Risk of injury by surgical positioning in the elderly: prevalence and associated factors

Risco de lesão por posicionamento cirúrgico em idosos: prevalência e fatores associados

Riesgo de lesión por posicionamiento quirúrgico en el anciano: prevalencia y factores asociados

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ABSTRACT: Objective: To estimate the prevalence of injury risk due to positioning in the elderly and to analyze associations with variables of the Risk Assessment Scale for the Development of Injuries Due to Surgical Positioning (ELPO). **Method:** Cross-sectional study, carried out in the surgical block of a teaching hospital, with a sample of 138 elderly people undergoing elective surgery in the trans-operative period. The ELPO scale was applied after anesthetic induction, and next the data were analyzed to estimate the prevalence of risk. **Results:** The prevalence of high risk of injury in the elderly was 57.24%, associated with the types of position – supine and Trendelenburg; local anesthetic induction and sedation; and patient aged between 70 and 79 years. The categories "limb position", "comorbidities" and "patient age" showed strong predictive power in relation to high risk. **Conclusions:** The prevalence of high risk of positioning injury among the elderly is related to age and the presence of comorbidities, highlighting the importance of rethinking care for the elderly, in the perioperative period, to achieve quality care with attention to surgical positioning.
Keywords: Perioperative nursing. Elderly. Patient positioning. Prevalence.

RESUMO: Objetivo: Estimar a prevalência do risco de lesão por posicionamento em idosos e analisar associações com variáveis da Escala de Avaliação de Risco para o Desenvolvimento de Lesões Decorrentes do Posicionamento Cirúrgico (ELPO). **Método:** Estudo transversal, realizado no bloco cirúrgico de um hospital de ensino, com amostra de 138 idosos submetidos a cirurgias eletivas no período transoperatório. A escala ELPO foi aplicada após indução anestésica e, em seguida, os dados foram analisados estimando a prevalência para risco. **Resultados:** A prevalência do alto risco de lesão em idosos foi de 57,24%, associada aos tipos de posição supina e Trendelenburg; indução anestésica local e sedação; e idade do paciente entre 70 a 79 anos. As categorias "posição dos membros", "comorbidades" e "idade do paciente" demonstraram forte poder preditivo em relação ao alto risco. **Conclusão:** A prevalência de alto risco de lesão por posicionamento entre idosos está relacionada à idade e presença de comorbidades, destacando-se a importância de repensar a assistência ao idoso, no momento perioperatório, para o alcance da qualidade do cuidado com atenção ao posicionamento cirúrgico.
Palavras-chave: Enfermagem perioperatória. Idoso. Posicionamento do paciente. Prevalência.

RESUMEN: Objetivo: Estimar la prevalencia de riesgo de lesión por posicionamiento en ancianos y analizar asociaciones con variables de la Escala de Evaluación de Riesgos para el Desarrollo de Lesiones por Posicionamiento Quirúrgico (ELPO). **Método:** Estudio transversal, realizado en el bloque quirúrgico de un hospital universitario, con una muestra de 138 ancianos sometidos a cirugías electivas en el período transoperatorio. Se aplicó la escala ELPO después de la inducción anestésica, luego se analizaron los datos, estimando la prevalencia de riesgo. **Resultados:** La prevalencia de alto riesgo de lesión en adultos mayores fue 57,24%, asociada a las posiciones supina y Trendelenburg; inducción anestésica local y sedación; edad del paciente entre 70 y 79 años. Las categorías "posición de las extremidades", "comorbilidades" y "edad del paciente" mostraron un fuerte poder predictivo en relación con el alto riesgo. **Conclusión:** La prevalencia de alto riesgo de lesión por posicionamiento entre los ancianos está relacionada con la edad y la presencia de comorbilidades, destacando la importancia de repensar la atención al anciano, en el período perioperatorio, para lograr una atención de calidad con atención al posicionamiento quirúrgicos.
Palabras clave: Enfermería perioperatoria. Anciano. Posicionamiento del paciente. Prevalencia.

INTRODUCTION

Surgical positioning injury is an indicator of the quality of care provided to the patient and its consequence is related to higher costs, either by prolonging hospitalization or by the need for inputs in the treatment of the adverse event[1]. Surgical positioning aims at adequate surgical visualization; however, complications resulting from surgical positioning are frequent, especially pressure injuries (PI), but they can also result in musculoskeletal pain, joint dislocation, peripheral nerve damage, and cardiovascular and pulmonary impairment[2].

The occurrence of perioperative positioning injuries (PPIs) varies in international and national studies. A retrospective study carried out in Seoul, South Korea, showed an incidence of PPI of 3.7% in the elderly[3]. A national study in a teaching hospital in the state of Minas Gerais, with 206 patients, reported 77.3% of elderly with stage I PPI[4].

In this context, the health of the elderly is a research priority, given the global aging of populations. The elderly is the population segment most exposed to chronic non-communicable diseases and conditions, according to a report by the World Health Organization (WHO), and disabilities resulting from diseases worldwide will be treated through surgical procedures[5].

Along the aging process there is a decline in all organs' functions, although the magnitude of such decline varies between organs and from individual to individual. Thus, physiological changes are visible in all systems of the human body and are aggravated according to the surgical intervention that the elderly person will endure[6].

Thus, comprehensive care for the elderly undergoing surgery requires an important analysis of their functional capacity and intrinsic risks at this stage of life, in order to reduce losses in this group resulting from positioning[6]. To assess these risks, there is a Risk Assessment Scale for the Development of Injuries Due to Surgical Positioning (ELPO), an instrument developed and validated by Lopes, composed of the variables: duration of surgery, type of anesthesia, surgical positioning, support surface, positioning of upper and lower limbs, comorbidities, and age of the patient[7].

It is recommended that the preexisting conditions of the elderly and the changes related to aging, be known by the perioperative team, highlighting changes in the musculoskeletal, integumentary, vascular, and neurological systems[1,6,7]. Therefore, it is necessary to be familiar with the elderly and their restrictions concerning the surgical position that will be adopted to ensure qualified assistance.

Based on this, the present research is justified since it is necessary to expand the knowledge of predictors related to surgical positioning injury in the elderly, in order to contribute to the prevention of this event that directly interferes with the quality of life after surgery and, above all, to foster the planning of quality perioperative nursing care for the elderly.

OBJECTIVE

To estimate the prevalence of positioning injury risk in older adults undergoing elective surgery and analyze associations with the ELPO variables.

METHOD

This is a descriptive, cross-sectional, quantitative study carried out in the surgical block of a university hospital located in the city of João Pessoa, state of Paraíba (PB), Brazil.

The sample was calculated based on the total number of individuals undergoing elective surgery at the University Hospital of the Federal University of Paraíba, from November 2019 to February 2020, totaling 182 individuals. A 95% confidence interval (CI) and a 4% margin of error were assumed. The sample consisted of 138 older adults, selected through non-probabilistic convenience sampling.

Inclusion criteria were age 60 years or older, both sexes, and patients undergoing elective procedures in any specialty. Likewise, unconscious patients and those with cognitive alterations that made verbal reporting difficult were excluded from the study.

Two instruments were used for data collection: a structured script for sociodemographic characterization and the ELPO. The ELPO was filled out at the time the elderly person was positioned on the operating table and the anesthetic induction process began.

To measure the risk of injury due to surgical positioning, the ELPO scale was used, a Likert-type instrument whose scores range from 7 to 35 points. The ELPO indicates that the higher the score, the higher the risk of developing injuries due to surgical positioning[7].

The raw score is recommended when using the scale, however, a cut-off point is suggested for classifying patient risk. Thus, the high risk is considered when the patient reaches a score ≥20, and the low risk when the sum reaches a score between 7 and 9. It is highly recommended to apply the ELPO at the time the patient is positioned on the operating table[4,7].

The data collected were recorded in a Microsoft Excel spreadsheet, Windows 2007 version. Subsequently, they were exported and analyzed in the R software, version 3.6.0, for statistical analysis[8].

The prevalence ratio (PR) for high risk of positioning injury associated with the investigated variables was estimated considering a 95% CI. Sequentially, the Weight of Evidence (WoE) method and the Information Value (IV) were used to ascertain the strength of the relationship between the independent variables and the dependent variable (risk stratification). The IV can be classified as <0.02: the predictor is not useful (very weak); 0.02 to <0.10: the predictor has a weak relationship; 0.10 to 0.30: the predictor has a medium strength relationship; and >0.30: the predictor has a strong relationship with the odds ratio (OR)[9].

The WoE considers the predictive power of an independent variable in relation to the dependent variable. As the response variable is binary, logistic regression was applied, which indicates the influence of each variable on the probability of high risk in relation to low risk. In independent and categorical variables, WoE values were used to replace the raw categories of the scale in the adjustment of the model[9].

The elderly were invited to participate in the research and received explanations to understand the objectives and their consequences, presented in the Informed Consent Form (ICF), prepared in accordance with the norms of Resolution No. 466/2012 of the National Health Council. Upon acceptance to participate in the study, sociodemographic data were collected.

The research was cleared by the Research Ethics Committee of the Health Sciences Center of the Federal University of Paraíba (UFPB), with opinion No. 2,190,153 and CAAE: 67103917.6.0000.5188.

RESULTS

The 138 older adults, who composed the study sample, were mainly females (63.7%), with an average age between 70 and 79 years (48.75%). Of the total patients, 26.1% were illiterate and 26% had studied for 12 or more years.

Regarding the risk of developing injuries due to surgical positioning, according to ELPO, there was a greater incidence (57.24%) of high risk in the elderly, as shown in Table 1.

Table 2 shows the data referring to the PR of high risk in relation to the ELPO categories. It was found that in the category "type of surgical position", the positions that obtained a PR above 1.00 were "supine" 1.79 (1.45-2.21) and "Trendelenburg" 1.90 (1.53–2.37), which indicates a positive association between exposure to the factor and the high-risk outcome.

Regarding the variable "time of surgery", the interval "more than 4h up to 6h" 1.48 (1.10–1.99) obtained PR estimates above 1.00, indicating a positive association with high risk. In the "type of anesthesia" category, "local" 1.88 (1.60–2.22) and "sedation" 1.70 (1.26–2.29) also with PR higher than 1.00, in agreement with the test, indicate association between the factors and the outcome.

In the condition "limb position", the categories "upper limb opening <90°" 1.81 (1.55–2.11) and "knees >90° or lower limbs >90°" 1.39 (1.01–1.92) were associated with the outcome. Regarding the comorbidities evaluated, the category "diabetes mellitus" 1.49 (1.08–2.04) indicated an association with the outcome. In the variable "age", the categories "60–69" and "70–79" years, according to the estimates and the test, have an association with the outcome. The other categories were not associated with high risk in this study.

The variables that have little predictive power, according to IV and not considering the categories that had zero in the distribution of events and non-events, are "sex" and "support surface". The categories "limb position", "comorbidities" and "patient's age" have strong predictive power (Figure 1).

According to the coefficient estimates, considering the variables that were significant in the model, the variables "type of surgical position", "type of anesthesia", "limb position", "comorbidities", and "patient age" influenced the high risk of PPI, by 2.0%, 3.5%, 2.7%, 5.8%, and 3.3%, respectively (Table 3).

Evaluating the strength of the relationship between variables and risk stratification, using the WoE method, we note that only the variables "type of surgical position", "type of anesthesia", and "time of surgery" showed a strong relationship with risk stratification. Thus, we have "scores", in which the higher the score or percentage, the greater the probability of a result equal to one, that is, a greater probability of high risk.

Table 1. Distribution of the risk of developing injuries according to Risk Assessment Scale for the Development of Injuries Due to Surgical Positioning. João Pessoa (PB), Brazil, 2020.

ELPO score	N	%
High risk	80	57.2
Low risk	58	42.8
Total	138	100

ELPO: Risk Assessment Scale for the Development of Injuries Due to Surgical Positioning.

Table 2. Prevalence ratio for high risk of surgical positioning injury in the elderly (n=138), associated with the variables of the Risk Assessment Scale for the Development of Injuries Due to Surgical Positioning. João Pessoa (PB), Brazil, 2020.

| Variables	PR (95%CI)	p-value
Type of surgical position		
Supine	1.79 (1.45–2.21)	0.00
Lateral	0.69 (0.23–2.04)	0.43
Trendelenburg	1.90 (1.53–2.37)	0.00
Prone	0.79 (0.43–1.45)	0.40
Lithotomic	0.51 (0.38–0.69)	0.00
Surgical time		
More than 1 h up to 2 h	1.79 (1.54–2.08)	0.08
More than 2 h up to 4 h	1.33 (1.00–1.77)	0.08
More than 4 h up to 6 h	1.48 (1.10–1.99)	0.01
More than 6 h	0.28 (0.14–0.54)	0.00
Type of anesthesia		
Local	1.88 (1.60–2.22)	0.00
Sedation	1.70 (1.26–2.29)	0.00
Regional	0.86 (0.61–1.23)	0.40
General	0.00 (0.00–0.00)	0.00
General+regional	0.11 (0.02–0.70)	0.00
Support surface		
Viscoelastic+viscoelastic cushions	1.25 (0.72–2.20)	0.38
Foam+viscoelastic cushions	0.86 (0.50–1.48)	0.56
Foam+foam cushions	0.00 (0.00–0.00)	0.42
Position of limbs		
Anatomical position	1.76 (1.52–2.03)	1.00
Opening <90° of upper limbs	1.81 (1.55–2.11)	0.03
Knees <90° and lower limbs <90º	1.77 (1.52–2.05)	0.50
Knees >90° or lower limbs >90°	1.39 (1.01–1.92)	0.03
Knees >90° and lower limbs >90°	0.53 (0.35–0.80)	0.00
Comorbidities		
No comorbidities	1.77 (1.52–2.05)	0.50
Vascular disease	1.80 (1.54–2.09)	0.07
Diabetes mellitus	1.49 (1.08–2.04)	0.01
Obesity or malnutrition	0.34 (0.06–1.98)	0.09
Ulcer, neuropathy or deep vein thrombosis	0.60 (0.41–0.86)	0.00
Patient's age (years)		
60–69	1.31 (0.94–1.82)	0.17
70–79	1.53 (1.16–2.02)	0.00
80 or more	0.57 (0.41–0.78)	0.00
Sex		
Male	0.81 (0.59–1.11)	0.17
Female	1.24 (0.90–1.70)	0.17
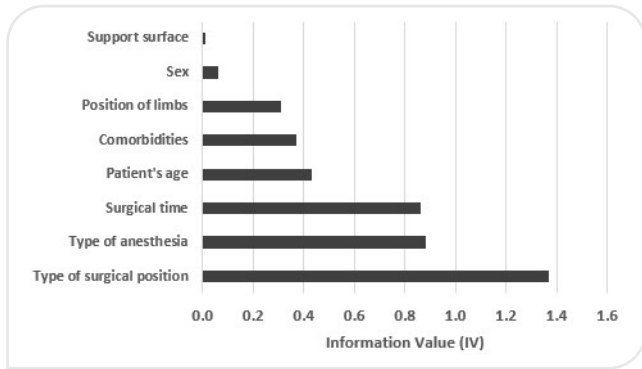
Figure 1. Relation of independent variables with risk stratification based on the weight of evidence method.

Table 3. Results of the logistic regression with the results variable "risk".

Variables	Coefficients	p-value
Type of surgical position	0.020	0.0008
Type of anesthesia	0.035	0.0000
Position of limbs	0.027	0.0062
Comorbidities	0.058	0.0001
Patient's age	0.033	0.0008

DISCUSSION

In this investigation, there was the majority of female elderly (63.7%), corroborated by a study carried out in a university hospital in Norway, in which of 696 elderly people who underwent surgical procedures, 76% were female[10]. The female gender is the majority in the population profile. Estimates indicate that women live, on average, five to seven years longer than men, generating greater demand for health services and greater notification[11].

Regarding the average age, the age group between 70 and 79 years (48.75%) predominated. Similar data was found in other national studies, in which there is a higher concentration of elderly people classified as younger[1,12]. This result indicates a recent demographic transition in Brazil, compared to European countries.

Most of the elderly were illiterate, and research indicates that low schooling can negatively influence the perception of the elderly regarding the understanding of health promotion concepts. A prospective study conducted with 48 patients undergoing inguinal hernia surgery, laparoscopic cholecystectomy, and thyroidectomy in the Department of General Surgery at Khoo Teck Puat Hospital in Singapore between 2017 and 2018 showed that, among those evaluated, the elderly with little schooling had less understanding of the surgical procedure and indication for surgery[13].

The risk of surgical positioning injury among the elderly in this study was high (57.24%), which differs from an observational study conducted in a large philanthropic hospital located in the city of Salvador. Of the total 258 patients undergoing cardiac surgery, 143 were elderly, and the ELPO score revealed 90.7% of patients at low risk of developing PPI. However, the data in both studies showed that the age group category analyzed in isolation is not predictive to assess the risk of PPI, since there is a need to investigate the influence of other variables[14].

When associating the prevalence of high risk of injury by surgical positioning in the elderly and the variables of the ELPO scale, it was observed that the type of surgical position was a significant event, with emphasis on the surgical positions supine and Trendelenburg. Research shows that losses occur when the patient is positioned dorsally and remains for a prolonged time in this position, which causes pressure on the bony prominences reducing circulation and increasing the risks[1,9]. In the Trendelenburg position, the patient's lower limbs are higher than the shoulders and head, offering a greater risk of complications such as hypotension[7].

The positive relationship between surgical position and risk of PPI observed in the present study confirms the results of a study conducted in Ohio with 222 patients, with mean age of 57.5 years. Of the total, 85.1% were submitted to the supine position. The high number of patients placed in this position correlated with incidents of PPI in the sacral region, coccygeal, buttocks, and heel[15]. This data reveals the need to evaluate changes related to aging, such as in the skin, due to the reduction of elastic and collagen fibers, which makes it thinner and more susceptible to injury. In this context, one of the strategies that help prevent injuries in these places is the use of protective devices below the head and knees and suspension equipment on the heels[9,14].

Another study with adult patients, of both sexes, undergoing elective surgeries, mentions that surgery time longer than two hours increases the risk of tissue injury from 35 to 50%[4]. In the elderly, the risk of tissue damage is significant since surgeries lasting more than two hours can affect the oxygenation of compressed tissues and favor the apparition of lesions[4,6].

The association between risk and types of anesthesia showed a positive relationship for the categories "local" and "sedation". A research conducted with elderly individuals in China showed transient paraplegia caused by local anesthetic drugs, resulting in an incidence rate of 0.6% for this complication[16]. In the same way, a study of elderly individuals over

70 years of age in Japan showed patients with severe bradycardia who required administration of atropine sulfate (0.5 mg), and patients who became hypotensive and required administration of a vasopressor during sedation[17].

Limb positioning is highlighted as a risk factor in a study that refers to the patient remaining in the same position and not manipulating the limbs during the surgical procedure, resulting in the formation of thrombi in the vessels and the maintenance of pressure points under tissues, increasing the risk of skin injury[1,4]. In the elderly, prolonged immobility increases the risk of PPI due to systemic changes inherent to aging[6].

A study conducted in a medium-sized hospital in a city in the interior of São Paulo, with 14 elderly individuals, recommended keeping the arms at an angle of less than 90° to the body and the hands in pronation. Such guidelines promote the reduction of PPI as the stretching of muscles and compression of arteries[17].

Comorbidities associated with age also interfere with the risk of patients developing PPI during anesthetic surgical procedures due to impaired tissue perfusion, which hinders healing and results in tissue damage due to the difficulty in replacing endothelial cells[1,4,6]. An analytical and longitudinal study encompassing 26.7% of elderly patients showed statistically significant associations between the risk of developing injuries due to surgical positioning and age (p=0.013), and systemic arterial hypertension (p=0.039)[18].

Identified as one of the most prevalent comorbidities, diabetes mellitus, a disease related to circulation, may be related to peripheral vasoconstriction, a condition in which the diameter of blood vessels decreases, increasing the risk of stroke and heart disease[4,7]. The literature points out that this risk factor deserves attention and has been described in research on pressure injury, especially in the elderly[6,17]. Likewise, a study carried out in a hospital in the United States between 2011 and 2016 obtained a high percentage of PPI in elderly patients with impaired circulation caused by the characteristics of aging or associated chronic morbidities[19].

In this study, the categories "limb position", "comorbidities", and "patient age" stood out, presenting strong predictive power in relation to the high risk of PPI. Research has shown that the elderly have an increased chance of developing PPI by 46% due to surgical positioning, and those with comorbidities, when subjected to prolonged periods of limb immobilization, may suffer tissue ischemia events leading to anoxia and necrosis[1].

Faced with the challenges of providing good quality care to the elderly surgical patient, the multiprofessional team is responsible for the integrated work to overcome these obstacles[20]. It is particularly up to nurses to evaluate the available evidence to better serve the patient.

Thus, it is essential to evaluate the changes related to aging and the risk factors related to trans-operative positioning, in order to adopt effective measures that can contribute to the prompt recovery of surgical patients, as well as to ensure the quality of care for the elderly.

The limitation of the present study was the time of evaluation restricted to the moment of the surgical act. Although it allowed the achievement of the proposed objectives, it did not enable the evaluation of the PPIs in the postoperative period. In addition, this is a population from a specific location, which does not allow the generalization of data, but allows its replication in other scenarios.

It is important to develop longitudinal research that evaluates injuries resulting from surgical positioning in the elderly. Furthermore, the research can contribute to supporting care practice through the elaboration of care protocols for the prevention of positioning injuries in elderly patients.

CONCLUSIONS

The results of this study made it possible to estimate the prevalence of risk for the occurrence of surgical positioning injury, indicating the vulnerability of the elderly to develop this type of harm. In addition, it is evident that variables such as comorbidities, aspects related to surgery such as surgical position, emphasizing supine and Trendelenburg, the type of anesthesia, and the time of surgery need to be considered during nursing care in the operating room, especially in the elderly.

In this sense, surgical positioning is an essential part of perioperative nursing care. The systematic nursing process should underpin interventions aimed at preventing risks related to surgical positioning in older adults. Thus, the evaluation of nurses based on the steps of the nursing process and using standardized classification systems, allows the evaluation of the clinical outcomes of the care *continuum*, which facilitates the dynamics of perioperative work.

As a final remark, regarding the practical repercussions, the study indicates the need to rethink the

operating room environment in order to acquire materials and equipment that prevent injury resulting from surgical positioning, contributing to maintaining the safety of the elderly.

CONFLICT OF INTERESTS

The authors declare no conflicts of interest.

AUTHORS' CONTRIBUTION

FALVN: Data curation, Investigation, Methodology, Project administration, Resources, Writing – original draft, Writing – review & editing. RAF: Investigation, Visualization. MAPL: Data curation, Methodology. RRP: Data curation, Visualization. NPRL: Data curation, Validation. GKGDB: Data curation, Methodology, Software, Validation. MLFP: Project administration, Data curation, Formal analysis, Writing – review & editing.

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