Pressure ulcer risk due to surgical positioning in adults and older adults

Risco de lesão por pressão decorrente do posicionamento cirúrgico em adultos e idosos

Riesgo de úlceras por presión debido al posicionamiento quirúrgico en adultos y adultos mayores

Laura Maria Donofre[1], Rhavenna Thais Silva Oliveira[1], Karime Rodrigues Emilio de Oliveira[1]*, Silvia Helena Salvador Ramos[2], Carolina da Silva Ferreira[1], Marla Andréia Garcia de Ávila[1]

ABSTRACT: Objective: To compare the risk of adult and older adult patients undergoing elective surgeries of developing pressure ulcer due to surgical positioning. **Methods:** This is a cross-sectional, comparative, prospective study with a quantitative approach and nonprobability integral sampling, composed of individuals undergoing elective surgeries in a tertiary hospital. Data were collected in the immediate preoperative and intraoperative periods. For statistical analysis, the χ^2 test, Student's *t*-test, and univariate logistic regression were carried out, considering $p<0.05$ as a significance level. **Results:** The mean score in the Risk Assessment Scale for the Development of Injuries due to Surgical Positioning among the 143 participants was 16.08 in adults and 18.62 in older adults (p=0.0003); 11.69% of adults and 34.85% of older people (p=0.0009) were at high risk for pressure ulcers. For each additional year in the age of older adults, the chance of presenting a high-risk classification score for developing pressure ulcer increases by 1.035 times (p=0.0215). **Conclusion:** Older adults present a higher risk of developing pressure ulcers due to surgical positioning when compared to adults.

Keywords: Pressure ulcer. Patient positioning. Perioperative nursing. Risk assessment. Cross-sectional studies.

RESUMO: Objetivo: Comparar o risco de pacientes adultos e idosos submetidos a cirurgias eletivas desenvolverem lesões por pressão decorrentes do posicionamento cirúrgico. **Métodos:** Estudo transversal, comparativo, prospectivo, com abordagem quantitativa e amostra não probabilística intencional, composta por indivíduos submetidos a cirurgias eletivas em um hospital terciário. A coleta de dados foi realizada no período pré-operatório imediato e intraoperatório. Para análise estatística, foi realizado o teste χ^2, o teste *t* de Student e regressão logística univariada, considerando-se $p<0,05$ como nível de significância. **Resultados:** O escore médio da escala de avaliação de risco para o desenvolvimento de lesões decorrentes do posicionamento cirúrgico entre os 143 participantes foi de 16,08 nos adultos e 18,62 nos idosos (p=0,0003); 11,69% dos adultos e 34,85% dos idosos (p=0,0009) apresentaram alto risco para lesões por pressão. Para cada ano adicional na idade dos idosos, a chance de apresentar um escore de classificação de alto risco para o desenvolvimento de LP aumenta em 1,035 vezes (p=0,0215). **Conclusão:** Os idosos apresentam maior risco de desenvolver lesões por pressão resultantes do posicionamento cirúrgico quando comparados aos adultos.

Palavras-chave: Lesão por pressão. Posicionamento do paciente. Enfermagem perioperatória. Medição de risco. Estudos transversais.

RESUMEN: Objetivo: Comparar el riesgo de que pacientes adultos y adultos mayores sometidos a cirugías electivas desarrollen úlceras por presión debido al posicionamiento quirúrgico. **Métodos:** Estudio transversal, comparativo, prospectivo, con enfoque cuantitativo y muestra no probabilística intencional, compuesta por individuos sometidos a cirugías electivas en un hospital terciario. La recolección de datos se realizó en el período preoperatorio inmediato e intraoperatorio. Para el análisis estadístico, se realizaron la prueba χ^2, la prueba t de *Student* y la regresión logística univariada, considerando $p<0,05$ como nivel de significancia. **Resultados:** La puntuación media de la escala de evaluación de riesgo para el desarrollo de lesiones por posicionamiento quirúrgico entre los 143 participantes fue de 16,08 en adultos y 18,62 en adultos mayores (p=0,0003); el 11,69% de los adultos y el 34,85% de los adultos

[1]Universidade Estadual Paulista "Julio de Mesquita Filho", Department of Nursing, School of Medicine of Botucatu – Botucatu (SP), Brazil.
[2]Universidade Estadual Paulista "Julio de Mesquita Filho", School of Medicine of Botucatu, Hospital das Clínicas – Botucatu (SP), Brazil.
*Corresponding author: karime.rodrigues@unesp.br
Received: 02/06/2025. Approved: 04/10/2025
https://doi.org/10.5327/Z1414-44251032

mayores (p=0,0009) presentaron alto riesgo de desarrollar úlceras por presión. Por cada año adicional de edad en los adultos mayores, la probabilidad de presentar una puntuación de clasificación de alto riesgo para el desarrollo de úlceras por presión aumenta en 1,035 veces (p=0,0215). **Conclusión:** Los adultos mayores presentan un mayor riesgo de desarrollar úlceras por presión debido al posicionamiento quirúrgico en comparación con los adultos.
Palabras clave: Úlcera por presión. Posicionamiento del paciente. Enfermería perioperatoria. Medición de riesgo. Estudios transversales.

INTRODUCTION

Pressure ulcers (PU) are defined as damage caused to the skin and/or underlying tissue or structure, usually over a bony prominence, which results from isolated pressure at the site, combined with friction and/or skin shear[1], and PU resulting from surgical positioning are those that develop on the skin within 72 hours after the end of the surgical procedure[2]. It is estimated that about 50% of patients who undergo elective surgeries present a high risk of developing them during the perioperative period[3].

The most significant risk factors for the emergence of PU due to surgical positioning, according to a meta-analysis on 1,903 patients, are: having cardiovascular, respiratory diseases, or diabetes mellitus, presenting low hemoglobin levels, and prolonged surgical time[4].

In order to assist nurses in identifying patients at risk of developing PU and to improve the quality of health care[5,6], the Risk Assessment Scale for the Development of Injuries due to Surgical Positioning, called ELPO, was developed and validated in Brazil[5].

Authors of a study conducted in Brazil on 239 surgical patients aged between 19 and 83 years showed that 37.7% of the sample developed PU in the postoperative period and that patients classified as high risk in the final ELPO score had 1.79 times more chance for the occurrence of this outcome (p=0.04)[3].

It is known that the aging process causes physiological changes in the integumentary system, favoring the emergence of skin lesions resulting from changes in the process of tissue repair, reduction of the inflammatory response, increase in capillary fragility, presence of chronic diseases, and mobility restriction[7,8].

The presence of PU is an indicator of the quality of care provided by the healthcare service[9]. Identifying the risk of developing these injuries, in different age groups, can support critical thinking, planning of care, and the adoption of appropriate care for specific populations, thus justifying this study.

OBJECTIVE

To compare the risk of adult and older adult patients undergoing elective surgeries of developing pressure ulcer due to surgical positioning.

METHODS

This is a cross-sectional, comparative, prospective study with a quantitative approach, carried out in an inland municipality located in the state of São Paulo, Brazil. The study is derived from a larger study titled *Impacto do SSKIN bundle-BR na incidência de lesão por pressão medida pelo indicador subepidermal moisture (SEM)* ["Impact of SSKIN bundle-BR on the incidence of pressure ulcer measured by the subepidermal moisture (SEM) indicator"]. Data were collected during 30 days, in May and June 2024. The study scenario comprises a tertiary hospital linked to the Brazilian Unified Health System (SUS), which has 664 active beds and where 11,052 surgeries were performed in 2022 in the following medical specialties: heart surgery, general surgery, pediatric, plastic, thoracic, vascular, trauma surgeries, gastrointestinal surgery, and neurosurgery. The surgical center of the study site has 13 operating rooms and performs surgeries of grades I, II, III, and IV, classified as elective, urgency, and emergency.

The study has a nonprobability integral sampling. Individuals of both sexes, aged 18 years or older, submitted to elective surgical procedures of different surgical specialties, on working days, from 7 a.m. to 7 p.m., hospitalized in surgical wards and neurological, cardiac, and surgical intensive care units (ICU), were selected.

The following patients were excluded: those who avoided or gave up undergoing the procedure, canceled surgeries, classified as urgency/emergency, performed prior to the scheduled day, patient transfer to another hospital, patients in isolation, with care for contact, not found in bed in the immediate preoperative period, and who presented PU prior to the surgical procedure (according to the visual evaluation

of the skin performed by the researchers based on the recommendations of the National Pressure Ulcer Advisory Panel [NPUAP][7] for PU classification according to stages I, II, III, IV, unstageable injury, and deep tissue injury).

Data collection was carried out in two stages using a form prepared by the authors. The first stage took place during the immediate preoperative period and the following variables were collected: biological sex, age, proposed surgery (name described by the surgeon), and surgical specialty. Older adults were considered as patients aged 60 years or over.

In the second stage, in the intraoperative period, information regarding the surgical procedure was collected through another form created by the researchers to obtain the following variables: surgical time (in minutes), need for administration of vasoactive drugs (yes or no, and name of the drug when necessary), classification of the American Society of Anesthesiologists (ASA)[10], described by the anesthesiologist (I, II, III, IV, V, VI, and E). The risk assessment of PU development was performed by applying the ELPO scale, which has seven items (surgical position, surgical time, type of anesthesia, support surface, limb position, patients' comorbidities and age), each with a 5-point Likert scale, with a total score ranging from 7 to 35 points, indicating that the higher the total score, the higher the patients' risk of developing PU due to surgical positioning. The score from 7 to 19 points represents low risk and the score from 20 to 35 points, high risk[5].

The gathered information was entered into a Microsoft Excel® spreadsheet and the data were analyzed by descriptive statistics, with the demonstration of frequencies and percentages for the qualitative variables, and mean, median, standard deviation, and minimum and maximum values for the quantitative variables.

To verify the association of the outcome and explanatory variables of interest, the Fisher's exact or χ^2 test was applied when necessary. To compare the quantitative variable, the normality test was performed. As the data presented symmetric distribution, the Student's *t*-test was used. A univariate logistic regression was also performed to verify the influence of age on the outcome, considering $p<0.05$ as a significance level. The statistical program used for data analysis was the SAS System, Statistical Analysis System version 5.9.4.

The research followed the ethical standards of research involving human beings, through Resolution No. 466/2012 of the Brazilian National Health Council (CNS), and obtained approval by the Research Ethics Committee (REC) of the university institution of the study, under Opinion No 6.728.898, and by the National Commission of Ethics in Research (CONEP), under Opinion No 6.779.162.

Individuals who, after the explanation of the study by the researchers, agreed to participate in the research, were requested to sign an Informed Consent Form. The freedom of participation was ensured, as well as the right of the participant to withdraw at any time of the research, without damage or any embarrassment. The participants' anonymity was preserved.

RESULTS

In the data collection period, 224 elective surgeries were scheduled for adults and older adults, 81 participants were excluded by eligibility criteria, and the final sample consisted of 143 patients aged 18 to 93 years, the median being 59 years. Regarding surgical specialties, 28 (19.58%) orthopedic, 23 (16.08%) gastric, 22 (15.38%) urological, 16 (11.19%) gynecological, 14 (9.79%) heart, 13 (9.09%) otolaryngology, 11 (7.69%) plastic, 10 (6.99) neurological, and 6 (18.88%) other specialties were performed. The most frequently performed surgical procedures were: 8 (11.4%) total thyroidectomy, 7 (10%) femur fracture surgical treatments, 7 (10%) myocardial revascularization, 7 (10%) hysterectomies, and 5 (7.1%) hip arthroplasties.

A total of 77 (53.85%) adults and 66 (46.15%) older adults participated in the study. In the group of adults, the mean age was 43.88±11.68 and among the older adults, 68.33±6.36 ($p<0.0001$). Among adults, 51 (66.23%) were women and 26 (33.77%) were men, and among older people, 37 (56.06%) were women and 29 (43.94%) were men ($p=0.2126$).

The ASA classification in adults was: 10 (12.99%) ASA 1; 31 (40.26%) ASA 2; 35 (45.45%) ASA 3; and 1 (1.30%) ASA 4. Among the older adults, the classification was: 29 (43.94%) ASA 2; 32 (48.48%) ASA 3; and 5 (7.58%) ASA 4 ($p=0.0032$). Both adults and older adults had a higher frequency of ASA 3 classification. The administration of vasoactive drugs during the surgical procedure was evidenced in 14 (18.18%) adults and 18 (27.27%) older adults ($p=0.1935$).

Adults and older adults presented similar frequency for risks in six out of seven domains of the scale: supine position, surgical time over two hours and up to four hours, general anesthesia, viscoelastic surgical table mattress + viscoelastic pads as the support surface used, <90º opening of the lower limbs, and classification as "no comorbidities" were the most frequent items in both groups.

Surgical position ($p=0.0317$) and comorbidities ($p=0.0050$) were the only domains that showed statistically significant

difference in the comparison of the groups, and in the comparison of the items of these domains, lithotomy position (p=0.02) and diabetes mellitus (p=0.001) were more frequent among older people.

The mean total score on the overall ELPO scale was higher in older adults (p=0.0003), as well as the high-risk classification, which was more frequent in this group (p=0.0009), evidencing that the item "age" was relevant for the increase in the overall risk score (Table 1).

By univariate logistic regression, which estimates the possibility of an event occurrence, we found that, by evaluating the ELPO scale, for each additional year in the age of older adults, the chance of this population presenting a high-risk classification score for the development of PU increased by 1.035 times (p=0.0215) (Table 2).

DISCUSSION

When compared to adults, older people who underwent elective surgeries presented a higher risk of developing pressure ulcers due to surgical positioning. The identification of risk by age group is necessary, considering that the body changes caused by aging involve cumulative biochemical and molecular modifications, resulting in greater progression of tissue damage[11].

Authors of a study carried out on 45 surgical patients aged 22 to 88 years showed a higher risk for PU in individuals aged over 46 years (24.4%) when compared to younger patients (6.7%), with a statistically significant association between high risk and age[12]. Researchers of another study, conducted specifically with older adult surgical patients (n=138), showed a higher incidence of high risk (52.24%) for PU in the older individuals compared to adults[11], corroborating our results.

The ELPO domains that showed positive association for increased risk among older adults were: supine (p=0.00) and Trendelenburg (p=0.00) positions; surgical time over four up to six hours (p=0.01); local anesthesia induction (p=0.00) and sedation (p=0.00); <90° opening of the upper limbs (p=0.03) and knees >90° or lower limbs >90° (p=0.03); diabetes mellitus (p=0.03); and patients' age between 70 and 79 years (p=0.00). Limb position, comorbidities, and patients' age demonstrated strong predictive power in relation to high risk[11]. In our findings, we verified a significant difference only in diabetes mellitus.

Authors of an observational study on 135 patients (52.59% adults and 47.41% older adults) who underwent elective surgeries identified that being older raised the probability of being classified as high risk for PU by 9.47 times. The association between being an older adult and having diabetes mellitus was statistically significant for increased risk (p<0.05)[13], considering that the older adult population is mostly prone to presenting chronic noncommunicable diseases[14], such as diabetes mellitus, which is capable of causing specific damage to blood circulation, damaging wound healing[7].

It should be noted that the identification of the risk, especially of older adult surgical patients developing PU, as observed in our results, should be followed by the elaboration of an efficient care plan to avoid the occurrence of this outcome[15].

Surgical patient care requires a multiprofessional and integrated approach of the healthcare team, and it is essential that nurses carry out thorough anamnesis and physical examination considering the specificities of each age group and identifying the factors that may contribute to the emergence of PU[14].

The National Patient Safety Program (*Programa Nacional de Segurança do Paciente*) established that healthcare services should include PU prevention measures resulting from inadequate health care[16], including those that may develop due to prolonged surgical positioning and time[14], and the nursing team is a protagonist in the elaboration of protocols and implementation of these strategies[15].

In order for nursing professionals to act effectively on this prevention, they must know the main related risk factors. However, authors of a study conducted on 70 professionals in the area identified that only 22.7% of nurses, 7.1% of nursing technicians, and 0.0% of nursing undergraduates were able to achieve the recommended percentage of right answers (≥90%) in the *Pieper's Pressure Ulcer Knowledge Test*, which evaluates healthcare professionals' knowledge of prevention, staging, and description of PU. Thus, it is necessary that continuing education actions be carried out to strengthen and update professionals on the best scientific evidence for risk identification and prevention of PU[17].

The application of predictive PU risk scales in surgical patients, such as ELPO, followed by efficient interventions, may lead to a decrease in the incidence of PU[6].

As in this study we showed that older adults who underwent elective surgical procedures have a higher risk of developing PU compared to adults, new studies should be carried out to identify the accuracy between risk and incidence of PU resulting from surgical positioning in the older adult population.

Table 1. Comparison between adults and older adults regarding the domains of the ELPO scale. Botucatu (SP), Brazil, 2024.

Variables	n (%) Adults	n (%) Older adults	p-value
Surgical position			**0.0317**
Supine	54 (70.13)	44 (66.67)	0.7919
Lateral	11 (14.29)	7 (10.61)	0.6829
Trendelenburg	1 (1.30)	0 (0)	-
Prone	6 (7.79)	1 (1.52)	0.1784
Lithotomy	5 (6.49)	14 (21.21)	**0.02**
Surgical time			0.8580
Up to 1 hour	3 (3.90)	3 (4.55)	
Over 1 up to 2 hours	16 (20.78)	16 (24.24)	
Over 2 up to 4 hours	42 (54.55)	32 (48.48)	
Over 4 up to 6 hours	11 (14.29)	8 (12.12)	
Over 6 hours	5 (6.49)	7 (10.61)	
Type of anesthesia			0.0602
Local	12 (15.58)	14 (21.21)	
General	51 (66.23)	31 (46.97)	
General and local	14 (18.18)	21 (31.82)	
Support surface			0.9521
Viscoelastic surgical table mattress + viscoelastic pads	60 (77.92)	52 (78.79)	
Foam surgical table mattress (conventional) + viscoelastic pads	1 (1.30)	1 (1.52)	
Foam surgical table mattress (conventional) + foam pads	0 (0)	1 (1.52)	
Foam surgical table mattress (conventional) + cotton pads	15 (19.48)	12 (18.18)	
No use of support surface or rigid support without padding or narrow ledges	1 (1.30)	0 (0)	
Limb position			0.3062
Anatomical position	16 (20.78)	6 (9.09)	
<90º opening of the lower limbs	48 (62.34)	45 (68.18)	
<90º knee elevation and <90º lower limb opening or neck without sternal alignment	7 (9.09)	10 (15.15)	
<90º knee elevation and >90º lower limb opening	4 (5.19)	4 (6.06)	
>90º knee elevation and >90º lower limb opening or >90º upper limb opening	2 (2.60)	1 (1.52)	
Comorbidities			**0.0050**
No comorbidities	45 (58.44)	30 (45.45)	0.1669
Vascular disease	7 (9.09)	4 (6.06)	0.7165
Diabetes mellitus	4 (5.19)	17 (25.76)	**0.001**
Obesity or malnutrition	21 (27.27)	14 (21.21)	0.5188
Presence of PU or previous peripheral neuropathy or deep vein thrombosis	0 (0)	1 (1.52)	-
Age (years)*			
Between 18 and 39	25 (32.47)	0 (0)	
Between 40 and 59	52 (67.53)	0 (0)	
Between 60 and 69	0 (0)	42 (63.64)	
Between 70 and 79	0 (0)	20 (30.30)	
80 or over	0 (0)	4 (6.06)	
General ELPO score**	**16.08 (3.11)**	**18.62 (2.93)**	**0.0003**
Categorized ELPO score			**0.0009**
ELPO 7 to 19 (low risk)	68 (88.31%)	43 (65.15%)	
ELPO 20 to 35 (high risk)	9 (11.69%)	23 (34.85%)	

*The age item was presented in a descriptive way; **mean and standard deviation.

Table 2. Influence of the age variable on the high-risk score according to the ELPO scale. Botucatu (SP), Brazil, 2024.

Variables	Estimate	OR	CI	p-value
Age	0.0342	1.035	(1.005–1.065)	**0.0215**

OR: odds ratio; CI: confidence interval.

As limitations of the study, we highlight the adoption of a nonprobability sampling and the fact that the research was carried out in a single scenario.

CONCLUSION

In this study, we evidenced that, based on the evaluation of the ELPO scale, older people who underwent elective surgeries present a higher risk of developing pressure ulcers due to surgical positioning when compared to adults. Each additional year in the age of older adults increased by 1.035 times the chance of this population presenting a high risk for developing PU.

Thus, with this study, we contribute to the advancement in nursing practice, as the identification of high risk in specific populations is the first strategy for clinical decision, highlighting the importance of developing and implementing prevention protocols for older adult patients in the perioperative context.

FUNDING

National Council for Scientific and Technological Development (CNPq), Process No. 403545/2024-2; and Coordination for the Improvement of Higher Education Personnel (CAPES) – Financing Code 001.

CONFLICT OF INTERESTS

The authors declare there is no conflict of interests.

AUTHORS' CONTRIBUTION

LMD: Conceptualization, Data curation, Formal analysis, Writing – original draft, Writing – review & editing. RTSO: Conceptualization, Data curation, Formal analysis, Writing – original draft, Writing – review & editing. KREO: Data curation, Formal analysis, Writing – original draft, Writing – review & editing. SHSR: Data curation, Formal analysis, Writing – original draft, Writing – review & editing. CSF: Data curation, Formal analysis, Writing – original draft, Writing – review & editing. MAGA: Conceptualization, Data curation, Formal analysis, Writing – original draft, Writing – review & editing.

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