

Factors associated with delayed healing of skin lesions in a private hospital

Fatores associados à dificuldade de cicatrização de lesões cutâneas em um hospital privado

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ABSTRACT

Objective: to analyze factors associated with delayed healing of skin lesions in a private hospital. **Methods:** this is an observational, retrospective study including patients with skin lesions of any etiology. Data were extracted from electronic medical records using a semi-structured tool that captured sociodemographic and clinical characteristics and therapeutic management. Multiple binary logistic regression models were applied in standard form and with Firth penalization. **Results:** the sample included 78 patients (mean age 46.3 years), with a predominance of females. Hard-to-heal lesions were most common and were typically traumatic, small in size, and located on the lower limbs. Pain was reported, along with abundant purulent or seropurulent exudate. The most frequent interventions were mechanical debridement, cleansing with a polyhexamethylene biguanide solution, and the use of antimicrobial dressings. **Conclusion:** wound recurrence and the presence of purulent/seropurulent exudate were significantly associated with delayed healing. **Contributions to practice:** these findings reinforce the importance of ongoing, detailed wound assessment to identify risks early and optimize therapeutic management.

Descriptors: Nursing; Wounds and Injuries; Health Profile; Measures of Association; Hospitals, Private.

RESUMO

Objetivo: analisar os fatores associados à dificuldade de cicatrização de lesões cutâneas em um hospital privado. **Métodos:** estudo observacional e retrospectivo, incluindo pacientes com lesões cutâneas de qualquer etiologia. A coleta foi realizada em prontuários eletrônicos, por meio de instrumento semiestruturado que contemplou caracterização sociodemográfica e clínica, além da conduta terapêutica instituída. Aplicaram-se modelos múltiplos de regressão logística binária, nas formas padrão e com penalização de Firth. **Resultados:** a amostra incluiu 78 pacientes, com média de idade de 46,3 anos e predominância do sexo feminino. Prevaleram lesões de difícil cicatrização, de etiologia traumática, pequeno porte, localizadas em membros inferiores. Houve relato de dor e exsudato abundante, de aspecto purulento ou seropurulento. A conduta mais frequente foi o desbridamento mecânico, a higienização com solução de polihexametileno biguanida e o uso de coberturas antimicrobianas. **Conclusão:** a recidiva da ferida e a presença de exsudato purulento/seropurulento associaram-se de forma significativa à dificuldade de cicatrização. **Contribuições para a prática:** os achados reforçam a importância da avaliação contínua e detalhada das feridas para identificar precocemente riscos e otimizar as condutas terapêuticas.

Descritores: Enfermagem; Ferimentos e Lesões; Perfil de Saúde; Medidas de Associação; Hospitais Privados.

Introduction

A skin lesion is a loss of skin integrity, classified by etiology, degree of contamination, tissue involvement, and healing trajectory⁽¹⁾. Conditions such as prolonged pressure, excessive moisture, friction, shear, physical trauma, vascular alterations, infection, and the use of medical devices compromise the body's protective barrier and quality of life, and may lead to pain, infection, increased morbidity, longer hospital stays, and death⁽²⁾.

Common risk factors for the development of skin lesions include advanced age, immobility, malnutrition, and chronic comorbidities such as diabetes mellitus (DM), hypertension, and vascular insufficiency⁽³⁾. Severe clinical presentations and the absence of preventive measures further worsen the problem and hinder tissue recovery.

In Brazil, an estimated 3% of the population experiences a skin lesion at some point in life⁽³⁾. Epidemiological data indicate a high frequency across all levels of care, with the greatest incidence in hospitals — especially among critically ill patients or those with multiple comorbidities⁽⁴⁾.

Nursing plays a central role in preventing lesions and promoting uncomplicated recovery. Grounded in technical and scientific evidence, nurses deliver comprehensive, patient-centered care⁽⁵⁾. This care, however, is influenced by the specific features of the care setting. Unlike public hospitals, private hospitals have distinct structural, organizational, and care characteristics (eg, patient sociodemographic profile, financing models, and available resources) that can directly affect healing processes⁽⁶⁾.

This study is warranted by the need to understand the prevalence of, and factors associated with, difficult-to-heal skin lesions in private hospitals, considering patient clinical profiles and available therapeutic resources — an area still underexplored in literature. Analyzing this context broadens understanding of clinical and contextual determinants of healing

and provides practical input to improve care and support decision-making by nurses and multiprofessional teams.

Accordingly, the objective of this study was to analyze factors associated with delayed healing of skin lesions in a private hospital.

Methods

This observational, retrospective study was conducted from September 2024 to September 2025 under a technical cooperation agreement between the *Universidade de Pernambuco* (Petrolina campus) and *Unimed Vale do São Francisco Hospital*.

The sample consisted of clinical records obtained from medical charts. We included records of patients of any sex and age with skin lesions of any etiology who were treated at the service during the period from 2023 to 2025. Records with missing data on key variables that precluded analysis were excluded.

Data were collected using a semi-structured instrument developed by the investigators according to a schedule agreed upon with the service. The instrument was adapted from a tool previously used in public-sector studies on the same topic⁽⁷⁾, underwent internal review by the Skin Management Committee, and, after approval, was used in the study. National and international classifications aligned with wound-care practice were also adopted⁽⁸⁻⁹⁾.

Variables of interest included: 1) patient profile — sex, age (years), place of birth, marital status (married, single, widowed, divorced), and employment (yes/no); 2) clinical characteristics — comorbidities (hypertension, diabetes mellitus), risk factors (physical inactivity, obesity), allergies (food, drug, topical), and wound pain assessed by the Numeric Rating Scale, the Visual Analog Scale, and the Behavioral Pain Scale, which are widely used to measure pain intensity in a standardized manner⁽¹⁰⁾; 3) wound characteristics — etiology (traumatic, vascular, diabetic, surgical), size (small: <50 cm²; medium: >51 cm² and <150

cm²; large: >151 cm² and <250 cm²; extensive: >251 cm²)⁽¹¹⁾, location, duration (acute: ≤6 weeks; hard-to-heal: >6 weeks)⁽¹²⁾, recurrence (yes/no), and exudate — amount (none, low, moderate, high) and appearance (serous, sanguineous, serosanguineous, purulent, seropurulent). Exudate classification followed international wound-assessment protocols in which amount and appearance indicate inflammatory status and possible infection⁽¹³⁾; 4) therapeutic management — debridement (yes/no), type (mechanical, autolytic, conservative sharp), and use of antimicrobial dressings (yes/no).

Statistical analyses were performed in Stata 16.0. First, variables were summarized as absolute and relative frequencies for categorical data and as measures of central tendency and dispersion for numerical data. Factors associated with difficult healing were examined using binary logistic regression. Independent variables were selected by a stepwise procedure with an entry criterion of $p < 0.10$. Clinically relevant variables were considered for the outcome; in the final adjusted model, wound recurrence and purulent exudate appearance were retained. Multicollinearity among predictors was assessed using the variance inflation factor.

Because of the sample size, we conducted a sensitivity analysis using Firth's penalized logistic regression to reduce small-sample bias and address quasi- or complete separation, which can produce inflated or infinite odds ratio (OR) in standard logistic regression. Robustness was assessed by comparing OR and their 95% Confidence Intervals (CI) between the standard and Firth models. Statistical significance was set at 5% (two-sided $p < 0.05$).

The study complied with Resolution 466/12 of the Brazilian National Health Council and was approved by the Research Ethics Committees of the *Universidade de Pernambuco* and the *Centro de Saúde Integrado Amaury de Medeiros* (opinion no. 6,136,747/2023; Certificate of Presentation of Ethical Appreciation no. 68735423.7.0000.5191).

Results

The sample included 78 patients records. Females predominated, and the mean age was 46.3 years. Most patients were born in Bahia, were employed, and were single (Table 1).

Table 1 – Sociodemographic characteristics of patients treated at a cutaneous wound clinic. Petrolina, PE, Brazil, 2024

Variables	n (%)
Age*: Mean ± SD = 46,3 ± 21,0; 95% CI (41,6-51,1)	
Sex	
Female	40 (51.2)
Male	38 (48.7)
Place of birth	
Pernambuco	27 (32.6)
Bahia	47 (60.2)
Other (Piauí, Paraíba)	4 (5.1)
Employment	
Yes	55 (70.5)
No	23 (29.4)
Marital status	
Married	22 (28.2)
Single	48 (61.5)
Widowed	4 (5.1)
Other (divorced)	2 (2.6)
Not reported	2 (2.6)

*SD: Standard deviation; CI: Confidence interval

Table 2 summarizes the patients' clinical profiles and wound characteristics. Among comorbidities, hypertension was most prevalent; among risk factors, obesity predominated. Of the recorded allergies, drug allergy was the most frequent. Most patients reported wound pain. Regarding wound profile, traumatic lesions predominated; they were mainly located on the lower limbs, small in size, in a hard-to-heal phase, without recurrence, and presented abundant exudate with a purulent/seropurulent appearance.

Table 2 – Clinical characteristics of patients and wounds at a cutaneous wound clinic. Petrolina, PE, Brazil, 2024

Variables	n (%)
Hypertension	25 (32.1)
Diabetes mellitus	21 (26.9)
Obesity	12 (15.4)
Drug allergy	16 (20.5)
Pain at the wound site	42 (53.8)
Traumatic wound etiology	42 (53.8)
Small wound size	59 (75.6)
Lower-limb location	46 (59.0)
Hard-to-heal duration (> 6 weeks)	45 (57.7)
Wound recurrence	16 (20.5)
High exudate amount	49 (62.8)
Purulent/seropurulent exudate	46 (59.0)

Regarding therapeutic conduct, 44 patients (56.4%) underwent debridement; among these, the mechanical type was the most frequent, in 29 cases (65.9%). For cleansing, 0.9% normal saline was used routinely in all patients; a polyhexamethylene biguanide solution was also predominantly used 65 (83.3%). For topical therapy, most patients received antimicrobial dressings 40 (51.2%).

Factors associated with hard-to-heal lesions are shown in Table 3. Patients with wound recurrence had higher odds of difficult healing ($p = 0.002$). Lesions with purulent/seropurulent exudate also had higher odds of difficult evolution ($p = 0.015$).

Table 3 – Factors associated with difficult healing in a cutaneous wound clinic. Petrolina, PE, Brazil, 2024

Variable	Standard logistic regression		Firth logistic regression	
	OR (95% CI)	p-value	OR (95% CI)	p-value
Wound recurrence	19.86 (3.24–121.62)	0.001	13.57 (2.71–68.11)	0.002
Purulent/seropurulent exudate	9.70 (1.50–62.64)	0.017	7.74 (1.50–40.07)	0.015

OR: Odds ratio; CI: Confidence interval

Discussion

We observed a predominance of females. Although the literature describes a higher prevalence of wounds in men^(3,14), women are increasingly represented in this setting^(1,15). Men may be more likely to seek care sporadically and in severe situations, whereas women may do so preventively and in acute presentations⁽¹⁶⁾. The predominant age group indicates a socially active sample in which wounds significantly affect quality of life⁽¹⁷⁾.

Most patients were employed. Individuals with wounds often experience social and occupational repercussions as well as stress and anxiety⁽¹⁸⁾.

Hypertension and diabetes mellitus were the most frequent comorbidities, consistent with the literature. Both are recognized risk factors for the development of skin lesions and for delayed healing because they alter tissue perfusion, immunity, and local inflammatory processes⁽¹⁹⁾. In the hospital setting, these conditions contribute to wound chronicity and recur-

rence, underscoring the need for ongoing interventions to reduce complications⁽²⁰⁾. Although less prevalent in our sample, obesity can act as a risk factor for the development and persistence of lesions by impairing vascularization and limiting mobility⁽¹⁵⁾.

Among recorded allergies, drug allergy was most common. This finding calls for careful selection of systemic or topical antimicrobials and of dressings impregnated with active agents, which may provoke adverse reactions and worsen the condition, given variability in cytotoxicity and sensitization risk⁽¹⁴⁾.

Most lesions had a traumatic etiology. National and international evidence identifies accidental events, advanced age, reduced mobility, and use of invasive devices as common causes⁽²¹⁾. Traumatic lesions associated with fractures and surgical management are more prone to complications such as deep infection and delayed healing, and may become persistent⁽²²⁾.

Wound size is a potential contributor to complications. Among lesions classified as small, 62.86% were considered hard to heal. Comorbidities, local in-

fection, and inadequate care can prolong healing even in smaller wounds⁽²³⁾.

Pain at the wound site was recorded in 53.8% of cases. As a subjective experience, pain may reflect clinical factors (active inflammation) and psychological factors (low self-esteem, apathy, lack of motivation)⁽²⁴⁾. Management falls to nursing, using pharmacological measures (prescribed analgesics) and non-pharmacological strategies (integrative and complementary practices), including during dressing changes, to reduce discomfort and support procedure success⁽⁸⁾.

High exudate volume and purulent appearance were frequent, conditions that generally indicate complications such as stalled tissue repair or local infection. In these cases, targeted assessment and the use of antimicrobial dressings and highly absorbent materials are indicated⁽⁸⁾.

In this study, debridement was the main therapeutic approach, with mechanical debridement predominating. Aimed at removing nonviable tissue to promote regeneration, debridement is within the legal scope of nursing practice when indicated⁽⁶⁾. Even so, despite regulatory support, many professionals report insecurity in performing all techniques, suggesting training gaps and the potential underuse of a relevant therapeutic resource⁽²⁵⁻²⁶⁾.

For wound cleansing, polyhexamethylene biguanide solution was most commonly used; for topical therapy, antimicrobial dressings predominated. This pattern has been frequent in wound care owing to its effectiveness in reducing microbial burden and alleviating pain, helping to prevent and manage infection and, consequently, to support healing⁽²⁷⁾.

Regarding factors associated with difficult healing, we observed higher odds of unfavorable outcomes in wounds with recurrence and in those with purulent exudate.

Recurrence corresponds to the reappearance of a lesion at a previously healed site, generally related to the persistence of risk factors or etiologies that hinder repair, such as chronic disease, ischemia, and

infection⁽²⁸⁾. Low treatment adherence may also contribute. Therapeutic success requires attentive nursing care and patient adherence to guidance to enable uncomplicated tissue restoration⁽²⁹⁾.

Purulent exudate is commonly indicative of infection. Lesions that fail to progress according to the care plan and persist beyond 6 weeks are classified as hard to heal, a condition that increases infection risk⁽²²⁾. In such cases, appropriate treatment selection and wound-bed preparation are essential, with emphasis on cleansing, debridement, edge remodeling, and choosing the most suitable dressing⁽³⁰⁾.

Current topical management of cutaneous infections employs dressings with antimicrobial agents — such as chlorhexidine digluconate, povidone-iodine, polyhexanide, hypochlorous acid, and silver — which help reduce microbial burden and support healing⁽³⁰⁾.

Study limitations

This research is limited by the description of some variables of interest, which may be incomplete, vary in clinical characterization, or be subject to documentation errors in the medical record. In addition, the sample derives from a single service in the interior of Pernambuco which, although a reference center for this topic, does not allow the conclusions to be extrapolated to other regions of the country or to international contexts.

Contributions to practice

The findings underscore the importance of continuous, detailed assessment of skin lesions, with a focus on early risk identification and optimization of therapeutic management. This approach helps minimize recurrence and improves professional care and patient guidance aimed at preventing infection. Identifying factors associated with difficult healing can inform managers and practitioners in defining quality indicators, allocating resources, and shaping institutional policies focused on patient safety and improved care.

Conclusion

There was a high prevalence of hard-to-heal skin lesions. Traumatic lesions predominated; they were small, located on the lower limbs, and frequently presented abundant purulent/seropurulent exudate. Recurrence was associated with impaired healing, and the presence of purulent/seropurulent exudate also increased the likelihood of unfavorable healing outcomes.

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Authors' contributions

Conception and design or data analysis and interpretation; drafting the manuscript or critical revision for important intellectual content; responsibility for all aspects of the work, ensuring the accuracy and integrity of any part of the manuscript: Silva RG. Drafting the manuscript or critical revision for important intellectual content; responsibility for all aspects of the work, ensuring the accuracy and integrity of any part of the manuscript: Dias LAS, Andrade TMN, Dias ML, Góis ARS. Conception and design or data analysis and interpretation; final approval of the version to be published; responsibility for all aspects of the work, ensuring the accuracy and integrity of any part of the manuscript: Fernandes FECV. Conception and design or data analysis and interpretation; drafting the manuscript or critical revision for important intellectual content; final approval of the version to be published; responsibility for all aspects of the work, ensuring the accuracy and integrity of any part of the manuscript: Mola R.

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