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Identifying internal and external factors of pressure injury in surgical patients: Literature Review

Identificación de factores internos y externos de la lesión por presión en pacientes quirúrgicos: Revisión de la literatura

Luh Titi Handayani[1a*], Nursalam[2b], Rondhianto[3c], Jumanto[4d], Susi Wahyuning Asih[5e]

SUMMARY

Introduction: *Pressure injury (PI) induced by surgical interventions usually occurs within a few hours after surgery. This comprehensive study aims to identify internal and external factors of PI in surgical patients.* **Methods:** *The research used descriptive data from all the papers searched in ScienceDirect, CINAHL, PubMed, and Google Scholar databases, ensuring a thorough investigation. The review results were analyzed and grouped into intrinsic and extrinsic factors for pressure injury in patients with surgery.* **Results***: Results of identification of internal factors including reduced mobility, age, body mass index (BMI), albumin, comorbidities, blood pressure, nutritional status, and body temperature, while external factors include length of operation, medical equipment and medication, nurse knowledge, temperature, surfaces or interface pressure, friction and shear, positioning, blood loss, and tools.* **Conclusion:** *The study findings suggest that internal and external factors can predict pressure injuries in surgical patients. The analysis indicates that the predictor variables for surgical patients' pressure injuries are often under control. More studies are required to validate the PI prediction model, but the comprehensive nature of this study provides a solid foundation for future research.*

Keywords: *Risk factors, surgery, pressure injury.*

RESUMEN

Introducción: *Las lesiones por presión inducidas por intervenciones quirúrgicas suelen ocurrir unas horas después de la cirugía. Este estudio tiene como objetivo identificar los factores internos y externos que predicen las lesiones por presión en pacientes quirúrgicos.* **Métodos:** *Se extrajeron datos descriptivos de todos los artículos. Se buscaron artículos en las bases de datos ScienceDirect, CINAHL, PubMed y Google Scholar. Los resultados de la revisión se analizaron*

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ORCID ID: 0000-0002-2521-9426[1a]
ORCID ID: 0000-0002-9052-6983[2a]
ORCID ID: 0000-0002-8487-069X[3b]
ORCID ID: 0000-0001-9204-7954[4c]
ORCID ID: 0000-0002-6884-2795[5d]

[a]Doctoral student of nursing program, Faculty of Nursing, Airlangga University – Indonesia.
[a]Department of Medical and Surgery, Faculty of Health Science, University of Muhammadiyah Jember – Indonesia.

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[b]Department of Medical and Surgery, Faculty of Nursing, Airlangga University -Indonesia.
[c]Department of Medical and Surgery, Faculty of Nursing, Jember University – Indonesia.
[d]Department of Medical and Surgery, RSUD Dr. Soebandi – Indonesia.
[e]Department of Health Environment, Faculty of Health Science, University of Muhammadiyah Jember – Indonesia.

*Corresponding Author: Luh Titi Handayani
E-mail: luh.titi.handayani-2023@fkp.unair.ac.id

y agruparon en dos, a saber, factores intrínsecos y extrínsecos para las lesiones por presión en pacientes con cirugía. **Resultados:** *Resultados de la identificación de factores internos que incluyen movilidad reducida, edad, índice de masa corporal (IMC), albúmina, comorbilidades, presión arterial, estado nutricional y temperatura corporal, mientras que los factores externos incluyen: duración de la operación, equipo médico y medicación, conocimiento de enfermería, temperatura, superficies o presión de interfaz, fricción y cizallamiento, posicionamiento, pérdida de sangre y herramientas.* **Conclusión:** *Los hallazgos del estudio sugieren que los factores internos y externos pueden predecir las lesiones por presión en pacientes quirúrgicos. El análisis indica que las variables predictoras de las lesiones por presión de los pacientes quirúrgicos a menudo están bajo control. Para validar el modelo de predicción de las lesiones por presión, se requieren más estudios.*

Palabras clave: *Factores de riesgo, Cirugía, Lesión por presión.*

INTRODUCTION

Pressure injuries (PI) are caused by persistent pressure on a region, damaging the skin and underlying tissue. PI is more common in surgical patients due to a variety of circumstances, including extended periods of immobility, variables connected to surgery or anesthesia, and pre-existing medical disorders. Patients are more vulnerable to the side effects of anesthesia and surgery, particularly those who are having lengthy operations. This issue arises from prolonged pressure application to the skin and underlying tissue, which disrupts blood flow and causes damage and necrosis of the tissue (1). Another crucial factor is the sharing and friction processes. Despite fluctuations in occurrence and an imprecise number, PI remains a prevalent issue in hospitals. Injuries that develop a few hours to six days following surgery are known as intraoperative pressure injuries. Sores called decubitus that appear a few hours to six days following surgery are called intraoperative PI.

Within 48 to 72 hours following surgery, surgical PI develops, according to the Association of Perioperative Registered Nurses (AORN) (2). Intraoperative PI is more common than inpatient PI, with an incidence range of 4.7 % to 66 % (3). Surgical patients have a PI incidence that ranges from 12 to 66 % (4). PI is one of the main postoperative issues linked to an extended hospital stay. PI following surgery occurred in 17.8 % (34/191) of patients. Age above 70, a history of hypertension, a history of heart disease, a Braden score of less than 15, the type of surgery, and the type of anesthesia are among the factors that influence this occurrence (4).

All PI are costly and risky acute care issues that can lead to extended hospital admissions, morbidity, and unfavorable outcomes (5). Surgical patients are more susceptible to PI because of several illnesses, including aging. In addition to nutritional deficiencies, consequences include diabetes, heart disease, cancer, and extensive procedures. Older skin becomes less elastic, thinner, and less flexible. PI is the postoperative variable contributing to surgical patients' admission to the hospital. PI can range in severity from minor (redness) to major (deep tissue damage). In addition to taking longer to heal, severe wounds are more likely to cause problems.

Finding the disease's risk factors is crucial for both treating and preventing postoperative PI (6). Effective treatment and prevention of intraoperative PI are necessary to preserve patient health and avert unfavorable consequences. PI are a costly and dangerous issue in acute care settings that can lead to extended hospital admissions, morbidity, and adverse outcomes (5). Three significant risk factors need to be considered among 444 patients, with an internal factor of four outside variables. Precise and trustworthy PI risk assessment methods are used to evaluate the risk (7). Patients undergoing surgery are more susceptible to pressure injuries because of both internal and external variables, such as being sedated, immobilized, and unable to communicate their pain or discomfort from their position (2). In perioperative patients, PI is frequently avoidable. Preventing perioperative PI requires multidisciplinary cooperation, which starts before the patient enters the procedure or operation room. Preoperative evaluations of risk variables (internal and external factors) that raise a patient's vulnerability to pressure injuries should be performed on all perioperative patients. The assessment of perioperative PI ought to be complete, visible, and conducted using conventional risk assessment instruments.

Knowledge about preoperative risk factors is important so nurses can implement preventive interventions before tissue injury begins. Therefore, this study aims to identify internal and external factors of PI in surgical patients.

METHODS

Included were all studies discussing risk variables linked to the emergence of PI. Data were taken from all the papers when three or more studies were reported on a particular variable. To find papers, we searched ScienceDirect, CINAHL, PubMed, and Google Scholar databases. The following search terms were used: "risk factors," "surgery," "operative procedures," or "surgical procedures," as well as "pressure ulcer," "decubitus ulcer," or "bedsore." Terms were from the Medical Subject Heading (MeSH). In gathering data, the authors created a form to extract data. Two writers each completed the extraction separately, and their work was then cross-checked for accuracy. The factors looked for were kind, country, year, and title. The eight papers differed in terms of study design, population target, and PI areas of interest.

RESULTS

PI Risk Factors in Surgical Patients

A PI is a localized injury, usually over a bony prominence, brought on by prolonged pressure (including shear-related pressure) to the skin and underlying tissue (15). Although additional complicating factors exist, the primary cause of PI is impaired mobility. People whose activities or movements are restricted may develop PI (16). People are categorized as high risk if they display several risk factors, including the kind, amount, timing, and how long the mechanical load lasted, as well as their susceptibility and tolerance, which are their unique mechanical characteristics, geometry, physiology, repair, and the movement and temperature of characteristics of the tissues (15,17). People who are considered high-risk include individuals who have experienced. One of the perioperative treatment issues that has a detrimental impact on anticipated postoperative results is intraoperative PI (18).

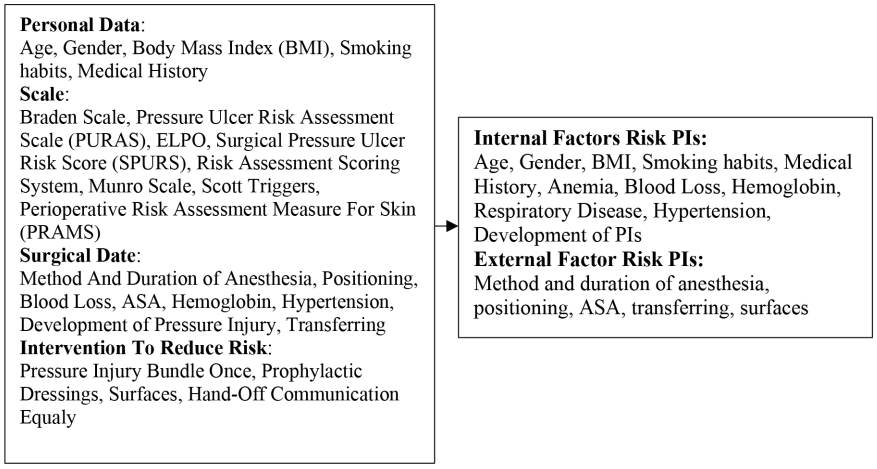

Figure 1. Internal and external risk for PI.

Figure 1 is the result of a literature review determining risk factors for pressure injury in patients with surgery. The initial identification was categorized into four categories: demographic data, surgical data, assessment scale, and risk prevention interventions. Then, the author categorized the four categories into two groups: internal and external risk factors for pressure injury in patients with surgery.

Table 1. Characteristics of the study

Authors	Title	Setting Internal Factor	Finding Factor PI
(8)	Relationship between predisposing and facilitating factors: Does it influence the risk of developing peri-operative pressure injuries?	A retrospective cohort study design.	1.Personal data: age, gender, hemoglobin, Body Mass Index (BMI), smoking habits, medical history 2.Surgical Data: method of anesthesia, the duration of anesthesia, patient positioning, blood loss. The method of anesthesia, the duration of anesthesia, patient positioning, therapy anticoagulants
(9)	Incidence and Risk Factors of Pressure Injuries in Surgical Spinal Patients.	A retrospective study.	Variable: Sex, sender, specific spinal injury, location of surgical intervention, operative time, preoperative, postoperative, Body Mass Index (BMI), length of surgery, development of any PI
(10)	A prediction tool for hospital-acquired PI among Surgical Patients: Surgical PI risk score. Keywords: nosocomial, PI, surgery, surgical risk factors, risk assessment	Original Article	Identified risk factors who developed hospital-acquired pressure injury: age, female, American Society of Anesthesiologists (ASA), BMI, preoperative Braden score, anemia, respiratory disease, and hypertension
(11)	Knowledge and practices of operating room nurses in the prevention of pressure injuries.	Clinical Study, Cross-sectional approach	Part I: Descriptive Characteristics of the nurses: age, gender, nursing schools attended, years worked, and patient safety and pressure injury education Part II: OR Nurses' Preventive Measures for Pressure Injury: utilizing a scale or form to assess PI risk; transferring; conducting risk assessments for PI during surgery; implementing interventions to prevent PI; creating support structures for pressure areas; and documenting interventions to prevent PI. Part III: OR nurses' familiarity with ORPI: The risk-focused elements.
(12)	The Effect of Selected Risk Factors on Perioperative PI Development	Cross-sectional	1.Sociodemographic and Clinical Characteristics Survey: age, sex, BMI, clinical characteristics, including albumin, hematocrit, and hemoglobin levels (obtained from laboratory samples); skin turgor; type of procedure; surgical clinic where the patient was admitted; and the presence of diabetes mellitus, heart disease, and peripheral vascular disease 2.Braden Scale 3.Surgery Related Pressure Ulcer Risk Factors Assessment Survey: procedure duration, the exact

Continued in pag. S333…

…continuation Table 1. Characteristics of the study

Authors	Title	Setting Internal Factor	Finding Factor PI
			exact time a pressure injury was first observed, pressure injury stage and location, intraoperative position of the patient, type of surgical procedure, intraoperative diastolic blood pressure, and intraoperative vasopressor use.
(13)	Risk assessment for perioperative pressure injuries.	Original Article	Sociodemographic variables, such as age, sex, self-reported skin color, and clinic variables (body mass, hemoglobin values, ASA physical status classification, and atrial temperature) of the patient, were used. The Risk Assessment Scale for Perioperative Pressure Injuries (ELPO) is composed of the following variables: duration of the surgery, type of anesthesia, surgical positioning, support surface, positioning of upper and lower limbs, comorbidities and age of the patient.
(7)	Using Evidence to Prevent Risk Associated with Perioperative Pressure Injuries.	Clinical Study	Using Evidence: 1.Assessment of Patient PI Risk Assessment: Risk Assessment Scoring Systems, Braden Scale, Munro, Scott Triggers, Perioperative Risk Assessment Measure for Skin (PRAMS) 2.PI Risk Factors: Risk factors contributing to PI formation include those unique to the patient (intrinsic) and those due to environment or surgical needs (extrinsic). 3.Interventions to Reduce Risk: Pressure Injury Bundles Once, Prophylactic Dressings, surfaces, Handoff Communication Equally 4.Attitudes and Education
(14)	Construction of a Risk Prediction Model for Intraoperative Pressure Injuries: A Prospective, Observational Study.	A prospective, observational study	1.To explore the incidence and risk factors of intraoperative pressure injuries: age, malnutrition, BMI, poor circulation, diabetes mellitus, cardiovascular disease, anemia, body temperature, anesthesia type, surgery time, humidity, support surface (decompression pad) type, and surgical position. 2.Risk factor screening: 3 days after transfer to the ICU, and in the first (24 hours), second (48 hours), and third (72 hours) days postoperatively in the ICU).

Internal Factors

Internal factors originate from the patient, including reduced mobility, age, body mass index (BMI), albumin, comorbidities, blood pressure, nutritional status, and body temperature.

Reduced Mobility

The primary factor in tissue deterioration and pressure sores' emergence is decreased mobility (15). When soft tissue is crushed for an extended time, usually between an exterior surface and a bony prominence, tissue necrosis results, and certain conditions such as drowsiness, restrictions, trauma, dementia, or a disease process might result in immobility or limited mobility (19). Pressure sores are skin and underlying tissue damage caused by constant pressure or friction (20).

Age

The development of pressure sores and tissue disintegration is also highly associated with age, as aging causes a reduction in muscle, collagen, flexibility, and subcutaneous fat (15,19). Since the majority of pressure sores are preventable, as stated by the NPUAP, the prevalence of pressure sores has been utilized as a gauge of the caliber of patient care (21). For bariatric individuals, one of the risk factors is age. The highest frequency of PI was observed in patients above 65. According to several studies, aging skin has reduced muscle, adipose tissue, collagen, and dermal thickness, making it less elastic and more prone to tissue injury. These outcomes align with the review findings. Male sex was found to be a more significant risk factor than female sex (22). A significantly increased risk of perioperative PI was associated with being older than 60 years old (23).

Body Mass Index (BMI)

PI development and BMI were found to be statistically significantly correlated (24). Individuals with a BMI of less than 23 kg/m^2 are equally susceptible to pressure injuries, but the prevalence of these accidents is higher in those with a BMI of more than 30 kg/m^2. The majority of patients with a BMI higher than 25 kg/m^2 will be at risk of having more extensive surgical intervention and longer recovery times, according to the study's results, which are in line with previous research (24-26). The risks of PI were not significantly impacted by obesity or morbid obesity, according to this systematic study and pooled data meta-analysis. Being underweight has been associated with an increased risk of pressure injuries while being overweight has been connected to a lower incidence of PI. When creating weight-loss and dietary strategies for the treatment of PI, these data may be taken into account (27).

Albumin

An individual's dietary status significantly impacts skin integrity and tissue perfusion. Thin individuals with less tissue covering their bony features are more vulnerable to pressure sores (19). Because vitamins and proteins improve tissue and cell wall integrity and help avoid pressure sores, malnourished people are more likely to have tissue disintegration (28). Micronutrients and supplements are important for preserving tissue integrity; on the other hand, deficits and deficiencies hinder the healing of wounds. A patient may suffer intraoperative PI if their albumin levels are less than 3.5 mg/dL. The risk of intraoperative PI was increased by 2.4 times in patients with low albumin levels. Individuals who have low serum albumin levels run the risk of developing preoperative interstitial edema, which can cause harm from pressure. The current study found a significant correlation between preoperative hemoglobin, low albumin levels, and high lactate levels with the development of PI after surgery (29).

Comorbid

Comorbidity is a concomitant disease, meaning there are other diseases experienced in addition to the main disease (30). For many patients, PI represents the last stop on a journey that leads to the accumulation of severe comorbidities and aggravating illnesses that impair the fragile (31). Several additional comorbid conditions have previously been shown to impact the development of PI, including immobility, urinary or bowel incontinence, chronic kidney disease, congestive heart failure, dementia, diabetes, malnutrition, moisture-associated dermatitis, neoplasm, neuropathy, shock, vasopressor use, anemia, fluid and electrolyte disorders, sepsis, history of

diabetic ulcers of the lower limb, quadriplegia/ hemiplegia, unstable spine, and obstructive sleep apnea (30).

Blood Pressure

The entire duration of time a patient's mean arterial blood pressure was below 60 mmHg while on vasopressors may be a separate predictor of the onset of pressure damage. According to current thinking, intraoperative hypotension and the damage threshold are both at 65 mmHg for mean arterial pressure (MAP) (32).

Nutritional Status

Hemoglobin levels might reveal nutritional status. Another risk factor that causes less nutrition and lower oxygenation and pressure injuries grows more quickly, and low hemoglobin hastens up wound recovery (33). It was found that while low hemoglobin levels promoted the development of pressure injuries, oxygenation, and hemoglobin levels had no effect in preventing pressure injuries (34). Inadequate nutrition and oxygenation (low serum albumin and hemoglobin), which are critical for preventing tissue damage, cause pressure injuries to develop more quickly (35).

Body Temperature

Frequent perioperative hypothermia has been associated with increased rates of wound infection, blood loss, fusion requirements, length of stay in the post-anesthesia care unit, and costs. Temperature regulation before, during, and after surgery is essential to reduce the risk of perioperative hypothermia (36). Hypothermia is the cause of disorders with the coagulation of plasma. Hypothermia can result in decreased enzyme activity, decreased enzyme capacity, and coagulopathy, which increases blood loss, thrombocytopenia, and hypercoagulation. A significant drop in temperature accelerates blood loss. For example, a mere 10 ºC decrease in core temperature was associated with greater rates of transfusion need (+22 %) and bleeding ePIodes (+16 %). Perioperative hypothermia's duration and severity significantly increase the chance of transfusion (37).

External Factors

External factors are environmental factors that have a deteriorating effect on the external layer of the skin, including length of operation, medical equipment and medication, nurse knowledge, temperature, surfaces or interface pressure, friction and shear, positioning, blood loss, and tools.

Length of Operation

An average person may spend 45 minutes to seven hours in an operating room. One study found that patients on the operating table for longer than 6.15 hours had a higher risk of pressure injuries (PI). A medical device's compression of the surrounding skin or mucosa increases with its duration of use, leading to pressure sores (23).

Medical equipment and Medication

A single vasopressor infusion increases the risk of PI (PI), and some evidence suggests that dopamine may play a role in the development of PI (14). The most frequent effects of dopamine include activation of beta-adrenergic receptors at moderate dosages, vasoconstriction in peripheral vasculature as a result of activation of alpha-adrenergic receptors at high doses (>10 pg/kg), and selective vasodilatory effects at low doses (1-2 pg/kg). This study found that dopamine did not influence the development of PI in the patients, perhaps because of the low mean dose (4.47 mcg/kg/min) given to the patients (38).

Nurse Knowledge

The majority of OR (operating room) nurses did not obtain information regarding patients with a high PI risk from clinical nurses, and some of them only received information verbally. OR nurses also did not use scales or assessment

tools. This makes sense because the OR nurses are not informed of the patient's PI high-risk condition (11).

Temperature

Temperature is a quantity that indicates the degree of hotness or coldness of an object, while humidity is the level of wet air conditions caused by the presence of water vapor (26). According to epidemiological research, there isn't necessarily a correlation between general measures of skin wetness like fecal and urine incontinence and a higher chance of PI development. The following scales, measurements, and descriptions are used in the literature to represent skin moisture in the literature. Proper skin function and resistance require a specific amount of moisture. One of the previously mentioned reasons is excess wetness. Moisture has an impact on the skin's physiologic, mechanical, healing, sensitivity, and tolerance properties (14).

Surfaces or Interface Pressure

Support surfaces are specialized instruments that regulate pressure redistribution, microclimate, and tissue stress. This emphasizes how important it is for everyone who has PI or is at risk of using a high-quality pressure redistribution support surface. Prolonged, unrelieved pressure on the skin is the cause of these PI, which often mimic the shape or pattern of the device. The emergence of these PI is influenced by several factors, including systemic variables, associated dampness, decreased sensibility or perfusion, and sometimes local edema. Interfacial pressure refers to the pressure that is applied through a particular surface, like foam or mattresses, to minimize pressure injuries, as well as pressure that is generated by external forces, such as the application of force, the use of restraints, or operational postures. Most of the foam pads or mattresses that were inspected served as general protective elements (15). Finding the support surface with the largest skin contact area, lowest peak interfacial pressure, and lowest average interfacial pressure is critical. The operation position (supine or prone) should be considered when choosing a surface type (viscoelastic or gel). Patients prone to pressure injuries should use a viscoelastic foam support surface in the operating room (39).

Anesthesia

In perioperative patients, pressure injuries (PI) can be more likely due to anesthetic drugs and surgical placement. The kind of anesthetic used is a significant risk factor during the intraoperative stage. This factor affects how much the neurological system, pain receptors, and muscles relax, making it more likely that the patient may experience pain and pressure injury because their defensive mechanisms won't be able to fend off pressure (13).

Friction and Shear

Shearing wounds and friction frequently coexist. Dragging or rubbing an object across the skin, such as a bed sheet, can result in friction wounds. When forces are applied to body components or tissues that cause them to move in opposite directions, shearing wounds result (40). A mechanical load is any force applied to a person's soft tissue because of skin contact with a solid surface, such as other body surfaces, air- or water-filled support surfaces, or medical equipment. It consists of the forces supported by the skeletal structures and transmitted by the soft tissue to the supporting surface. Mechanical stresses are commonly described by two types of forces: shear forces, which are parallel to the skin surface, and normal forces, which are perpendicular to the skin surface. In practical situations, the interaction force usually consists of a normal and a shear force (21).

Positioning

The surgeon, anesthesiologist, and operating room nurses all share responsibility for positioning the patient for a surgical procedure. A trade-off between the ideal surgical access position and the position the patient can tolerate may need to be made to achieve the ideal position (41). Significant risk factors for PI developing within 30 minutes included the patient's position in the

operating room, the surgical specialty (prone *vs*. supine: odds ratio, 22.10 (95 % CI, 5.72); lateral *vs*. supine: odds ratio, 14.32 (95 % CI, 0.37), and the surgical type (orthopedic surgery *vs*. general surgery: odds ratio, 18.33 (95 % CI, 2.31); cardiac surgery *vs*. general surgery: odds ratio, 22.00 (95 % CI, 2.19) (42).

Blood Loss

Blood loss in PI is an external factor that is one of the causes of the severity of PI. The severity of PI with blood loss ≥1 000 mL increases compared to blood loss ≤100 mL. By reducing body temperature and vasoconstriction, anesthetics modify the patient's autonomic thermoregulatory responses. This lowers soft tissue pressure, particularly in locations where pressure is constant. The patient's mean arterial pressure is also lowered during surgery due to blood loss. Stage 2 PI was more common in patients who lost over 1 000 milliliters of blood during surgery. Increased blood loss following surgery results in increased cellular hypoxia, hemodynamic fluctuations that lower blood pressure and filling pressure, and a higher risk of pressure injuries (PI) occurring or worsening (8).

Tools

The risk of surgical pressure sores was assessed in this descriptive cross-sectional study. The 3S Intraoperative PI Risk Assessment Scale and the Patient Descriptive Information Form (PDIF) were used to gather data (IPIRAS) (43). The Scott Triggers, Perioperative Risk Assessment Measure for Skin (PRAMS), Munro PI Risk Assessment Scale for Perioperative Patients, and Risk Assessment Scale for Perioperative Pressure Injuries (ELPO) were used to evaluate risk (41). These instruments are reliable and accurate for PI risk assessment. The research findings on the prevalence of PI differed widely. The lack of PI preventive and treatment regimens and variations in the PI evaluation instruments employed may be the cause of the highest incidence observed in the research (44). The complex and dynamic interactions among risk factors are not fully considered by the conceptual frameworks and risk assessment techniques that are now in use. This may indicate that the risk factors we synthesized need to be reexamined and that additional high-quality research, such as cohort studies, is required to understand better how hospital-acquired pressure injuries in adult patients are predicted (45).

DISCUSSION

Risk Factor PI in Surgery

Surgery patients have the danger of suffering pressure injuries (PI), which can be fatal or result in serious injury. Frequently, pressure injuries go unnoticed in the first few days following surgery. It could take up to 72 hours for an injury to show symptoms (13). The evaluation, diagnosis, and execution of a personalized preventive plan for at-risk patients are essential steps in preventing pressure injuries. When assessing risk, patient and environmental factors linked to the development of PI are considered (46). Effective pressure sore management requires ongoing patient assessment for possible risk factors and appropriate interventions to lower the risk of injury to vulnerable individuals (39). The ability of the skin and the structures that support it to withstand the impacts of pressure by serving as a cushion and transmitting pressure loads from the skin's surface to the skeleton is known as tissue tolerance. When pressure is present, tissue tolerance is influenced by both internal and extrinsic elements.

Pressure

Although pressure injuries are less likely to injure the superficial skin layer, the physical examination may not reveal as much damage as is there (33). The underlying history of immobility encompasses bedridden people, among others. Localized skin injuries with or without underlying tissue involvement are classified as skin and soft tissue pressure-induced injuries. But they typically develop over a bony protrusion. Shear stress, along with pressure, is the initiating component (40). The most prevalent bone prominences are ischium, sacrum, and

calcaneus. It's important to distinguish between PI-induced and superficial moisture-induced lesions, skin tears, tape burns, perineal dermatitis, or excoriation. Pressure injuries are believed to be caused by pressure from a medical device or an individual's body weight applied for an extended period above a specified threshold. An absence of pressure feedback response in persons with sensory deficiencies may lead to prolonged pressure that damages tissue. Increased arteriole pressure, shearing forces, friction, moisture, and nutritional condition are just a few of the many variables that can lead to PI and injury formation (24).

Tissue Tolerance

When pressure exceeds a threshold, it can induce persistent tissue ischemia, which can eventually result in necrosis and pressure injuries to the skin and soft tissues (47). Another contributing element is injury from reperfusion, since the creation of reactive oxygen species following a period of ischemia can create an inflammatory response. When patients are positioned at an angle, gravity pushes internal tissues like bone and muscle lower, causing tissue hypoxia because of deformed or flattened blood arteries (15).

Internal Factors

Internal variables lower the skin's tolerance by affecting the skin's vascular, lymphatic, and supporting tissues. The demographic trait most strongly linked to a higher risk of PI is advancing age. Patients who are older than 65 are more vulnerable, and the risk rises with age beyond 75. Men and Caucasians are at higher risk in certain studies (1,4,6,); however, opinions on the significance of these demographic traits are divided. A study (4 found, 25 males had a higher chance of developing peripheral ischemia during the chronic phase of Spinal cord ischemia (SCI) (eight studies, odds ratio OR 1.3, 95 % CI 1.1 to 1.7) in an SR on risk variables in SCI patients. In this population, age and ethnicity did not seem to be associated with PI risk. PI risk is also increased by chronic disorders that affect sensibility, the lymphatic system, and tissue perfusion. Additionally, a higher risk of peripheral ischemia is linked to illnesses and disorders that hinder oxygen transport to the tissues. Lower limb fractures, pneumonia, and a history of deep vein thrombosis have all been linked to an increased risk of peripheral ischemia (PI) in patients with chronic SCI. Chronic diseases and ailments are linked to an increased risk of peripheral artery disease (PI) that affect oxygen supply, tissue perfusion, sensibility, and lymphatic function.

External Factors

The skin's capacity to withstand pressure is affected by shear, friction, and wetness. Shear is a mechanical force that causes the body to slide due to a tangential, parallel load pushing against resistance between the skin and a contact surface. The blood arteries and lymphatic system between the dermis and deep fascia get distorted due to the deep fascia moving with the skeleton. In contrast, the skin's outer layers, the dermis and epidermis, remain constant. Thrombosis and capillary blockage result from this. Shear, a mechanical force generated by parallel stress, makes the skin and a contact surface oppose each other and cause the body to slide. The dermis and epidermis, the skin's surface layers, stay in place while deep fascia moves in tandem with the skeleton to create. Shear is caused by friction, a mechanical force that develops when two surfaces move over one another, creating resistance between the skin and the contact surface. Moisture causes maceration, which changes the epidermis' resistance to external forces, especially when the skin is exposed for extended periods. Perspiration, wound exudate, and incontinence can all result in moisture. Certain types of wetness, like fecal incontinence, increase the risk of certain conditions by exposing the skin to bacteria and enzymes that raise the skin's pH.

CONCLUSION

Pressure injuries (PI) can result from both surgical techniques and clinical circumstances that can trigger PI development. These findings may benefit the development of models to forecast

the risk of pressure injuries. A risk assessment should be part of the education provided to health professionals about pressure injuries. Only a small number of very predictive risk factors for pressure injuries must be used in the screening process to meet the screening objectives. Risk factors for PI in surgical patients are divided into two factors, namely internal and external factors. Internal factors include reduced mobility, age, body mass index (BMI), albumin, comorbidities, blood pressure, nutritional status, and body temperature. External factors include length of operation, medical equipment and medication, nurse knowledge, temperature, surfaces or interface pressure, friction and shear, positioning, blood loss, and tools. Pressure sores are a common problem among surgical patients, particularly in those with compromised sensory function or restricted mobility. The emergence of a pressure sore may shorten a patient's stay and increase the need for medical care. Applying the prevention strategies outlined and having a thorough understanding of the pathophysiology of pressure sores can reduce the occurrence and associated costs. When treating a patient with a pressure sore, a multidisciplinary team approach involving medical and allied health specialists is the most effective method. Further research is needed to understand why the prevalence of PI varies so significantly between surgical locations and types of surgery.

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