such as: search and evaluate (A1), elaborate (A2), analyze (A3), provide (A4), discuss (A5), characterize (A6), and identify (A7). It is also possible to notice that, in four of the analyzed articles (A1, A3, A4 and A7), the theme of nursing

care related to electrosurgery is configured as the core of the discussion of the studies. Other associated topics are: recommendations for the use of electrosurgery and elaboration of safety protocols (A2); complications related to the procedure (A5), and exposure of the team to surgical smoke (A6).

In the construction of a word cloud, the terms that obtained higher relative frequency were: “patient” (n=14);

“surgical risk” (n=12); “electrosurgery” (n=10); “nurse” (n=8); “knowledge” (n=6), “care” (n=6), and “prevention” (n=5), which gained central position and were larger in relation to other words, as represented in Figure 2.

In the odds ratio analysis between the selected terms in the processing of data based on the similitude analysis (Figure 3), there is a semantic range of more frequent words: “patient”, “electrosurgery”, “nurse”, and “surgical risk”.

**Chart 1.** Bibliometric categorization of the articles included in the integrative review.

N	Author/Year Language	Title	Method	Database	LE
A1	Brito e Galvão <sup>10</sup> 2009 Portuguese	<i>Os cuidados de enfermagem no uso da eletrocirurgia</i>	Integrative review	LILACS	V
A2	Brito e Galvão <sup>11</sup> 2010 Portuguese	<i>Protocolo de cuidados no uso de eletrocirurgia monopolar</i>	Integrative review	LILACS	V
A3	Olímpio et al. <sup>12</sup> 2016 Portuguese	Electric scalpel usage and related safety measures: integrative review	Integrative review	CINAHL	V
A4	Spruce e Braswell <sup>13</sup> 2012 English	Implementing AORN recommended practices for electrosurgery	Narrative review	CINAHL	V
A5	Afonso et al. <sup>14</sup> 2010 Portuguese	<i>Risco do uso do eletrocautério em pacientes portadores de adornos metálicos</i>	Integrative review	SciELO	V
A6	Steege et al. <sup>15</sup> 2017 English	Secondhand smoke in the operating room? Precautionary practices lacking for surgical smoke	Descriptive and exploratory	PubMed	IV
A7	Parra et al. <sup>16</sup> 2012 Português	<i>O conhecimento dos circulantes de sala sobre a utilização do bisturi elétrico</i>	Descriptive and exploratory	LILACS	IV

LE: level of evidence; AORN: Association of periOperative Registered Nurses.

**Chart 2.** Synthesis of the objective, main results and conclusion of the publications.

N	Objective	Main Results	Conclusion
A1 <sup>10</sup>	To search and assess the produced scientific knowledge about nursing care related to the use of electrosurgery in the intraoperative period.	The following categories were presented: complications resulting from the electrosurgery; complications resulting from high potency electrosurgery; complications resulting from electrosurgery, other electric equipment and antiseptic agents; knowledge of the nurses about the unit of electrosurgery; practical recommendations for the use of electrosurgery.	It is imperative that the perioperative nurse have technical and scientific knowledge about electrosurgery, and the evidence found provides subsidies for the implementation of policies and procedures to ensure patient safety, minimizing the potential risks of this technology.

Continue...

**Chart 2.** Continuation.

N	Objective	Main Results	Conclusion
A2 <sup>11</sup>	To elaborate a care protocol for the use of monopolar electrosurgery.	For the elaboration of the protocol, seven articles were analyzed and their practical recommendations were synthesized. The protocol was developed including the following items: pre, intra and post-operative care.	The elaboration of care protocols allows the reduction of error and minimizes risks, thus providing improved quality of care in the pre, intra and post-operative periods.
A3 <sup>12</sup>	To analyze scientific evidence about the use of an electric scalpel and the care related to the use of this equipment.	The search strategy allowed to analyze six articles, which approached three main themes: risks associated with the use of the electric scalpel, knowledge of the team regarding the use of this instrument, and role of the nurse to prevent the risks associated with electrosurgery.	It is necessary to implement actions so that nurses and technicians can acquire the proper level of knowledge and skills related to patient safety in electrosurgery.
A4 <sup>13</sup>	To provide guidance to the perioperative nurses in the use and care of electrosurgical equipment, including high frequency, ultrasound and modalities of argon beam.	The recommendations include the selection of electrosurgical units and accessories for purchase, minimizing the potential of injuries in patients and staff, defining precautions to be taken during the minimally invasive surgery, and ways to prevent risks of surgical smoke.	The recommendations include education, skills, documents, policies, procedures, quality, guarantee and improved performance. Perioperative nurses should consider the use of verification lists and safety posters to remind the staff members of the dangers of electrosurgery and the measures to be taken to minimize the risks of injury.
A5 <sup>14</sup>	To discuss the aspects related to complications and the adequate use of electrosurgery.	The injuries in monopolar electrosurgery are more common in the place of the dispersive plate, but also happens in places with monitoring electrodes and sites of accidental contact with metal objects, which work as an alternative path for electricity dispersion. The main complications related to electrosurgery are thermal lesions, followed by shock and interference with other electric equipment and devices.	It is essential to know the basics of electrosurgery, its proper use, safe equipment, constant monitoring and immediate investigation in case of any suspicions to minimize the risk of accidents in patients with metallic ornaments. The patient's cooperation to follow the preventive measures should be mandatory.
A6 <sup>15</sup>	To characterize the use of exposure controls and barriers to use local exhaust ventilation and individual protection equipment (including respiratory protection) by health professionals who were exposed to surgical smoke generated by laser or electrosurgical procedures.	It is worth to mention that 4,533 interviewees reported exposure to surgical smoke; 4,500 during electrosurgery, and 1,392 during laser surgery procedures. The following were interviewed: nurses (56%) and anesthesiologists (21%). Only 14% of the exposed individuals during electrosurgery reported that the local exhaust ventilation was always used during these procedures, whereas 47% reported its use during laser surgery. A few interviewees reported the use of respiratory protection.	The results of the study can be used to raise awareness about the marginal use of exposure controls and hindrances for its use.
A7 <sup>16</sup>	To identify the knowledge of nursing professionals in the operating room as to the use of an electric scalpel.	Even though the use of an electric scalpel is frequent in the operating room, only 54% of the users had undergone efficient training. As to the specific care with patients with pacemakers who had to use the electric scalpel, 72% of the interviewees were unaware of such care.	There are flaws in the training of the nursing team in the operating room regarding the use of an electric scalpel. The suggestion is to provide permanent training on this subject, in order to guarantee quality and safety in the care of the surgical patient.



Figure 2. Word cloud.

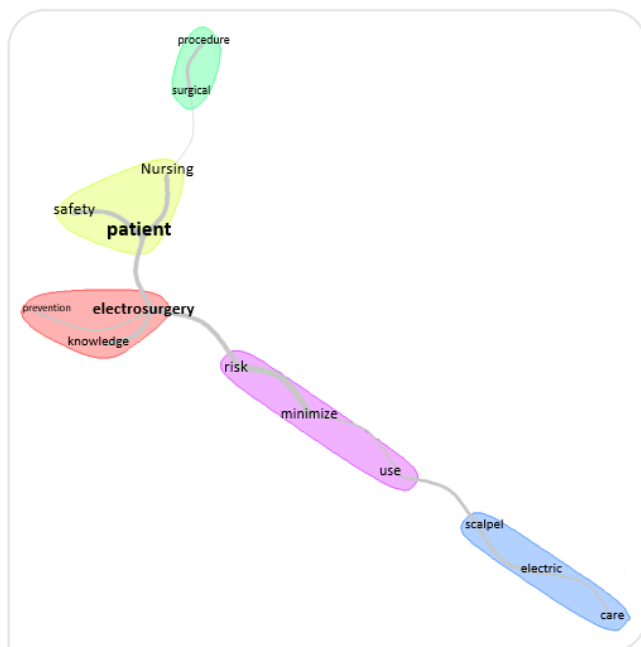


Figure 3. Similitude analysis of text corpus.

## DISCUSSION

In the analysis of the articles, the studies pointed out to the main risks and complications that may arise from the inadequate use of the electrocautery. The following risk factors stand out: time of exposure to electric current, use of the monopolar system, lack of communication between the members of the surgical staff, damage or inadequate use of the gas network, insufficient knowledge of professionals

about its functioning, necessary care regarding the safe handling of the electric scalpel<sup>13,14,16</sup>.

We identified that the patient is exposed to direct or indirect risks related to the surgery, as aforementioned. The time of exposure to the electric current or duration of the current has an influence on the effects of its passage through the human body; so, the longer the exposure, the higher the effects and risks of the injury<sup>12,17</sup>.

The main complications identified while summarizing the selected articles were burns, electric shocks and inhalation of surgical smoke, which lead to significant impairment for the patient. One of the studies emphasizes that the risk of injury is associated with the onset of burns resulting from three secondary causes: unintentional thermal trauma or inappropriate use of the active electrode; unwanted thermal trauma at the plate region; and the third cause may occur when the electric current takes an unwanted path through the patient's body, and not of the dispersive electrode<sup>14</sup>.

Shocks are complications in the electrosurgery unit commonly mistaken for burns, which occur when the surgeon holds the instrument on the tissue to be cauterized. In order to prevent the shock from the active electrode, it should be placed on the region of interest before its activation. Metallic materials and ornaments may potentialize the risk, increasing, in proportion, the occurrence of injuries<sup>1,12,14</sup>.

Researchers observed that the smoke dispersed in electrosurgery can contain toxic gas and steam, such as benzene, hydrogen cyanide, formaldehyde, bioaerosols, live and dead cellular material and virus. One of the recommendations to contain this damage is the use of smoke evacuation systems, so that the potential acute and chronic risks to health be reduced, both to patients and to the surgical staff<sup>1,17,18</sup>.

It is necessary to highlight that the operating room is a therapeutic environment that aims at promoting safety and well-being to the patient. It is the nurse's role to recognize and minimize the possible risks and prevent complications, planning and establishing nursing interventions to contribute with the patient's well-being and rehabilitation. To care for a patient in an operating room, it is mandatory that the perioperative nursing care can plan and implement actions, being categorized by a dynamic and systematic process<sup>14,19</sup>.

Concerning the analysis of the similitude tree, it was possible to consider, by linking the words, that the sense given to nursing care in the intraoperative period of an electrosurgery, aims at ensuring the patient's safety during the procedure, therefore reducing associated risks and complications; for that, some recommendations must be established.

In this sense, the nursing team is essential to perform the professional care based on scientific evidence that can meet the patient's needs. Besides, the nursing procedures carried out during the electrosurgery are divided in care addressed to the patient and the room during the perioperative period. The following stands out: verification of personal data, proper surgical procedure, indication, laboratory tests, vital signs in normal parameters, instructions and preparation of the patient in the preoperative period<sup>20</sup>.

Besides care related to transportation and reception of the patient in the OR, the use of aqueous antiseptic solutions instead of alcohol, the surgical positioning of the patient and the rational use of oxygen stand out. Besides, the patients with a pacemaker should be constantly monitored, because even though the devices are modern, they are still subjected to the interference of the electric current. Other types of care, such as monitoring the patient's parameters during the procedure, proper placement of the dispersion plate, follow-up in the post-anesthesia recovery room, monitoring and surgical dressings must be strictly followed<sup>11,19,21</sup>.

Electrosurgery is a routine practice in the OR. Therefore, nursing care in the perioperative environment is essential: preparation of the OR; adjustment of the focus and potency of the electric scalpel, so that there are no sparks; placement of surgical fields as far as possible from sources of heat; making sure that every outlet and device in the OR is functioning; providing the material to be used; making sure there is no accumulation of inflammable liquids in any cavity of the patient's body; the patient must not be in contact with metal objects; cables and electrodes must be verified before use to make sure the isolation is intact, among other conducts<sup>10,12</sup>.

In electrosurgery, nursing care is related to patient care itself; it is necessary to pay attention to maintain the equipment to be used, as well as the location where the surgical procedure will take place<sup>11,22</sup>.

As to the limitations of this study, there is the low level of scientific evidence between the sample of the articles and the scarce literature about the theme. Therefore, it is necessary to develop new scientific productions that can fill the gaps in the current literature, thus contributing with significant information to integrate new knowledge and favor qualified nursing care to the patient who undergoes electrosurgery.

However, despite the limitations, the findings in this study can be used both in the academic and professional level, in order to favor the acquisition of updated knowledge about nursing care related to the use of electrosurgery in the intra-operative period, besides indirectly promoting qualified and safe care to the surgical patient.

## CONCLUSION

This study enabled to identify scientific evidence about the necessary care regarding the use of electrosurgery and its associated risks. We analyzed publications that highlight the importance of the effective dialogue between the members of the multidisciplinary team for the development of prevention actions that can minimize the risks of procedures related to electrosurgery, including the constant monitoring of the safe equipment. Besides, we observed the need for self-training by using strategies of continuous and permanent education among the team professionals.

It is necessary to execute strategies that allow nursing professionals to acquire proper technical and scientific knowledge, as well as skills related to the safety of the patient who undergoes electrosurgery. The goal is to reduce the chances of adverse effects during the procedure, such as burns, shocks and inhalation of surgical smoke, which directly interfere in the physical integrity of the patients and professionals.

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