






## REVIEW

**PRESSURE INJURIES IN ADULTS AND THE ELDERLY:  
A SCOPING REVIEW\*****HIGHLIGHTS**

1. Stage 2 PUs developed during hospitalization.
2. Stage 3 PUs developed at home.
3. Wound bed: granulation, liquefaction necrosis, and/or coagulation.
4. Professionals' delay in detecting the first signs of Pus.

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**Objective:** to map the evidence available in the literature on the development and characteristics of pressure injuries in adults and the elderly in primary and tertiary care settings. **Method:** retrospective analytical scoping review, carried out in 2023, in the Virtual Health Library, PUBMED, EMBASE, Web of Science, and SCOPUS databases. Registration (DOI 10.17605/OSF.IO/C63YM). **Results:** 29 studies were selected. The lesions were predominantly stage 2, located in the sacral, gluteal, and calcaneal regions, which developed during hospitalization, and some had recurrent lesions. Granulation tissue, liquefaction necrosis, and/or coagulation were found in the wound bed, with epithelialized, macerated, or a flaky edge. The presence of exudate was rarely reported. **Conclusion:** Based on these results, care can be improved by understanding the characteristics of pressure injuries, investing in therapies that optimize the healing process, improving patients' quality of life, and reducing the cost of wound care.

**KEYWORDS:** Pressure Ulcer; Tissues; Skin; Patient Care Planning; Evidence-Based Practice.

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## INTRODUCTION

Pressure ulcers (PUs) consist of damage to the skin or soft tissues underlying it because of pressure, friction, or shear force exerted on areas of bony prominences, such as the sacral, trochanteric, ischial, and calcaneal regions or the use of medical devices that exert the same pressure<sup>1</sup>. It develops from an inflammatory process in the area affected by the uninterrupted pressure, which can result in tissue necrosis. In this process, tissue damage begins before the skin is broken. For this reason, when the skin is broken, the lesion evolves rapidly within 24 hours, demonstrating the need for continuous and careful assessment of the patient<sup>2</sup>.

PUs can be classified as Stage 1: the skin is whole with erythema; Stage 2: partial loss of skin thickness and exposure of the dermis; Stage 3: total thickness of the skin; Stage 4: total thickness of the skin and tissue loss; Unclassifiable: total thickness of the skin and no visible tissue loss; and Deep tissue: the skin is dark red, brown or purple, persistent and does not whiten<sup>3</sup>.

This preventable condition negatively impacts people's quality of life and increases treatment costs, hospitalization, length of stay, and readmissions. To prevent the development of PU, strategies that cover two interdependent areas are necessary: identifying and mitigating the risk of PU<sup>3</sup>.

The literature on the risk factors associated with the development of PU and prevention and treatment measures is vast. However, to determine an effective care plan that considers the complexity of a patient with PU, it is essential to understand the structural characteristics of the lesions, as well as the aspects that differ in the population in which it was established (adults and elderly) and the care environment with the highest prevalence of this condition<sup>4-5</sup>.

Given the complexity and prevalence of PUs, it is imperative to conduct a scoping review. This review will systematically map the evidence in the literature on the development and characteristics of PUs in adults and the elderly, particularly in primary and tertiary care settings.

## METHOD

This is a retrospective analytical scoping review. The protocol for this study was based on the guidelines proposed by PRISMA Extension for Scoping Reviews (Prisma-ScR): Checklist and Explanation<sup>6</sup>.

The mnemonic PCC (P - population, C - concept, and C - context) was used to construct the research question. Adopting the items: P - adults and elderly, C - Pressure Injury, and C - primary and tertiary care: What evidence is available on the development and characteristics of PUs in adults and the elderly in primary and tertiary care settings? Other sub-questions were used to deepen the review: In which care setting did PU in adults and the elderly, included in the primary question, develop most frequently? In which age group is there a higher incidence of PUs? What evidence is available about the wound bed and the perilesional area? What structural/characteristic differences are described for PUs that developed in adults and the elderly?

As for the eligibility criteria adopted, we included scientific articles published in full, freely available, with a quantitative focus; official materials; guidelines that addressed the development and structural characteristics of PU, regardless of the language of publication (Concept); in individuals over the age of 18 (Population); in a clinical environment of primary and tertiary care (hospital, outpatient, and home); regardless of the country of origin and language of publication (Open context). We excluded qualitative studies, research whose focus was limited to the prevention of PU; study protocols, without publication of results which address any injury other than PU; letters to the editor, websites, blogs, abstracts presented at congresses, Course Conclusion Work, Dissertations and Theses. It was decided to exclude these secondary data sources (gray literature) because of the need for robust evidence to answer the research questions listed for this scoping review. According to the PRISMA protocol<sup>6</sup>, limits can be imposed on the types of evidence sources to determine relevant knowledge appropriate for answering specific topics.

Data selection took place in four stages: 1) Initial search in the search strategies; 2) Title and abstract analysis and exclusion of those that did not fit any of the criteria; 3) Full reading of the works selected in stage two; and 4) Examination of the list of references of the sources selected from the full text and included in the review<sup>6</sup>.

The initial search used a combination of terms from the Medical Subject Headings (MeSH): Pressure Ulcer, Wound Healing, Wounds and Injuries, Skin, Tissues, Adult AND Aged in the PUBMED, EMBASE, Web of Science, and SCOPUS search strategies. In the Virtual Health Library (VHL) using the Health Sciences Descriptors (DeCS): Pressure Injury, Healing, Wounds and Injuries, Skin, Tissues, Adult AND Aged. Only the keywords were used for this collection, and the synonyms presented were discarded. A cross-search between the keywords was used using the Boolean connector "AND" and "OR," adopting the same combination in all search locations to maximize the number of articles. Two researchers carried out the steps independently, and disagreements were discussed until a consensus was reached. Duplicate works in the databases were excluded only after reading them in full. Data collection took place between May and June 2023.

To facilitate the extraction of the information contained in the studies, RAYYAN® software was used, exporting the following data: identification, title, year of publication, index base, journal, level of evidence, objective, study design, primary results, and conclusion.

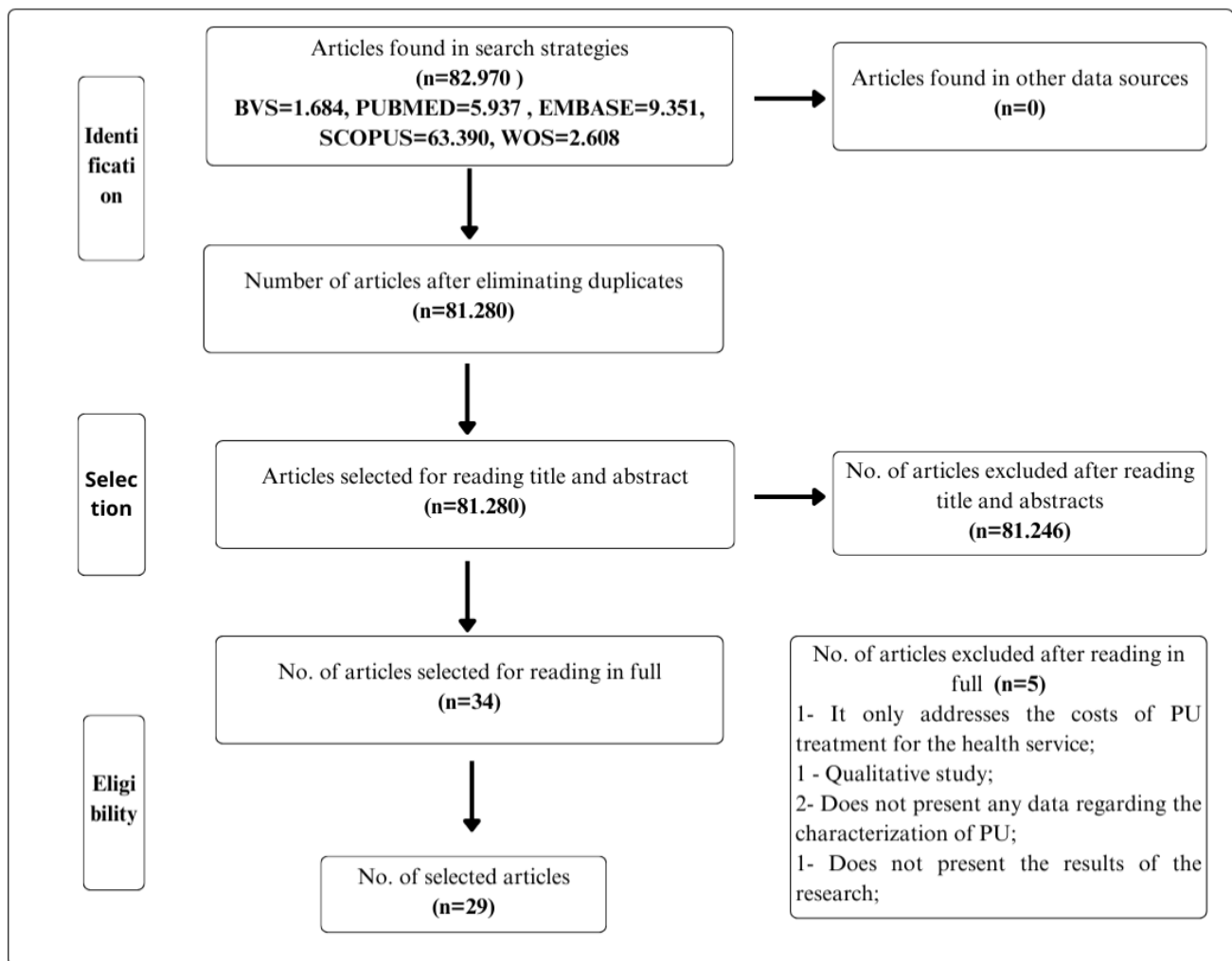
The level of evidence was based on the classification proposed by Galvão<sup>7</sup>. The data was mapped descriptively, using simple frequency counts of concepts, populations, and other characteristics that addressed the research questions. A descriptive qualitative content analysis was carried out, including basic data coding. Based on the findings, a concept map was drawn up using the free CANVA® tool.

The project was registered on the Open Science Framework (OSF) Platform under DOI 10.17605/OSF.IO/C63YM. As this was a scoping review based on data in the public domain, it was not submitted to the Human Research Ethics Committee.

## RESULTS

Of the 2,153 studies detected in the databases, 29 comprised this scoping review. The selection of studies is described in the flowchart (Figure 1).

Figure 1 - Study selection flowchart. Maringá, PR, Brazil, 2024



Source: Adapted<sup>6</sup> by the authors (2024).

All the studies (n=29) were quantitative and used retrospective, prospective, cohort, observational, and secondary data analysis as their study design. The population of the studies ranged from five to 523,354 (mean 41,901). The level of evidence of the studies is described in Chart 1.

**Chart 1** - Level of evidence of the studies that make up this scoping review. Maringá, PR, Brazil, 2024 (n=29)

Id	Title	Evidence Level
A1	Wound Repair Using Discarded Skin Tissue From The Rolled Edge Of Pressure Injury: A Feasibility Study Of Five Cases, 2022 <sup>8</sup> .	4
A2	Epidemiological Profile of Chronic Skin Lesions in Hospitalized Patients, 2021 <sup>9</sup> .	6
A3	Incidence and factors related to the appearance of pressure injuries in intensive care units, 2021 <sup>10</sup> .	4
A4	Injuries in Hospitalized Elderly: Prevalence, Risk and Association with Functional Capacity, 2021 <sup>11</sup> .	6

A5	<i>Skin Physiology And Its Microbiome As Factors Associated With The Recurrence Of Pressure Injuries, 2020<sup>12</sup>.</i>	4
A6	<i>Clinical and Laboratory Profile of Hospitalized Patients Affected by Pressure Injury, 2020<sup>13</sup>.</i>	6
A7	<i>Impaired Mobility And Pressure Ulcer Development In Older Adults: Excess Movement And Too Little Movement-Two Sides Of The One Coin? 2020<sup>14</sup>.</i>	4
A8	<i>Prevalence Of Skin Tears Among Frail Older Adults Living In Canadian Long-Term Care Facilities, 2018<sup>15</sup>.</i>	6
A9	<i>The Relationship Of Subepidermal Moisture And Early-Stage Pressure Injury By Visual Skin Assessment, 2018<sup>16</sup>.</i>	4
A10	<i>Incidence And Risk Factors Associated With The Development Of Pressure Ulcers In An Intensive Care Unit, 2017<sup>17</sup>.</i>	4
A11	<i>Hospital-Acquired Pressure Injury: Risk-Adjusted Comparisons In An Integrated Healthcare Delivery System, 2018<sup>18</sup>.</i>	4
A12	<i>Polypoid Granulation Tissue In Pressure Ulcers: Significance Of Describing Individual Ulcers, 2018<sup>19</sup>.</i>	6
A13	<i>Factors Impairing Cell Proliferation In The Granulation Tissue Of Pressure Ulcers: Impact Of Bacterial Burden, 2018<sup>20</sup>.</i>	6
A14	<i>Root Cause Analysis To Identify Contributing Factors For The Development Of Hospital Acquired Pressure Injuries, 2021<sup>21</sup>.</i>	4
A15	<i>Community-Acquired Pressure Injuries In The Acute Care Setting, 2021<sup>22</sup>.</i>	6
A16	<i>Dysphagia, Immobility, And Diet Acceptance: Main Factors Associated With Increased Risk Of Pressure Injury In Patients Hospitalized After Stroke, 2020<sup>23</sup>.</i>	4
A17	<i>Development Of Recurrent Pressure Ulcers, Risk Factors In Older Patients: A Prospective Observational Study, 2020<sup>24</sup>.</i>	4
A18	<i>Pressure Ulcer Risk Factors In Persons With Mobility-Related Disabilities, 2019<sup>25</sup>.</i>	4
A19	<i>Are Pressure Injuries Related To Skin Failure In Critically Ill Patients? 2018<sup>26</sup>.</i>	6
A20	<i>Risks And Prevalence Of Pressure Ulcers Among Patients In An Acute Hospital In Finland, 2018<sup>27</sup>.</i>	6
A21	<i>Prevalence, Associated Factors And Outcomes Of Pressure Injuries In Adult Intensive Care Unit Patients: The Decubitus Study, 2020<sup>28</sup>.</i>	4
A22	<i>Relationship Between Healing Status And Microbial Dissimilarity In Wound And Peri-Wound Skin In Pressure Injuries, 2023<sup>29</sup>.</i>	4
A23	<i>Pressure Ulcers In Hospital Patients: Incidence And Risk Factors, 2023<sup>30</sup>.</i>	2
A24	<i>Higher Periwound Temperature Associated With Wound Healing Of Pressure Ulcers Detected By Infrared Thermography, 2021<sup>31</sup>.</i>	4
A25	<i>Skin Physiology And Its Microbiome As Factors Associated With The Recurrence Of Pressure Injuries, 2021<sup>32</sup>.</i>	4
A26	<i>Predictors Of Superficial And Severe Hospital-Acquired Pressure Injuries: A Cross-Sectional Study Using The International Pressure Ulcer Prevalence™ Survey, 2019<sup>33</sup>.</i>	6
A27	<i>Skin Temperature And Vascular Attributes As Early Warning Signs Of Pressure Injury, 2020<sup>34</sup>.</i>	4
A28	<i>Incidence And Characteristics Of Hospital-Acquired Mucous Membrane Pressure Injury: A Five-Year Analysis, 2020<sup>35</sup>.</i>	6
A29	<i>A Prospective Study Of Pressure Injury Healing Rate And Time And Influencing Factors In An Acute Care Setting, 2022<sup>36</sup>.</i>	4

Source: The authors (2024).



The studies came from 12 countries: Brazil, China, Japan, Canada, South Korea, Spain, the United States, the United Kingdom, Australia, Finland, Belgium and Italy. The participants were primarily adults and elderly people of both sexes, with an average age of 71 years and a history of alcoholism (A2 and A16) or smoking (A1, A11, A14, and A18). The target population was white (A3 and A4) or black (A3), with a low level of education (incomplete primary education or illiterate) (A4), with a monthly income of one minimum wage (A4) or retired (A2 and A4). Only 10 (34%) used the Braden Scale, considered the gold standard for assessing PU (A3, A4, A5, A6, A7, A9, A11, A17, A20 and A21).

Stage 1 and 2 PUs developed during hospitalization (A3, A4, A10, A11, A12, A15, A18, A28), and stage 3 lesions resulted from previous hospitalizations or originated at home (A4). Injuries were more frequent in the sacral, calcaneal, and gluteal regions (A1 to A29).

A study (A15) showed that elderly patients who developed PU originating in the community, especially at home, had an average of 1.5 injuries, 37% of which were stage 2, and had reduced mobility or a compromised Muscle Mass Index, with an average of 26.38 kg/m<sup>2</sup>.

The incidence of PU in elderly people living in long-term care facilities was 12.7% (A7) to 15.8% (A8), which developed on average after 14.4 days (minimum of three days and maximum of 20 days) (A10), and the repetition rate was 26.7% within six weeks (A5).

With regards to hospital-acquired PU, there was a rate of 0.57 ( $p=0.019$ ) per 1,000 patient days, ranging from 2.2 to 3.7 cases per 1,000 patients. The average stay until the onset of stage 1 PU was 11.4 days (A11). Of the PUs that developed in the hospital, 59.3% healed in 17.63 days. The healing rate was better, and the healing time was shorter for stage 2 PUs than for non-staged or deep tissue PUs (A29).

In patients admitted to the Intensive Care Unit (ICU), the incidence of PU ranged from 8.1% to 16.2% (A10 and A21), with 11.72 lesions per 1,000 days of hospitalization, of which 40.6% were stage 1 and 59.4% stage 2, mainly in the sacral region (A10). Hospitalization in the ICU is associated with a 10-fold increase in the chance of developing PU compared to other sectors (A19). The average size of the lesions was 27.8 cm<sup>2</sup>  $\pm$  17.7 cm (A1).

Length of hospital stay (average of 50 days) (A3, A6, A7, A10 and A20), Intensive Care Unit (ICU) stay (A3, A6, A7, A10, A20 and A21), oncological or respiratory causes (A4), had a higher incidence of PU due to immobility (A6, A16 and A27), use of medication such as vasoactive drugs, sedatives, corticosteroids or antibiotics (A20 and A27). PU acquired in the ICU had a higher mortality rate (A21).

Regarding the tissue composition of the wounds, it was noted that granulation tissue, liquefaction necrosis, or coagulation were found on the bed, with epithelialized, macerated, or friable edges (A4 and A24). Polypoid granulation tissue was observed in the PUs of the sacral and ischial regions, reducing the lesion's epithelialization and contraction (A14). The most common types of exudates were serous and serosanguinous, with a yellow or greenish color and a slight odor (A4).

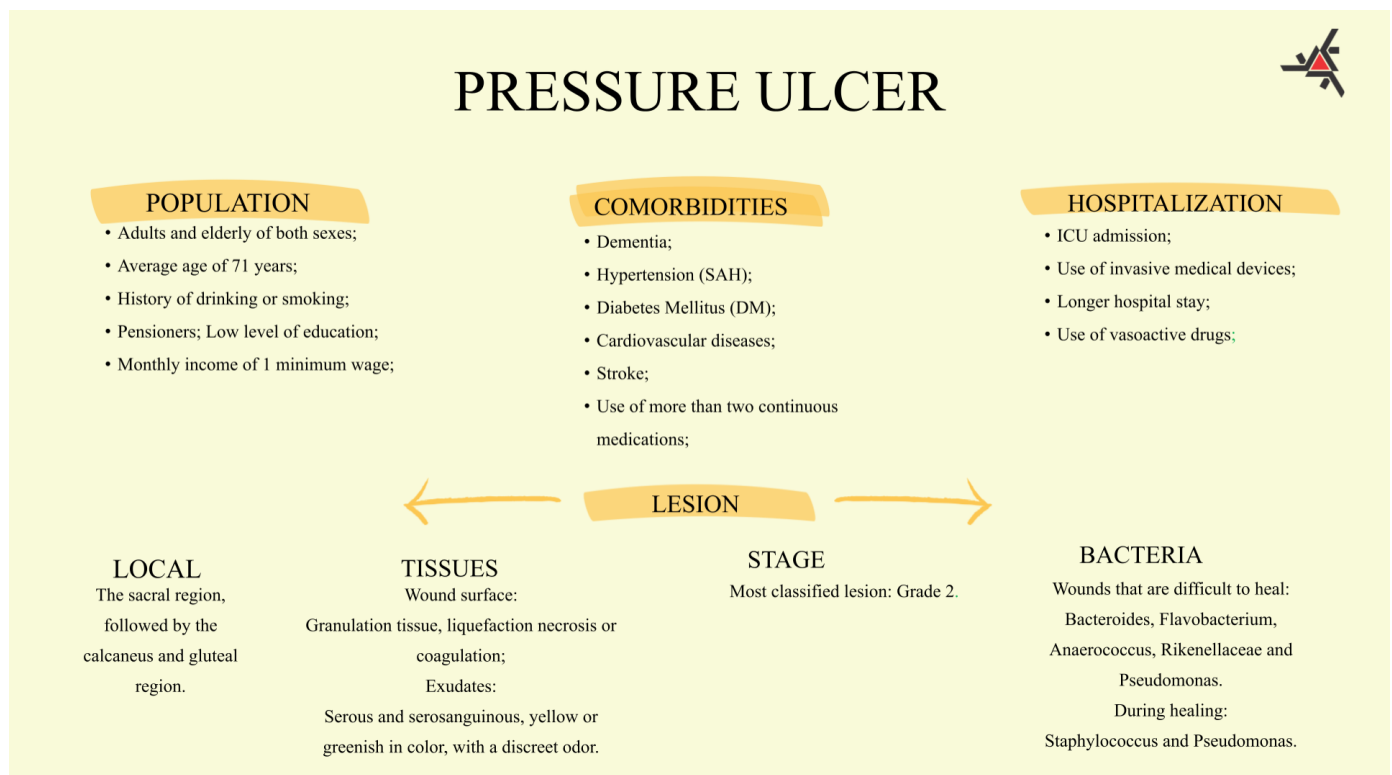
The temperature of the peripheral skin was highlighted as a point to consider when healing PU. In patients with delayed healing, the temperature of the wound bed gradually decreases as the lesion heals. In patients with sound healing, the peripheral skin temperature was higher than that of the wound bed and normal skin (A24). The high skin temperature in the pressure region has been highlighted as a factor that increases the risk of developing these lesions (A27).

Changes in the skin's natural moisture contribute to recurrent PU and hinder healing (A5, A9, A14, and A25). A relationship was noted between subepidermal moisture and the development of PU (A9). Increased values of subepidermal moisture were related to blanched erythema and the development of stage 1 PU ( $p=0.005$ ) (A9).

The cells present at the edge of the wounds were keratinocytes and keratinized tissues, being viable and proliferative. These particles could survive and expand on the surface of the PUs granulation tissue, which can speed up the healing process (A3). The microbiota of the wounds included bacteria such as *Corynebacterium spp.*, *Staphylococcus aureus*, *Bacteroides*, *Flavobacterium*, *Anaerococcus*, unidentified *Rikenellaceae*, and *Pseudomonas*, which were associated with poor cell quality and reduced formation of granulation tissue (A15, A24, and A27).

Based on the data analysis, a conceptual map was constructed outlining the factors related to the development of pressure injuries described in the literature (Figure 2).

**Figure 2** - Conceptual map of the development of pressure injuries. Maringá, PR, Brazil, 2024 (n=29)



Source: The authors (2024).

## DISCUSSION

From the results, the incidence of PUs is more significant in the elderly, white or black, bedridden/with impaired physical mobility, with a lower monthly income and education, who have more than one underlying disease, and with habits that are harmful to health, such as alcoholism and smoking. Although the publication period was not limited in this review, most studies were current.

The staging of the lesions proved to be relevant, with stages 1 and 2 being the most reported. A key issue that emerged is the delay in detecting the first signs of PUs, such as changes in skin color. This finding has significant implications for patient care, as it underscores the urgent need to understand the reasons for late detection. It is crucial to identify whether this is due to a lack of knowledge on the part of the professionals responsible for caring for patients about the warning signs of PU or a technical inability to identify them.

Considering that most lesions are acquired in hospitals and consequently increase the length of hospital stay and treatment costs, the later the lesion is detected and the intervention begins, the higher the expenses related to the therapy implemented<sup>37</sup>. Because of this, it is necessary to disseminate knowledge about tools that help professionals identify lesions early and start treatment, such as using the Braden scale, including assessing the reasons that led the patient to develop the wound since PUs are a preventable problem. It is necessary to understand the gaps in care that must be improved and optimized to qualify the care plan.

Another critical point was the length of hospitalization and ICU stay, identified as contributing factors to the development of PUs. The longer the hospital stay, the greater the chance of acquiring PUs. The literature shows that each day of hospitalization increases the chance of developing PUs by 3.5 times<sup>4</sup>.

In addition, the relationship between PU and ICU admission may be associated, in part, with the use of invasive medical devices and invasive mechanical ventilation (IMV) since this level of complexity is often related to patients in critical condition, hemodynamically unstable and with more incredible difficulty in making decubitus changes<sup>38-39</sup>.

As for the sites affected by the injuries (sacral, calcaneal, and gluteal), a similar result was obtained in a study that found that the sacral region was the most compromised due to the difficulty in decompressing the site, given that most hospitalized patients remain in the supine position for longer<sup>39</sup>.

Recently, during the COVID-19 pandemic, the literature detected a change in the location of PUs, which were more frequently reported on the face, head, elbow, chest, knee, ankle, and sacrum, with an increase in the incidence of unclassifiable PUs<sup>40</sup>.

This change in the anatomical region affected can partly be explained by the need to keep severe COVID-19 patients in the prone position for prolonged periods.

Skin damage in these patients has a complex etiology. It may be related to hypoxemia, mechanical ventilation, the use of devices, or a vascular event due to the COVID-19 infection. Using vasopressors can add barriers to blood flow to the epidermal layers. The combination of hypoxemia, vasoconstriction, and decreased blood flow through the dermal layer results in ischemia and tissue death with minimal exposure to pressure<sup>25,40</sup>.

Subepidermal temperature and humidity were relevant to PUs healing. Similar results were found in a systematic review of deep tissue injuries. The authors identified that the risk factors for developing and delaying healing include cold skin, fluid in the interstitial spaces, and longer capillary filling time<sup>38</sup>.

The literature has few studies describing the wound bed, and when they do occur, they are more frequent in animals and, more recently, in patients who have had COVID-19. The data found in this scoping review is like that. A randomized clinical trial on rats described



the appearance of stage 2 PUs, which were dark red, the skin around the wound was red, bleeding and exudate did not occur, with local pain<sup>40</sup>.

Colonization of bacteria in the reported wounds was also reported, the most common being *Corynebacterium spp.* and *Staphylococcus aureus*. Bacterial colonization does not necessarily influence the healing process. However, if there is a significant increase in the bacterial load, the lesion becomes infected. This process compromises healing and increases the presence of serous exudate, a change in the color of the wound bed, decreases the formation of granulation tissue, as well as other more common signs of infection, such as heat, redness, and edema, which also hinder the healing of the lesion<sup>41</sup>.

Although this scoping review is contemporary, it has significant limitations. Firstly, it highlights the heterogeneity of study designs, definition and evaluation of results, the small number of the population evaluated, and the insufficient follow-up time to determine causes and effects. Also noteworthy is the scarcity of studies evaluating the tissue viability of wounds and describing the lesions, studying the characteristics of the lesions according to the color/ethnicity of the population, and paying attention to the specificities of each one, which prevents the quantitative/qualitative evaluation of the grouped results. Therefore, there is a need for careful interpretation of the results.

From this perspective, the question, *“What structural/characteristic differences are described for PUs that developed in adults and the elderly?”* set for this study, cannot be answered due to the scarcity of research to support the arguments. More prospective studies are needed with a focus on establishing causation between the associated factors identified in previous retrospective studies and the need to look at tissue studies of the lesions. Prospective research should use samples with relevant statistical power and a sufficient follow-up period to determine the relationship between the results achieved.

## FINAL CONSIDERATIONS

From the results of this review, the evidence on the development and characteristics of PU in adults and the elderly in primary and tertiary care settings can be mapped. PUs developed during hospitalization, mainly in the ICU, with stage 2 staging and located in the sacral, calcaneus, and gluteal regions, with an average size of 27.8 cm<sup>2</sup>. The average length of stay until PUs developed was 11.4 days. Stage 3 lesions originated in the community, being more frequent in elderly people, and developed at home or in LTCFs.

Although the collection of recent studies that made up this review is considerable, there are few studies describing the characteristics of the lesions, such as the type of tissue and exudate present in the wound. The results can contribute to improving the knowledge of professionals on the subject, to improve care by understanding and identifying the patients most likely to develop PU, what the characteristics of the lesions are and thus invest in therapies that optimize the healing process, improve the quality of life of patients and reduce spending on wounds.

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