

Nursing interventions for preventing pressure ulcers in the perioperative period

Intervenções de enfermagem para prevenção de lesão por pressão no perioperatório

Intervenciones de enfermería para prevenir lesiones por presión en el periodo perioperatorio

Ludmila Oliveira Santana^{1*} , Sandra Maria Cezar Leal¹ , Denilse Damasceno Trevilato² ,
Camila Mendonça de Moraes³ , Galbia Nelma Silva Rodrigues Santos⁴ , Patrícia Treviso¹ 

ABSTRACT: Objective: To identify risk factors and nursing interventions for preventing pressure ulcers in perioperative patients. **Method:** This is an integrative literature review, for which data were collected in the following databases: Web of Science, Latin American and Caribbean Health Sciences Literature (LILACS), and National Library of Medicine (Medline). Data collection took place between July and August 2022. Original articles, without language restrictions and related to the research topic, were included. Thematic analysis was used for data processing. **Results:** Based on the analysis of the 16 publications that composed the corpus of this study, two categories were listed: a) risk factors for developing pressure ulcers in patients in the perioperative period; b) nursing interventions to prevent pressure ulcers. **Conclusion:** Risk factors for developing pressure ulcers are: being an older adult, malnourished or overweight, and comorbidities such as diabetes mellitus, vasculopathy, neuropathy, among others. Nursing interventions include: assessing risks using scales, such as ELPO and Munro, performing appropriate surgical positioning, protecting bone spurs, and planning unique patient care. **Keywords:** Pressure ulcer. Perioperative period. Nursing. Nursing care. Perioperative nursing.

RESUMO: Objetivo: Identificar fatores de risco e as intervenções de enfermagem para a prevenção de lesão por pressão em pacientes no perioperatório. **Método:** Trata-se de revisão integrativa, para a qual os dados foram coletados nas bases: *Web of Science*, Literatura Latino-americana e do Caribe em Ciências da Saúde (LILACS) e *National Library of Medicine* (Medline). Coleta realizada entre julho e agosto de 2022. Incluídos artigos originais, sem restrição de idioma, relacionados à temática de investigação. Utilizou-se análise temática para tratamento dos dados. **Resultados:** Com base na análise das 16 publicações que compuseram o *corpus* deste estudo, foram elencadas duas categorias: a) fatores de risco para o desenvolvimento de lesão por pressão em pacientes no período perioperatório; b) intervenções de enfermagem para prevenir lesões por pressão. **Conclusão:** São considerados fatores de risco para o desenvolvimento de lesão por pressão: ser idoso, apresentar desnutrição ou sobrepeso, comorbidades como diabetes *mellitus*, vasculopatia, neuropatia, entre outros. As intervenções de enfermagem compreendem: avaliar os riscos por meio de escalas como a Elpo e a Munro, realizar o posicionamento cirúrgico adequado, proteger saliências ósseas e planejar o cuidado singular ao paciente. **Palavras-chave:** Lesão por pressão. Período perioperatório. Enfermagem. Cuidados de enfermagem. Enfermagem perioperatória.

RESUMEN: Objetivo: identificar factores de riesgo e intervenciones de enfermería para prevenir lesiones por presión en pacientes perioperatorios. **Método:** se trata de una revisión integradora, para la cual se recolectaron datos en las siguientes bases de datos: *Web of Science*, Literatura Latinoamericana y del Caribe en Ciencias de la Salud (LILACS), Biblioteca Nacional de Medicina (MEDLINE). Recopilación realizada entre julio y agosto de 2022. Se incluyeron artículos originales, sin restricción de idioma, relacionados con el tema de investigación. Se utilizó el análisis temático para procesar los datos. **Resultados:** A partir del análisis de las 16 publicaciones que constituyeron el corpus de este estudio, se enumeraron dos categorías: a) factores de riesgo para el desarrollo de lesiones por presión en pacientes en el período perioperatorio; b) intervenciones de enfermería para prevenir las lesiones por presión. **Conclusión:** se consideran factores de riesgo para el desarrollo de lesiones por presión: ser anciano, estar desnutrido o con sobrepeso, comorbilidades como diabetes *mellitus*, vasculopatía, neuropatía, entre otras. Las intervenciones de enfermería incluyen: evaluación de riesgos mediante escalas como ELPO y Munro, realización de un posicionamiento quirúrgico adecuado, protección de protuberancias óseas y planificación de cuidados únicos al paciente. **Palabras clave:** Úlcera por presión. Periodo perioperatorio. Enfermería. Atención de enfermería. Enfermería perioperatoria.

¹Universidade do Vale do Rio dos Sinos – Porto Alegre (RS), Brazil.

²Universidade Federal do Rio Grande do Sul – Porto Alegre (RS), Brazil.

³Universidade Federal do Rio de Janeiro – Rio de Janeiro (RJ), Brazil.

⁴Universidade Federal do Maranhão – São Luís (MA), Brazil.

Corresponding author: Losantana1@outlook.com

Received: 07/07/2023. Approved: 11/28/2023.

<https://doi.org/10.5327/Z1414-4425202428919>



This is an open access article distributed under the terms of the Creative Commons Attribution 4.0 license.

INTRODUCTION

The operating room is a high-complexity hospital unit where anesthetic-surgical procedures are performed. It is also where specialized care is provided, with the handling of various equipment, inputs, and technological devices, thus requiring highly trained professionals¹.

It is a service with a dynamic scenario, peculiar in relation to health care, as it presupposes nursing professionals with extensive knowledge of the processes that involve the perioperative period (preoperative, intraoperative, and postoperative), anesthetic-surgical procedures, equipment and surgical instruments, and especially with regard to the safety and care that each stage of the perioperative period requires¹.

The safe surgery protocol consists of a set of measures to be adopted to reduce the risks existing in the surgical process. The implementation of this protocol corresponds to the second global challenge for patient safety, a campaign proposed by the World Health Organization (WHO) aimed at promoting improvements in surgical safety and reducing rates of deaths and complications in the perioperative period, and contributing to increasing safety in performing surgical procedures in the correct site and patient, by using the safe surgery checklist^{2,3}.

The guiding document of the safe surgery protocol points out the importance of performing the safe surgery checklist at three moments of the intraoperative period: at identification, or sign in (before induction of anesthesia); at confirmation, or time out (before skin incision and surgical pause); and at registration, or sign out (before the patient leaves the operating room)².

The application of the safe surgery checklist is essential to assess the risks and subsequently reduce the occurrence of adverse events and harm to the patient. It is worth noting that the implementation of the protocol requires training staff for its applicability⁴.

Among the various risks of adverse events that permeate the perioperative process we can list complications due to medications, electrocautery burns, falls, and the risk of pressure ulcer (PU), resulting from pressure alone or combined with friction and/or shear, intense pressure, and/or prolonged immobility during surgery^{5,6}.

Taking this into consideration, the following guiding question arises: what are the risk factors for the occurrence of pressure ulcers and the nursing interventions to prevent pressure ulcers in patients in the perioperative period?

OBJECTIVE

To identify risk factors and nursing interventions for preventing pressure ulcers in perioperative patients.

METHOD

This is an integrative literature review, a method whose aim is to gather and synthesize research results on a given topic or issue in an integrative and orderly manner, contributing to the deepening of knowledge of what has been investigated⁷.

For carrying out the review, the followed steps were taken: identification of the topic and selection of the research question; establishment of inclusion and exclusion criteria; definition of the information to be extracted from the selected studies; evaluation of included studies; interpretation of results; and presentation of the review^{7,8}.

The steps begin with the definition of the topic and the selection of the hypothesis and the research question. To elaborate the guiding question of this study, the PICO strategy was used, considering that it provides an accurate search for scientific evidence related to the object. PICO is an acronym in which the letter P (population) refers to the population, the letter I (interest) is related to the interest, and Co (context) refers to context. In this sense, the scope of the research was determined as follows: P for “surgical patient”; I for “pressure ulcer prevention”; and Co for “perioperative nursing.” Thus, the following guiding question was raised: what nursing interventions are used to prevent pressure ulcers in patients in the perioperative period?

The survey was carried out in July and August 2022 in the following databases: Web of Science, Latin American and Caribbean Health Sciences Literature (LILACS), and National Library of Medicine (Medline).

The descriptors used for the search were selected based on the vocabulary structured by the Health Sciences Descriptors (DeCS), in Portuguese and English languages: “*paciente/patient*”; “*período perioperatório/perioperative period*”; “*lesão por pressão/pressure ulcer*”; “*posicionamento do paciente/patient positioning*”; “*cuidados de enfermagem/nursing care*”; and “*enfermagem perioperatória/perioperative nursing*.”

The cross-referencing was carried out by advanced search, using the Boolean operator “AND.” Different search strategies were chosen due to the peculiarities of the

databases. Therefore, a time frame was defined as a filter, and only articles published in the last five years were selected.

The inclusion criteria for the identified texts were articles from original studies, without language restrictions, related to the research topic. Dissertations, monographs, theses, experience reports, editorials, and duplicate articles, which were considered only once, were excluded (Chart 1).

The articles selected for the integrative review were characterized according to the level of scientific evidence, according to the seven-level evidence classification system:

1. Level I – systematic reviews or meta-analysis of clinical trials;
2. Level II – evidence from at least one randomized clinical trial, as long as it is controlled and designed;
3. Level III – designed, but not randomized clinical trials;
4. Level IV – case-control and well-designed cohort studies;
5. Level V – systematic review of qualitative and descriptive research;
6. Level VI – single qualitative or descriptive study; and
7. Level VII – committee reports and expert opinions.

In this system, the evidence for levels I and II can be considered strong, while those for levels III to V are moderate and those for VI and VII are weak⁹.

To evaluate the data, the thematic analysis methodology proposed by Minayo was used, which comprises three stages:

- a) pre-analysis, which consists of the resumption of the initial objectives of the research, articulating them with the collected material; skimming, which is a greater appropriation of data through exhaustive reading;

careful organization of the material; and the definition of keywords or categories;

- b) exploration of the material, which consists of selecting, classifying, and aggregating the categories; and
- c) processing of the achieved results, in which the obtained data are correlated with the theory, aiming to complement the questioning of the study¹⁰.

It should be noted that the study followed the ethical precepts related to copyright.

RESULTS

The search resulted in 150 studies. Duplicate files were considered only once and, therefore, 16 studies were excluded in this process. A total of 134 articles were selected for reading the title and abstract, and after applying the inclusion and exclusion criteria, 40 publications were excluded. Subsequently, we fully read 94 articles and, of these, 78 publications were excluded, as they did not meet the research objective. Thus, 16 articles compose the sample of the present study. This process is illustrated in Figure 1.

The summary of the articles that compose the study sample is presented in Chart 2^{5,11-25}. We observed that most of the studies were published in Portuguese (13) and that publications that occurred in the years 2018 (4) and 2019 (4) predominated. Regarding the design, despite the variability in the selections, we perceived the predominance of descriptive (5), observational (4), and cross-sectional (3) studies.

Based on the analysis of the findings, two categories emerged:

Chart 1. Search expressions used to retrieve articles.

Search expression	Medline and LILACS	(Patients) AND (PerioperativePeriod) AND (PressureUlcer) AND (PatientPositioning) AND (NursingCare)
		(Patients) AND (PressureUlcer) AND (PatientPositioning) AND (NursingCare)
		(Patients) AND (PressureUlcer) AND (PatientPositioning) AND (PerioperativeNursing)
		(Patients) AND (PerioperativePeriod) AND (PressureUlcer) AND (PatientPositioning) AND (NursingCare) AND (PerioperativeNursing)
	Web of Science	((((TS=(Patients)) AND TS=(PerioperativePeriod)) AND TS=(PressureUlcer)) AND TS=(PatientPositioning)) AND TS=(NursingCare)
		((TS=(Patients)) AND TS=(PressureUlcer)) AND TS=(PatientPositioning)) AND TS=(NursingCare)
		((((TS=(Patients)) AND TS=(PressureUlcer)) AND TS=(PatientPositioning)) AND TS=(PerioperativeNursing))
		(((((TS=(Patients)) AND TS=(PerioperativePeriod)) AND TS=(PressureUlcer)) AND TS=(PatientPositioning)) AND TS=(NursingCare)) AND TS=(PerioperativeNursing))

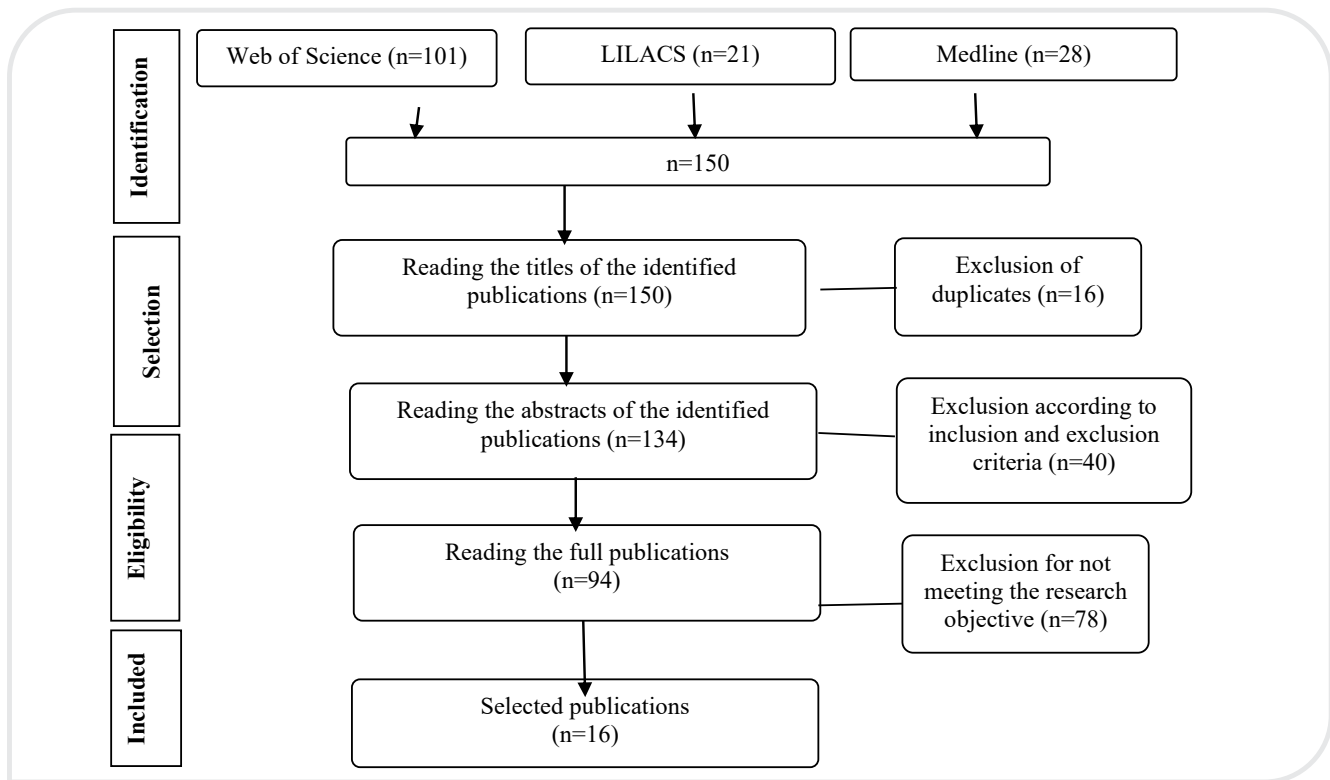


Figure 1. Flowchart of the selection process of the publications chosen for the integrative review.

- risk factors for developing pressure ulcers in the perioperative period;
- nursing interventions to prevent pressure ulcers in the perioperative period.

DISCUSSION

Risk factors for developing pressure ulcers in patients in the perioperative period

Pressure ulcer is characterized as a damage to the skin and/or underlying soft tissues, usually over a bony prominence or related to the use of medical devices or other instruments, affecting the patient due to prolonged immobility or intense pressure. The risk of developing pressure ulcers in surgical procedures is mainly due to the prolonged time that the patient remains in the same position during surgery²⁶.

The injury can be caused by the stretching or compression of the tissues, causing reduced blood flow and ischemia, either by friction and shear forces, or by prolonged pressure, which can lead to skin fissure, causing harm to the

patient. As for the duration of the injury, it may be temporary or permanent²⁷.

There are several risk factors related to the development of pressure ulcers during surgical procedures, which can be divided into intrinsic and extrinsic factors. According to the bibliographic findings, intrinsic factors include age, body weight, nutritional status, chronic diseases, and aspects related to skin morphology such as resistance and level of compaction of the stratum corneum. With regard to body mass, an index lower than 20 kg/m² or greater than 30 kg/m² may represent a risk for pressure ulcer, considering that thinness and overweight potentiate pressure, shear, and friction^{5,17}.

Comorbidities, such as deep vein thrombosis, neuropathies, or previously diagnosed pressure ulcers; malnutrition or obesity; diabetes mellitus; and other vascular diseases, are also considered risks for the development of injuries resulting from surgical positioning^{5,11,19}.

In a study published in 2020 with the objective of validating the Risk Assessment Scale for the Development of Injuries due to Surgical Positioning (*Escala de Avaliação de Risco para o Desenvolvimento de Lesões Decorrentes do Posicionamento Cirúrgico – ELPO*) for surgical positioning in a rehabilitation hospital, it was identified that 99 (93.4%) of the 106 patients

Chart 2. Summary of the articles included in this study.

Authors	Objective	Type of study and level of evidence	Outcome	Database
Angelo et al. ⁵	To verify the effectiveness of the skin injury prevention protocol by the survey of occurrences caused by surgical positioning in cancer patients undergoing robot-assisted urological surgeries and to demonstrate the importance of simulation as an educational strategy in the training of the nursing team.	Descriptive, retrospective, and quantitative study. Level IV.	The occurrence of skin injuries associated with surgical positioning of cancer patients undergoing robot-assisted urological surgeries was zero. This result proves the effectiveness of the institutional protocol, demonstrating the importance of simulation as an improvement educational strategy to ensure the success of robot-assisted surgical positioning.	LILACS
Trevilato et al. ¹¹	To determine the prevalence of patients at risk of developing injuries resulting from surgical positioning.	Cross-sectional study. Level II.	The use of ELPO allowed us to determine the prevalence of risk of injuries in patients undergoing elective procedures, identifying that the risk is more related to the surgical positioning than to the size of the surgery.	LILACS
Oliveira et al. ¹²	To evaluate the interface pressure of the support surfaces on bony prominences.	Randomized controlled study. Level II.	Foam-based materials, specifically D33 sealed foam, redistribute body interface pressure on operating tables more effectively. This result shows that the sacral and calcaneal regions suffered less pressure using the viscoelastic polymer.	LILACS
Bjorklund-Lima et al. ¹³	To test the validity and reliability of the results of the Nursing Outcomes Classification (NOC) and its clinical indicators for patients with the nursing diagnosis of risk of perioperative injury due to positioning.	Cohort study. Level IV.	A total of 50 patients were included; each of them underwent five distinct clinical evaluations, resulting in a total of 250 documented evaluations. The objective of this study was to test, in clinical practice, the applicability of NOC results to patients diagnosed with risk of injury due to perioperative positioning.	Web of Science
Xiong et al. ¹⁴	To investigate the incidence of intraoperative blanching erythema and pressure ulcers in patients undergoing digestive surgery and to explore potential risk factors.	Retrospective observational study. Level IV.	Of the 5,136 surgical cases, 134 (2.61%) had blanching erythema, 37 (0.72%) had intraoperative pressure ulcers, and 8 (0.16%) had pressure ulcers at 72 hours of follow-up.	Medline
Guo et al. ¹⁵	To identify the effects of an improving curvilinear supine position on the prevention of perioperative pressure ulcer (1-4) in surgical patients with a surgical duration of more than three hours in a hospital setting.	Prospective, randomized, controlled study. Level II.	The curvilinear supine position can significantly decrease the incidence of perioperative pressure ulcers in surgical patients with a surgery time of more than three hours. Considering these results, the use of the curvilinear supine position is recommended as an effective intervention for perioperative care, reducing perioperative pressure ulcers.	Web of Science
Bezerra et al. ¹⁶	To evaluate the occurrence of skin injuries in the intraoperative period resulting from surgical procedures performed in a large university hospital.	Cross-sectional study. Level IV.	Among the patients who presented skin injuries due to surgical positioning, most were classified by ELPO as high risk, which leads us to believe that this is an adequate scale for assessing the risk of skin injuries in surgical patients.	LILACS
Peixoto et al. ¹⁷	To evaluate and classify patients according to ELPO.	Observational, longitudinal, prospective and quantitative study. Level IV.	ELPO enables to identify the risk of injury early, subsidizing the adoption of preventive strategies to ensure the quality of perioperative care.	LILACS

Continue...

Chart 2. Continuation.

Authors	Objective	Type of study and level of evidence	Outcome	Database
Oliveira et al. ¹⁸	To evaluate the risk of developing perioperative injuries resulting from surgical positioning in patients undergoing elective surgeries.	Analytical and longitudinal study. Level IV.	It was possible to assess the risk for the development of perioperative injuries resulting from positioning, and 31.1% of the participants were evaluated as high risk. Age greater than 46 years and diagnosis of systemic arterial hypertension were associated with a higher risk of surgical injuries due to positioning.	Medline
Nascimento and Rodrigues ¹⁹	To validate ELPO in the stratification of the risk of developing injuries in perioperative patients of a rehabilitation hospital.	Analytical, longitudinal and quantitative research. Level III.	The validation of the scale is evidenced by the association of the scores with the occurrence of injuries; therefore, it is a valid and useful tool, and can guide the clinical practice of perioperative nurses in rehabilitation hospitals in reducing the risk of injuries resulting from surgical positioning.	Web of Science
Eberhardt et al. ²⁰	To evaluate the efficacy of multilayer silicone foam (intervention) compared to clear polyurethane film (control) in preventing heel pressure ulcers caused by surgical positioning of individuals undergoing elective surgeries.	Randomized clinical trial Level II.	The multilayer silicone foam (intervention) is more effective than clear polyurethane film (control) in preventing pressure ulcers caused by surgical positioning of individuals undergoing elective surgeries.	Web of Science
Sousa ²¹	To translate, adapt, and validate the Munro Scale to Brazilian patients in the perioperative period.	Methodological study. Level II.	The Munro Scale has been translated, adapted and validated, and it is a reliable instrument to measure the risk of developing pressure ulcers in the perioperative period.	Web of Science
Gonzaga et al. ²²	To identify if there are consecutive risks of surgical positioning through the application of ELPO.	Observational, descriptive and cross-sectional study. Level IV.	The ELPO scale was effective in preventing pressure ulcers in the preoperative and intraoperative periods in a hospital operating room in Northeastern Brazil, where the scale has not been previously used for the evaluation and prevention of injuries resulting from surgical positioning.	LILACS
Buso et al. ²³	To analyze the occurrence of pressure ulcers resulting from surgical positioning and the associated factors.	Observational and longitudinal study. Level IV.	The occurrence of pressure ulcers resulting from surgical positioning was 37.7%, and 81 (90.0%) patients had stage 1 pressure ulcer and the most frequent sites of occurrence of this type of injury were the sacral region (19; 13.9%) and the right (16; 11.7%) and left (13; 9.5%) calcaneal regions. Age (adults) and higher risk according to the score observed by ELPO were predictors for the occurrence of pressure ulcers.	Web of Science
Lei et al. ²⁴	To investigate the value of the Munro Pressure Ulcer Risk Assessment Scale in predicting acute pressure ulcers in patients under general anesthesia.	Case-control study Level IV.	The scale was used to assess the risk of pressure ulcers in patients under general anesthesia during and after surgery. There was little difference in the development of pressure ulcers between the control group and the experimental group in terms of risk factors. The results clarified that prolonged surgeries, duration of anesthesia, increased intraoperative and postoperative Munro scores, and coma were important independent risk factors for the occurrence of acute pressure ulcers after general anesthesia. The scale score proved to be effective in measuring the risk of postoperative pressure ulcers.	Web of Science
Santos et al. ²⁵	To assess the risk levels resulting from surgical positioning in patients undergoing cardiac surgery.	Observational, cross-sectional, documental, and descriptive study. Level IV.	According to the evaluation, carried out by using the ELPO scale, patients were at low risk of developing skin injury during cardiac surgeries, a result attributed to the use of a viscoelastic polymer mattress on the operating tables.	LILACS

followed up during the three surgical phases had no history of pressure ulcer, 57 (53.8%) without any type of physical limitation. When applying the ELPO 1 score, 45.3% of the patients showed low risk of developing injury and 54.7%, high risk. In addition, in ELPO 2, 46.2% were at low risk and the remaining 53.8% were at high risk. Thus, according to both versions of ELPO, there was a predominance of patients at high risk of developing injuries¹⁹.

One of the risk factors related to the development of pressure ulcers is systemic arterial hypertension, described in the selected publications as one of the main comorbidities related to this type of injury. With a prevalence of 37.5%, it is more common in women, regardless of age. The pathology stands out for affecting blood circulation and, therefore, the sensory and oxygenation capacities of organs and tissues; hence, it is a risk factor for pressure ulcers^{5,15-20}.

People with diabetes mellitus have a higher risk of developing pressure ulcers due to the vasculopathy that may be present, implying a decrease in blood flow, compromising tissue perfusion, increasing the chances of injuries resulting from perioperative positioning and hindering their healing^{5,18,19}.

The age criterion should also be considered, due to changes in the skin structure resulting from aging itself. In this sense, older patients present physiological changes, loss of skin elasticity and impairment of tissue nutrition and oxygenation as well as healing and cell replacement^{5,11,19}. Therefore, this population is proportionally more susceptible to the development of pressure ulcers, while younger individuals are less at risk. Furthermore, numerous surgical procedures performed on older patients are potentially more prone to complications, as they require longer times of surgery and/or hospitalization, such as coronary artery bypass grafting surgery^{18,22}.

Conversely, extrinsic factors are related to the type and duration of surgery and applied anesthesia; problems in controlling body temperature; surgical positions; and immobilization due to positioning. With regard to body temperature, the findings indicate that the ear temperature decreases uniformly after anesthesia, reaching an average of 35.1°C after four hours¹⁷. Similarly, a 2021 study indicates hypothermia in 26.8% of patients when entering the operating room and in 67.4% of cases at the end of the procedure. The mean ear temperature before anesthesia was 36.1°C, with a gradual reduction to 35.2°C, on average, after three hours of the procedure²³.

In addition, the use of epidural anesthesia may result in a higher probability of pressure ulcers related to general

anesthesia considering that, after surgery, the patient may still be under the effect of regional anesthetics, with the lower limbs having restricted movement. It is noteworthy that the effects of anesthetics and sedatives make sensitivity to pain and pressure unfeasible and, therefore, prevent the patient from feeling discomfort and changing position. Moreover, the pressure on the tissues is unregulated due to vasodilation, resulting in low tissue perfusion, ischemic rupture, and pressure ulcer. In addition, the lack of sensitivity, combined with immobilization for long periods, can result in pressure accumulation, anoxia, necrosis, and skin injuries^{18,25}.

According to the recommendations of the Association of PeriOperative Registered Nurses, among the good positioning practices is the performance of a preoperative evaluation of the patient to identify the risks of the occurrence of pressure ulcers and, thus, to outline a plan of care and interventions for the prevention of these injuries²⁸.

Interventions to prevent pressure ulcers

Patient care in the perioperative period is essential and requires the involvement of the entire surgical team in order to prevent complications and promote a brief anesthetic-surgical recovery.

In the previous category, the risks for developing pressure ulcers were described and, in this category, we list interventions to prevent such injuries. However, it is worth noting that assessing the risk of a patient developing injuries can also be listed as a strategy for injury prevention. To illustrate that, we can mention the use of the ELPO scale, which enables nurses to assess the risk of the patient developing pressure ulcers resulting from surgical positioning and, based on the singular assessment, to plan and implement protective measures such as the proper positioning of the patient and the use of protectors on bony prominences and devices for pressure relief^{6,16,17}.

Another scale that is also aimed at identifying risks for the development of injuries in patients undergoing surgical procedures is the Munro scale, which stands out for measuring risks in the three stages of the perioperative period (preoperative, intraoperative and postoperative), in which the level of risk is scored for each stage, obtaining a cumulative score at the end of the measurement. It is essential to analyze all perioperative stages, as each of them can contribute to the occurrence of pressure ulcers²⁵.

Other strategies to prevent the occurrence of PU in patients undergoing a surgical procedure involve: the proper

positioning of the patient for surgery and the use of devices to relieve pressure points such as pads, soft surfaces and supports, among others^{11,16-19,21,23,25}.

The choice of positioning is based on the surgeon's need for better visualization of the operative field, combined with the best possible body alignment, in order to reduce the pressure against the operating table and, consequently, the risk of injury^{5,11,18}. In this context, the careful selection of support surfaces can promote pressure distribution. Thus, in order to avoid the occurrence of injuries, these surfaces must be designed to manage the pressure on the tissues, reduce shear, and meet the specific needs of each patient¹⁹.

Devices for pressure reduction during the surgical procedure are classified as:

1. Static (gel or foam mattresses, accompanied by gel and viscoelastic coverings, or air or fluid mattresses, with the use of foam and gel pillows); and
2. Dynamic (micropulse air mattress).

However, not all hospitals have these devices, and there is a predominance of the use of traditional mattresses and pads made of fabric, foam or cotton¹⁶.

The use of viscoelastic mattresses can be an alternative to reduce the risks of surgical positioning. Conversely, in the absence of appropriate surfaces, patients will be subject to unequal pressure and shear, thus increasing the risk of developing pressure ulcers²⁵. In addition to the choice and use of devices to protect bone spurs, the use of mattresses, pillows, and pads, the sheets should be inspected in order to avoid the formation of folds and creases that may result in increased pressure and subsequent injuries²³.

According to the literature, when support surfaces are not used intraoperatively, the risk of pressure ulcers resulting from surgical positioning is increased^{19,22}. However, the review of the selected articles indicates that they are still little used for economic reasons^{11,16-18,23}.

Thus, in an unequal scenario between different health-care institutions, and the lack of supplies necessary for the prevention of injuries in the perioperative period, the use of traditional foam mattresses and pads is evidenced, leaving nursing professionals with the responsibility of trying to prevent pressure ulcers through surgical positioning, distributing pressure, and using the best support surfaces available in the hospital context^{17,19,23}.

It should be noted that every surgical procedure carries a risk of developing pressure ulcers, mainly because it results from a combination of intrinsic and extrinsic factors to the

surgical procedure. Thus, factors — such as the presence of comorbidities, poor nutrition, age aspects, types of anesthetics used, patient temperature, and positioning — interact and influence the occurrence of injuries. Within this context, the use of the aforementioned scales observed in the literature is essential for the identification and measurement of perioperative risks, in order to enable the promotion of nursing interventions that can prevent the development of pressure ulcers²³. The nursing professional is the protagonist agent in the identification of these factors, in proposing prevention measures, and in the communication of the perioperative team.

The presented results allow us to deepen the knowledge of the study topic, providing support for nursing care in the perioperative period, focusing on the risks of pressure ulcers, and striving for safe, quality, and evidence-based care. Simultaneously, we expect that the research can contribute to the understanding of risk factors related to the formation of pressure ulcers and interventions for the prevention of injuries during the operative period.

As a limitation, we mention the scarcity of studies with a high level of evidence that address nursing care in the prevention of risks of developing pressure ulcers in the intraoperative period. It is worth highlighting that the conclusions presented in this study cannot be generalized, as it lists level IV-evidence investigations, which are considered less robust and lack methodological strategies that contemplate the synthesis of the best scientific evidence.

CONCLUSIONS

Our results indicate the following risk factors for developing pressure ulcers: being an older adult, malnutrition and obesity, presenting comorbidities such as diabetes mellitus, vasculopathy, neuropathy, among others.

The nursing interventions to prevent the occurrence of pressure ulcers include: the use of scales that enable the assessment of risks for the development of injuries, such as the ELPO scale and the Munro scale, allowing nurses, based on the assessment of each patient's risks, to develop an individualized care plan. Furthermore, other strategies for the prevention of PU were identified, such as performing the appropriate surgical positioning; protect bone spurs using appropriate devices and surfaces that reduce friction, shear, and pressure of body points; and to evaluate the use of the devices to prevent

the formation of creases and folds that may cause harm to the patient.

It is important for perioperative professionals to know the risks for the development of PU in patients undergoing surgical procedures as well as to know and apply interventions to prevent these injuries. To this end, we emphasize the importance of continuing education in healthcare services, involving the entire surgical team in a multidisciplinary way.

New studies should be carried out with a methodology that enables to evaluate the risk of pressure ulcers in the intraoperative period, analyzing different surgical positioning and describing prevention measures.

FUNDING

None.

CONFLICT OF INTERESTS

The authors declare no conflicts of interest.

AUTHORS' CONTRIBUTIONS

LOS: Project administration, Formal analysis, Conceptualization, Data curation, Investigation, Methodology, Resources, Writing — original draft, Writing — review & editing, Software, Supervision, Validation, Visualization. SMCL: Formal analysis, Writing — review & editing, Validation, Visualization. DDT: Formal analysis, Writing — review & editing, Validation, Visualization. CMM: Formal analysis, Writing — review & editing, Validation, Visualization. GNSRS: Writing — review & editing, Validation, Visualization. PT: Project administration, Formal analysis, Conceptualization, Methodology, Writing — review & editing, Supervision, Validation, Visualization.

REFERENCES

1. Medeiros AC, Araújo-Filho I. Centro cirúrgico e cirurgia segura. *J Surg Cl Res.* 2017;8(1):77-105. <https://doi.org/10.20398/jscr.v8i1.13037>
2. Brasil. Ministério da Saúde. Protocolo para cirurgia segura [Internet]. Brasília: Ministério da Saúde; 2013 [cited on July 10, 2022]. Available at: <https://proqualis.net/sites/proqualis.net/files/0000024279j862R.pdf>
3. Governo do Distrito Federal. Secretaria de Estado de Saúde. Subsecretaria de Atenção Integral à Saúde. Comissão Permanente de Protocolos de Atenção à Saúde. Segurança do paciente: cirurgia segura [Internet]. Brasília: Governo do Distrito Federal; 2019 [cited on July 10, 2022]. Available at: <https://www.saude.df.gov.br/documentos/37101/51535/02.++Protocolo+de+Seguranca+do+Paciente++Cirurgia+Segura.pdf>
4. Neiva MJLM, Sousa MM, Silva MFN, Vieira JL, Melo MF, Reis EM, et al. Nursing care in prevention to pressure injuries in hospitalized patients. *Braz J Hea Rev.* 2019;2(5):4336-44. <https://doi.org/10.34119/bjhrv2n5-036>
5. Angelo CS, Pachioni CFM, Joaquim EHG, Silva EAL, Santos GG, Bonfim IM, et al. Effectiveness of the protocol for the prevention of skin lesions in robotic urological surgeries. *Rev SOBECC.* 2017;22(3):152-60. <https://doi.org/10.5327/Z1414-4425201700030006>
6. Lopes CMM, Haas VJ, Dantas RAS, Oliveira CG, Galvão CM. Assessment scale of risk for surgical positioning injuries. *Rev Lat Am Enfermagem.* 2016;24:e2704. <https://doi.org/10.1590/1518-8345-0644.2704>
7. Mendes KDS, Silveira RCCP, Galvão CM. Integrative literature review: a research method to incorporate evidence in health care and nursing. *Texto & Contexto Enferm.* 2008;17(4):758-64. <https://doi.org/10.1590/S0104-07072008000400018>
8. Brasil. Ministério da Saúde. Secretaria de Ciência, Tecnologia, Inovação e Insumos Estratégicos em Saúde. Departamento de Gestão e Incorporação de Tecnologias em Saúde. Diretrizes metodológicas: elaboração de revisão sistemática e meta-análise de ensaios clínicos randomizados [Internet]. Brasília: Ministério da Saúde; 2012 [cited on July 10, 2022]. Available at: https://rebrats.saude.gov.br/phocadownload/diretrizes/20210622_Diretriz_Revisao_Sistematica_2021.pdf
9. Melnyk BM, Fineout-Overholt E. Evidence based practice in nursing & healthcare: a guide to best practice. 3rd ed. Philadelphia: WoltersKluwer Health; 2015.
10. Minayo MCS. O desafio do conhecimento: pesquisa qualitativa em saúde. 12^a ed. São Paulo: Hucitec; 2010.
11. Trevilato DD, Melo TC, Fagundes MABG, Caregnato RCA. Posicionamento cirúrgico: prevalência de risco de lesões em pacientes cirúrgicos. *Rev SOBECC.* 2018;23(3):124-9. <https://doi.org/10.5327/Z1414-4425201800030003>
12. Oliveira KF, Pires PS, De-Mattia AL, Barichello E, Galvão CM, Araújo CA, et al. Influence of support surfaces on the distribution of body interface pressure in surgical positioning. *Rev Lat Am Enfermagem.* 2018;26:e3083. <https://doi.org/10.1590/1518-8345.2692.3083>
13. Bjorklund-Lima L, Müller-Staub M, Cardozo MC, Bernardes DS, Rabelo-Silva ER. Clinical indicators of nursing outcomes classification for patient with risk for perioperative positioning injury: a cohort

- study. *J Clin Nurs*. 2019;28(23-24):4367-78. <https://doi.org/10.1111/jocn.15019>
14. Xiong C, Gao X, Ma Q, Yang Y, Wang Z, Yu W, et al. Risk factors for intraoperative pressure injuries in patients undergoing digestive surgery: a retrospective study. *J Clin Nurs*. 2019;28(7-8):1148-55. <https://doi.org/10.1111/jocn.14712>
 15. Guo Y, Zhao K, Zhao T, Li Y, Yu Y, Kuang W. The effectiveness of curvilinear supine position on the incidence of pressure injuries and interface pressure among surgical patients. *J Tissue Viability*. 2019;28(2):81-6. <https://doi.org/10.1016/j.jtv.2019.02.005>
 16. Bezerra MBG, Galvão MCB, Vieira JCM, Lopes MGS, Cavalcanti ATA, Gomes ET. Factors associated with skin lesions resulting during the intraoperative period. *Rev SOBECC*. 2019;24(2):76-84. <https://doi.org/10.5327/Z1414-4425201900020005>
 17. Peixoto CA, Ferreira MBG, Felix MMS, Pires PS, Barichello E, Barbosa MH. Risk assessment for perioperative pressure injuries. *Rev Lat Am Enfermagem*. 2019;27:e3117. <https://doi.org/10.1590/1518-8345.2677-3117>
 18. Oliveira HMBS, Santos AMJF, Madeira MZA, Andrade EMLR, Silva GRF. Risk assessment for the development of perioperative lesions due to surgical positioning. *Rev Gaúcha Enferm*. 2019;40(spe):e20180114. <https://doi.org/10.1590/1983-1447.2019.20180114>
 19. Nascimento FCL, Rodrigues MCS. Risk for surgical positioning injuries: scale validation in a rehabilitation hospital. *Rev Lat Am Enfermagem*. 2020;28:e3261. <https://doi.org/10.1590/1518-8345.2912.3261>
 20. Eberhardt TD, Lima SBS, Soares RSA, Silveira LBTD, Pozzebon BR, Reis CR, et al. Prevention of pressure injury in the operating room: Heels operating room pressure injury trial. *Int Wound J*. 2021;18(3):359-66. <https://doi.org/10.1111/iwj.13538>
 21. Sousa CS. Tradução, adaptação cultural e validação da *Munro Scale* para português do Brasil. *REME Rev Min Enferm*. 2021;25:e1404. <http://dx.doi.org/10.5935/1415-2762-20210052>
 22. Gonzaga MJD, Gomes DF, Alves LC, Marques MF, Menezes RSP. Aplicação da escala em avaliação de risco para o desenvolvimento de lesões decorrentes do posicionamento cirúrgico do paciente. *Rev SOBECC*. 2021;26(2):99-106. <https://doi.org/10.5327/Z1414-4425202100020006>
 23. Buso FDS, Ferreira MBG, Felix MMS, Galvão CM, Barichello E, Barbosa MH. Pressure injury related to surgical positioning and associated factors. *Acta Paul Enferm*. 2021;34:eAPE00642. <https://doi.org/10.37689/acta-ape/2021A000642>
 24. Lei L, Zhou T, Xu X, Wang L. Munro pressure ulcer risk assessment scale in adult patients undergoing general anesthesia in the operating room. *J Healthc Eng*. 2022;2022:4157803. <https://doi.org/10.1155/2022/4157803>
 25. Santos LS, Silva MG, Souza DN, Tartaglia A. Risk evaluation for injuries due to surgical positioning in cardiac surgery. *Rev SOBECC*. 2022;27:E2227765. <https://doi.org/10.5327/Z1414-4425202227765>
 26. Associação Brasileira de Estomaterapia. Associação Brasileira de Enfermagem em Dermatologia. Consenso NPUAP 2016: classificação das lesões por pressão. Adaptada culturalmente para o Brasil [Internet]. 2016 [cited on July 18, 2022]. Available at: https://sobest.com.br/wp-content/uploads/2020/10/CONSENSO-NPUAP-2016_traducao-SOBEST-SOBENDE.pdf
 27. Burlingame BL Guideline implementation: positioning the patient. *AORN J*. 2017;106(3):227-37. <https://doi.org/10.1016/j.aorn.2017.07.010>
 28. Association of Perioperative Registered Nurses. Guidelines for perioperative practice. AORN: Canada; 2017.