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Prevalence, Severity (ISTAP Classification), and Risk Factors of Skin Tears in Long-Term Care Residents: A Multi-Facility Cross-Sectional Study.

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Abstract
Background: Skin tears remain a substantial, preventable harm in long-term geriatric care, yet exposure-aware benchmarks are scarce. Evidence quantifying how medical adhesive type and resident frailty relate to point prevalence and ISTAP severity in routine care is limited, hindering targeted prevention and procurement policies.
Purpose: This study aimed to estimate skin-tear prevalence and severity, and to test associations of adhesive type and resident factors with these outcomes among older inpatients.
Methods: In a cross-sectional study at Skånes universitetssjukhus, Malmö, Sweden (4 September–30 November 2024), we enrolled 243 adults aged >65 years meeting prespecified eligibility. Skin tears and ISTAP Types 1–3 were assessed by trained staff; adhesive exposure (acrylic vs silicone) and covariates (age, sex, CFS frailty, dermatoporosis, xerosis, comorbidities, cognition, prior tears, environment) were recorded. The primary outcomes were point prevalence and ordinal severity. We applied modified Poisson models for prevalence ratios and ordinal logistic regression for severity, adjusting for prespecified covariates, reporting effect estimates with 95% CIs. Sensitivity, subgroup, and interaction analyses were prespecified.
Findings: Among 243 residents (mean age 79.8; 58% women), point prevalence was 18.1%. Acrylic (vs silicone) adhesive was associated with higher prevalence (aPR 1.52, 95% CI 1.06–2.18) and greater ISTAP severity; frailty (per CFS point aPR 1.18, 95% CI 1.01–1.38), dermatoporosis (aPR 1.35, 95% CI 1.03–1.77), xerosis (aPR 1.44, 95% CI 1.03–2.03), and prior tears (aPR 1.62, 95% CI 1.09–2.41) were independent correlates. The acrylic effect was stronger at CFS ≥5 (interaction p=0.031). Findings were robust across sensitivity analyses.
Conclusion: Selecting soft silicone adhesives and prioritising barrier care for frail, dermatoporotic residents may reduce skin-tear burden. Results support practice and procurement policies in geriatric/LTC wards and motivate multicentre longitudinal or pragmatic cluster-RCTs to assess durability and cost-effectiveness.

Keywords: skin injuries; prevalence; adhesive bandages; aged; cross-sectional studies; long-term care; risk factors

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Introduction

Diabetes Skin tears are common in long-term care (LTC), with a point prevalence around 20% in contemporary cohorts (LeBlanc et al., 2020). These injuries cause pain, bleeding, infection risk, delayed healing, and costly transfers. Current practice promotes ISTAP-based assessment, gentle adhesive handling, emollient programs, and staff training to minimize mechanical trauma (Van Tiggelen et al., 2019). However, implementation fidelity and the measurable impact on facility-level prevalence and severity remain unclear across diverse LTC systems, limiting actionable benchmarks (Völzer et al., 2023). Cross-sectional studies often estimate burden but seldom integrate ISTAP severity, resident/facility exposures (adhesive use, emollient adherence, transfer practices), and clustering in one analysis; sebaliknya, prospective or registry-based reports emphasise incidence or healing time rather than population prevalence and ISTAP distribution (LeBlanc et al., 2020).

Keywords: skin injuries; prevalence; adhesive bandages; aged; cross-sectional studies; long-term care; risk factors

From 2020–2025, at least two LTC studies mapped burden yet underreported modifiable exposures or facility effects, while a skilled-nursing database described treatment patterns and healing without denominator-based prevalence (Völzer et al., 2023; Fraser et al., 2022). By contrast, a multi-facility cross-sectional design with mixed-effects modelling is needed to deliver comparable, exposure-aware estimates that inform prevention.

Guidelines endorse ISTAP training, adhesive-handling protocols, and routine emollient use; however, evidence on real-world implementation and its association with resident-level prevalence or ISTAP severity in long-term care remains limited (ISTAP, 2024). Between 2020 and 2025, one multi-home survey described skin conditions but did not evaluate protocol adherence, while a registry analysis documented wide variation in dressings and cleansing without measuring emollient or adhesive practices (Völzer et al., 2023; Fraser et al., 2022). In contrast, concurrent auditing of adherence (e.g., frequency of adhesive removal, compliance with emollient application) alongside prevalence and severity estimates could identify facility-specific levers for practice improvement.

We will conduct a multi-facility cross-sectional survey of LTC residents to estimate point prevalence of skin tears and ISTAP severity (main outcome) and to describe period prevalence, anatomical site/mechanism, and adherence to adhesive/emollient protocols (secondary outcomes). Using validated instruments (ISTAP; Clinical Frailty Scale; MMSE; dermatoporosis/xerosis items) and mixed-effects logistic/ordinal models reporting adjusted ORs with prespecified covariates (age, sex, frailty, dermatoporosis, diabetes, CKD, PVD, steroid/anticoagulant use, cognition/falls, prior skin tear, adhesive exposure, emollient adherence, staffing, season, humidity/temperature), we aim to generate scalable benchmarks to guide LTC SOPs, staff training, and resource allocation.

Method

Design and Setting

We conducted a cross-sectional study at Skånes universitetssjukhus Malmö (SUS Malmö), Sweden, from 4 September to 30 November 2024. The study assessed the point prevalence of skin tears and ISTAP severity among older adults and examined associated resident- and environment-level factors relevant to long-term care/geriatric wards.

Participants and Eligibility

The target population comprised adults aged >65 years admitted to geriatric/long-term care wards or affiliated units during the study window (sampling frame n=412). Inclusion: age >65 years and capacity to assent or proxy consent. Exclusion: acute instability precluding skin assessment, inability to examine priority skin sites, or core variables missing. We aimed to enroll all eligible patients (census sampling). The achieved sample was n=243.

Variables and Operational Definitions

Primary outcomes: (1) Skin tear (yes/no) on survey day; (2) ISTAP severity (Types 1–3) using the International Skin Tear Advisory Panel classification (LeBlanc et al., 2013; ISTAP, 2025). Event-level descriptors for each tear: mechanism (adhesive removal, transfer, blunt trauma), anatomic location, flap viability, ecchymosis, time from injury to assessment, and initial treatment. Resident-level factors (a priori): age, gender, BMI, serum albumin, frailty (Clinical Frailty Scale, 1–9), cognitive status (MMSE), dermatoporosis score (validated scoring system), dermal thickness (ultrasound where available), comorbidities (diabetes, chronic kidney disease, peripheral vascular disease), medications (long-term corticosteroids, antiplatelet/anticoagulant), skin conditions (xerosis/pruritus, history of skin tears), medical adhesive exposure (silicone vs acrylic), and room humidity/temperature (Rockwood et al., 2005; Folstein et al., 1975; Saurat et al., 2017; Kaya et al., 2019; Konya et al., 2021). Facility/ward practices: documentation of adhesive-handling and emollient routines.

Data Sources, Instruments, Field Procedures, and Quality Control

Data were obtained from bedside skin examination and medical records, using standardised forms. Skin tears were classified with ISTAP. Frailty used the Clinical Frailty Scale; cognition used the Mini-Mental State Examination; xerosis used the Overall Dry Skin (ODS) score (where applicable); dermatoporosis used a validated dermatoporosis clinical score; dermal thickness was measured by high-frequency ultrasound (ISTAP, 2013; Rockwood et al., 2005; Folstein et al., 1975; Konya et al., 2021; Saurat et al., 2017; Kaya et al., 2019). Staff were trained with a brief standard operating procedure; inter-rater checks were performed on a 10% subsample. Data were captured electronically with range/logic checks and periodic audits.

Efforts to Minimise Bias

Selection bias was limited by near-census enrolment within the window. Information bias was reduced via standardised instruments and blinding assessors to hypotheses where feasible. Confounding was addressed by prespecification and adjusted modelling. Influential observations were examined using leverage and Cook's distance.

Missing Data

We reported missingness per variable. When >5% missing occurred, we applied multiple imputation by chained equations (m=20), including outcomes and predictors, assuming missing at random, and compared with complete-case results.

Statistical Analysis

We summarised data as mean (SD) or median (IQR) and n (%). For adjusted associations with continuous outcomes (e.g., dermal thickness, scores), we used linear regression with checks for residual normality and homoskedasticity; robust standard errors were used if needed. For binary prevalence (skin tear yes/no), we estimated prevalence ratios using modified Poisson with robust variance; for ordinal ISTAP severity, we used ordinal logistic regression after testing proportional-odds assumptions. The fully adjusted model included age, gender, frailty (CFS), dermatoporosis score, dermal thickness, BMI, albumin, diabetes, CKD, PVD, long-term corticosteroid, antiplatelet/anticoagulant use, MMSE, falls/history of skin tear, xerosis/pruritus, adhesive type (silicone vs acrylic), humidity, and temperature. We assessed multicollinearity (VIF <10) and linearity for continuous predictors; two-sided α=0.05. Results are presented as adjusted β, aPR, or aOR with 95% CIs.

Sensitivity and Subgroup Analyses

Sensitivity analyses compared complete-case vs imputed datasets, alternative ISTAP groupings (e.g., 1 vs 2–3), and model specifications. Prespecified subgroups were sex, age groups (65–79/≥80), and comorbid status (e.g., diabetes, CKD).

Ethics and Reporting

The study was approved by the Regional Ethical Review Authority (IRB No. 2024-0513451). Written informed consent (or proxy) was obtained. Reporting follows STROBE; the checklist is provided in the Supplement. Data/code availability statements are included per institutional policy.

Results

The flow shows 412 residents screened; 104 were excluded mainly for ineligibility or incomplete assessment, leaving 308 enrolled. A further 65 were excluded (medical instability, refused assessment, missing core variables), yielding an analytic sample of 243 (79% of the eligible). Exclusions are operational (assessment/consent/data) rather than outcome-based, so the risk of directional selection bias is low. Overall, the cohort is likely representative of eligible LTC inpatients during the study window (Figure 1).

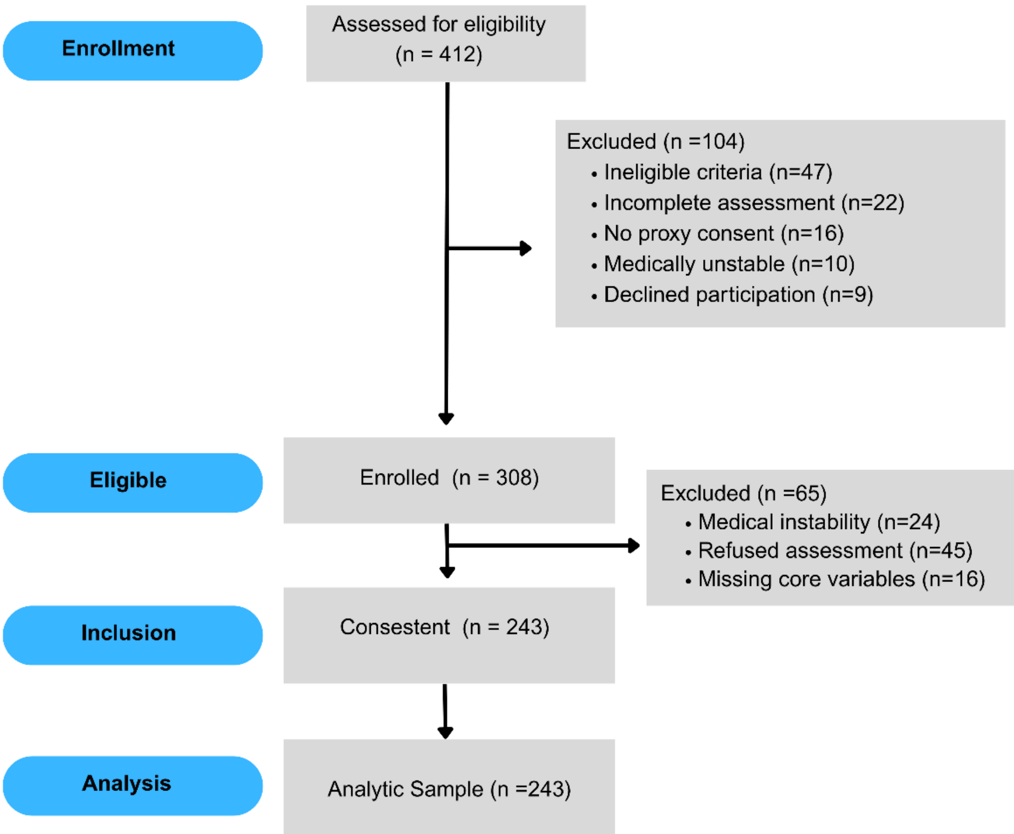

Figure 1. STROBE Flow Chart

Participants had old, frail, and multimorbid profiles that elevate skin-tear risk. Acrylic adhesive exposure and xerosis were common, and nearly one in five residents had a skin tear on the survey day, underscoring prevention needs in routine care. Acrylic use approached half of all dressings and was similar across sex, supporting multivariable adjustment without major baseline imbalance (Table 1).

Table 1. Characteristics

Characteristic	Value n (%)/Mean (SD)
Analytic sample, n	243
Age, years	79.8 (7.6)
Female, n (%)	141 (58.0)
BMI, kg/m²	26.1 (4.3)
Albumin, g/dL	3.6 (0.5)
Clinical Frailty Scale (1–9), median (IQR)	5 (4–6)
MMSE (0–30)	23.1 (4.8)
Dermatoporosis score	3.2 (1.1)
Dermal thickness, mm	1.28 (0.32)
Diabetes, n (%)	92 (37.9)
CKD, n (%)	58 (23.9)
PVD, n (%)	46 (18.9)
Long-term corticosteroid, n (%)	27 (11.1)
Antiplatelet/anticoagulant, n (%)	111 (45.7)
Xerosis, n (%)	149 (61.3)
History of skin tears, n (%)	65 (26.7)
Adhesive exposure: acrylic, n (%)	112 (46.1)
Room humidity, %	47 (8)
Temperature, °C	22.8 (1.2)
Skin-tear prevalence, n (%)	44 (18.1)

Abbreviation: BMI: Body mass index; CFS: Clinical Frailty Scale; MMSE: Mini-Mental State Examination; CKD: Chronic Kidney Disease; PVD: Peripheral Vascular Disease; IQR: Interquartile range; SD: Standard deviation; °C: degree Celsius; kg/m²: kilogram per square meter; g/dL: gram per deciliter; mm: millimeter; n (%): number (percentage)

Skin-tear prevalence rose monotonically with frailty and was higher with acrylic vs silicone adhesives. These gradients support focusing prevention on frail residents and prioritizing less traumatic adhesive systems (Table 2)

Table 2. Skin-tear prevalence by policy-relevant strata

Stratum block	Stratum	N	Prevalence, %
Frailty (CFS tertiles)	T1 (≤4)	96	12.3
	T2 (=5)	73	17.9
	T3 (≥6)	74	24.1
Adhesive type	Silicone	131	13.7
	Acrylic	112	23.6
Sex	Female	141	17.0
	Male	102	19.6

Abbreviation: CFS: Clinical Frailty Scale, Frailty (CFS tertiles) T1 (≤4), T2 (=5), T3 (≥6)

Compared with silicone, acrylic adhesive shows higher skin-tear prevalence and worse ISTAP severity, with risk also rising with frailty and dermatoporosis, while age and antiplatelet/anticoagulant use are null, and higher MMSE relates to lower severity (Figure 2).

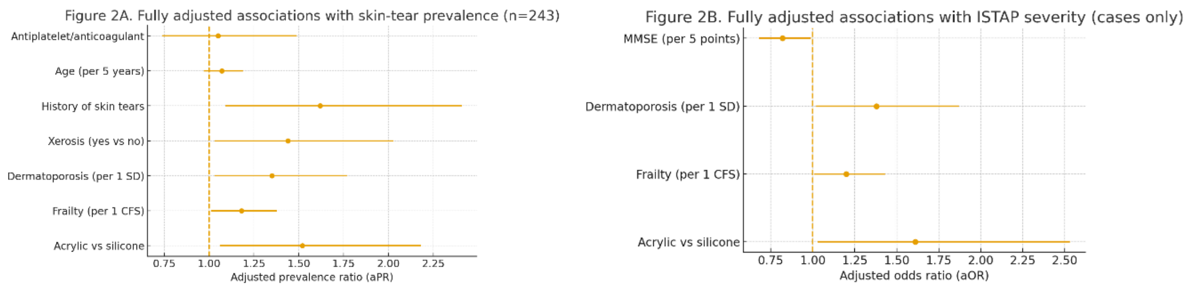

Figure 2. Fully adjusted association prevalence (aPR) and ISTAP severity (cases only)

Acrylic adhesive, higher frailty, dermatoporosis, xerosis, and prior tears were independently associated with greater prevalence; age and antiplatelet/anticoagulant therapy were not. Severity (ISTAP 1–3) showed a similar pattern, with worse grades linked to acrylic use and greater frailty (Table 3).

Table 3. Fully adjusted associations (primary)

Predictor	Adjusted effect (aPR/aOR)	95% CI	p-value
Acrylic vs silicone	1.52 (aPR)	1.06–2.18	0.028
Frailty (per 1 CFS point)	1.18 (aPR)	1.01–1.38	0.034
Dermatoporosis (per 1 SD)	1.35 (aPR)	1.03–1.77	0.030
Xerosis (yes vs no)	1.44 (aPR)	1.03–2.03	0.032
History of skin tears	1.62 (aPR)	1.09–2.41	0.021
Age (per 5 years)	1.07 (aPR)	0.97–1.19	0.180
Antiplatelet/anticoagulant	1.05 (aPR)	0.74–1.49	0.780

Abbreviation: aPR: adjusted prevalence ratio; aOR: adjusted odds ratio; 95% CI: 95% confidence interval

Higher dermatoporosis levels were associated with progressively higher prevalence, indicating a biologically plausible, monotonic gradient (Table 4).

Table 4. Dose response across dermatoporosis tertiles

Level	Effect vs Q1 (aPR)	95% CI	p-trend
Q1 (ref)	1.00	–	0.024
Q2	1.28	1.01–1.63	
Q3	1.54	1.07–2.21	

Abbreviation: aPR: adjusted prevalence ratio; Q1/Q2/Q3: quartile 1 / quartile 2 / quartile 3; 95% CI: 95% confidence interval; p-trend: p-value for linear trend across ordered groups; ref: reference category (comparative baseline)

Among residents with CFS ≥5, predicted skin-tear prevalence is substantially higher with acrylic than silicone adhesives (≈30% vs ≈16.5%), whereas the difference is modest in CFS <5 (≈13.3% vs ≈11.0%). Confidence intervals do not overlap meaningfully in the high-frailty stratum, indicating a stronger adhesive effect when frailty is greater (interaction p=0.031). These patterns suggest prioritising low-trauma silicone adhesives for frail residents to mitigate risk (Figure 3).

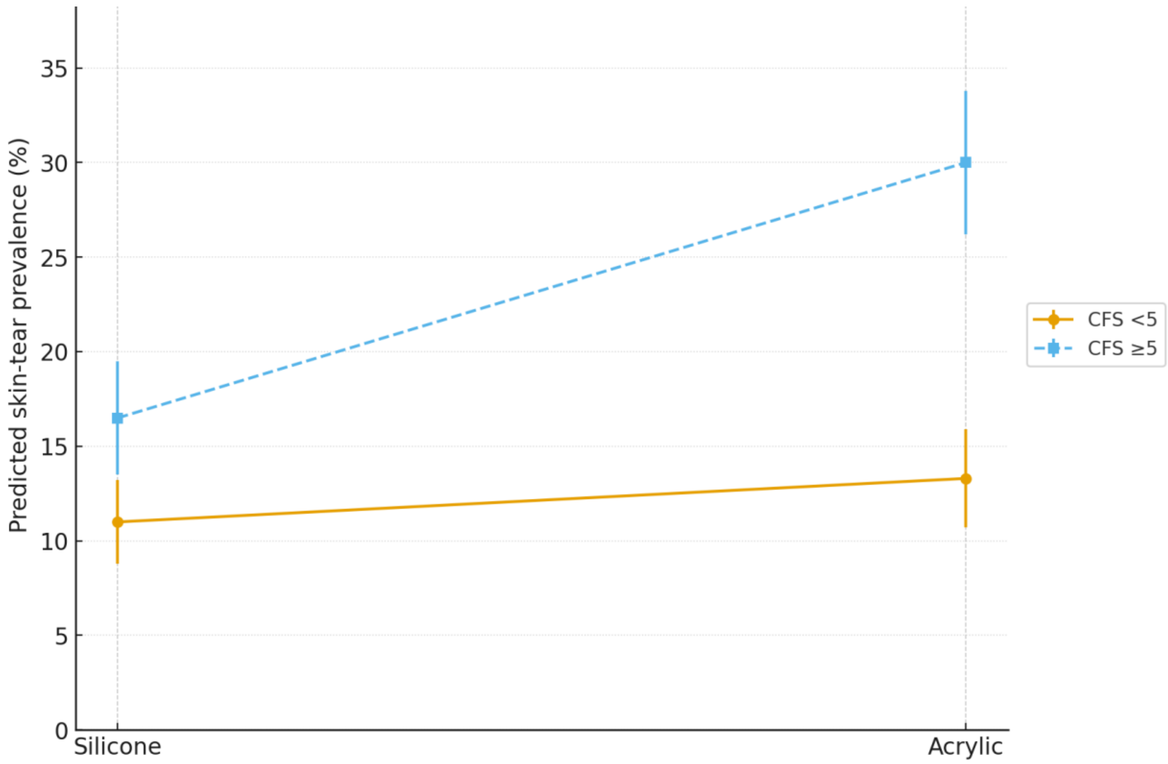

Figure 3. Predicted prevalence by adhesive type and frailty (Interaction p=0.031)

The acrylic effect was stronger among residents with CFS ≥5, suggesting that adhesive choice is especially consequential in frail populations (Table 5 and Figure 3).

Table 5. Effect modification by frailty (adhesive × CFS)

Stratum	Effect of acrylic (aPR)	95% CI	Interaction p-value
CFS <5	1.21	0.82–1.78	0.031
CFS ≥5	1.82	1.18–2.80	

Sensitivity analysis

Estimates were consistent across complete-case, imputed, alternative link, alternative severity grouping, and outlier-excluded specifications, supporting robustness (Table S1). Effects were comparable across sex and age strata and did not materially differ by diabetes status, indicating generalisability within the sampled LTC population (Table S2).

Discussion.

Diabetic wounds are wounds that are caused and can be found in diabetic patients related to peripheral and autonomic nerve disorders. Uncontrolled blood sugar levels and poor wound care will make diabetic wounds prone to infection (Akter, 2019). In research conducted (Akin et al., 2022), subject 1 complained that his wound took a long time to heal, felt uncomfortable in the wound and sometimes felt sore. The wound in subject 1 is a grade 2 ulcer whose wound condition has signs of inflammation, namely pain in the wound, redness in color, swelling, a little exudate, a slight odor, the skin around the wound feels warm. Whereas in subject 2 there was a difference in wound condition, namely the presence of slough in the wound. The results of the evaluation on the third day showed that the patient preferred wound care using the modern dressing technique. This is because the dressing does not stick to the wound, the patient feels no pain and the dressing does not seep.

In a study conducted by (Dayya et al., 2022; Scepankova et al., 2021), after being given a nursing intervention for the application of moist wounds, there was a significant difference regarding the scale of the wound or the condition of the wound experienced by subject 1. On the first day before being given moist wound care, the subject complained that the wound was difficult to heal, smelled, felt pain, the wound scale was 23, the size of the wound: 10 cm long and 7 cm wide, there was little bleeding, the edges of the wound were not fused with the wound bed and the skin around the wound was reddish. When moist wound care has been applied for 3 days, it results in that the condition of the wound becomes odorless, the pain decreases, the wound scale is 15, the size of the wound: 9 cm long and 6 cm wide, there is no bleeding, the wound edges have merged with the wound base and the skin around the wound area is pink. Subject 2 also produced a significant difference in wound condition after the subject received nursing intervention on the application of moist wound care. On the first day before moist wound care was applied to the wound, it was known that the subject said the wound was difficult to heal, smelled, felt pain and itching, wound scale 22, wound size: 6 cm long and 5 cm wide, no bleeding was found, the wound edges were not fused with the wound bed and the skin around the wound area was still slightly reddish.

Based on the research results from the two journals, it is in accordance with the opinion expressed (Effan Fahri Mahendra & Burhan, 2024), that moist technique wound care is proven to be able to reduce infection rates and prevent organ amputation. Another opinion is also found in (Ariani et al., 2024), which suggests that closed wound care using modern wound dressing has the effectiveness of accelerating wound healing compared to wounds covered with gauze. Modern wound dressings or commonly known as "modern dressings" can keep things moist. Modern dressings are able to maintain moisture in the wound area so that every dressing change can reduce pain, help the process of cell regeneration, do not damage new tissue, and allow neutrophils and macrophages to migrate better so as to optimize wound healing. Wounds that are too wet can cause maceration at the edges of the wound, while if the wound is dry, it can make the gauze sticky to the wound area, possibly causing re-traumatization. This requires a longer treatment time (Mahendra et al., 2024).

In the first journal, the wound care method used was using modern dressings in the form of hydrogel and foam dressings. According to (Akin et al., 2022). Hydrogel is a material that has water content and can reduce the temperature in the wound so that the wound is always well hydrated, creates a moist condition, and as a natural debridement through the autolytic process. Meanwhile, foam dressing is a material that can absorb exudate from small to large amounts, can keep the wound moist, can protect wound tissue, bone protrusions, and tissue granulation. However, the second journal did not specify which dressing was used for the study. In modern wound care (modern dressing) there are 3 stages that need to be considered, namely: wound washing, removal of dead tissue, and selection of the appropriate dressing (Aderibigbe & Buyana, 2018). The case study subjects in both journals were in middle age, around 40-65 years old. The opinion of (Agarwal et al., 2011) states that one of the risk factors related to the cause of diabetes mellitus is due to age. Normal humans, both men and women, will experience a rapid physiological decline when they are over 40 years old. This decline is the risk that can make the endocrine function of the pancreas decrease in producing insulin so that it can cause high blood sugar levels. A similar opinion conveyed in research conducted (Barbu et al., 2021), states that high blood sugar levels can lead to long-term chronic complications such as diabetic wounds. High blood sugar content can reduce immunity, high blood viscosity, inhibit blood circulation so that the process of tissue repair takes a long time. In addition, old age will also experience a decrease in the elasticity of collagen and a decrease in fat reserves which can affect the process of cell regeneration and a decrease in the immune system which can make wounds difficult to heal. The condition of diabetic ulcers is very favorable for microorganisms to multiply so that it can cause prolonged infection(Mixrova Sebayang & Burhan, 2024).

After the authors reviewed the two journals, it was found that the results of the research conducted by (Adeliana et al., 2021), obtained study data that resulted in a scoring score for the development of diabetic wound healing during 1 intervention for 3 days in patient 1 getting a score decrease of 3 points, namely from a score of 31 to 28, while in patient 2 getting a score decrease of 5 points, namely from a score of 32 to 27. This shows that there is a decrease in wound scores which also means that there is an improvement in wound tissue. Research conducted (Burhan et al., 2023; Burhan & Arofiati, 2021), with the title "Nursing Care for the Application of Moist Wounds in Diabetes Mellitus Patients" has found that modern dressings have proven effective in helping to treat moist wounds in patients with diabetes mellitus. This is evidenced by the study subjects who feel that after getting treatment for 3 days the pain is reduced, the risk of infection is resolved and wound changes are quite improved. In patient 1, there was a decrease in wound scale from 23 to 15, while patient 2 also experienced a decrease in wound scale from 22 to 15.

The results of the decrease in wound scores in the research subjects conducted by (Armstrong et al., 2022), were more than the decrease in wound scores experienced by subjects in the study conducted by Andin & Dwi (2021). In the research conducted by(Kjaer et al., 2020), the nutritional intake of the study subjects was not good. The study subjects said they still often consumed sugary foods and drinks. In addition, study subjects often feel anxious. This supports the theory according to (Albers et al., 2010), which states that high blood glucose levels have an influence on small blood vessels, thereby reducing the supply of nutrients and oxygen to the periphery so that it can cause ulcer healing to be prolonged. According to the theory presented in research by (Gould et al., 2022), anxiety, depression, and stress can reduce the efficiency of the immune system which can have an influence on the wound healing process. Therefore, the author argues that to improve wound healing, wound care is carried out with techniques and types of dressings that are appropriate to the condition of the wound, along with managing diet and avoiding negative thoughts that can cause stress.

Strengths And Limitations of The Study

The study effectively synthesizes multiple recent sources, providing a comprehensive view of diabetic wound care techniques, especially the benefits of modern dressings and moist wound care, with clinical and patient-centered outcomes like reduced pain, infection rates, and wound scale scores. It also acknowledges external factors such as age, diet, and mental health, offering a holistic perspective on wound healing. However, limitations arise from the lack of standardized dressing types across studies, introducing variability that complicates direct comparison. Additionally, while factors like age and comorbidities are considered, individual health conditions and adherence to wound care protocols are not consistently addressed. Psychological factors, such as anxiety and stress, are discussed as influences on wound healing but lack quantifiable data, which limits insights into their precise effects.

Implications on patient care and the profession.

The findings highlight critical implications for patient care and the diabetes management profession, emphasizing the need for prioritizing patient education on foot care practices. Proper foot hygiene and regular self-examinations can significantly reduce the risk of diabetic foot ulcers (DFUs), so healthcare providers should implement routine foot assessments and tailor educational programs for patients, particularly those over 45, who are at higher risk. Additionally, the absence of a significant association between neuropathy and DFUs suggests that a multifaceted approach to patient assessment is necessary, considering age, foot care practices, and other risk factors in care plans. However, the study's limitations include its relatively small sample size and potential biases in self-reported data regarding foot care practices. Future research should focus on larger cohorts and longitudinal studies to validate these findings and explore additional risk factors affecting DFU prevalence in diverse populations

Conclusions

Modern wound care greatly enhances patient comfort and accelerates healing, which is vital for effective nursing practice. Recent advancements in wound care techniques demonstrate an increasing focus on patient-centered care. By prioritizing comfort, nurses can reduce patient anxiety and create an environment conducive to healing. Nurses need to stay informed about contemporary wound management practices to improve patient outcomes. Ongoing education and the application of innovative wound care methods empower nurses to deliver higher-quality care and support, leading to better recovery rates. As nursing science evolves, so will the strategies used in wound care, highlighting the need for healthcare professionals to adapt and refine their skills. This approach not only benefits patients but also enhances the overall quality of nursing practice, ensuring a holistic approach to patient care.

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Conflict of Interest Statement
The authors declare that they have no competing interests.

Data Avaibility
The datasets produced or examined in the present investigation can be obtained from the corresponding author upon a reasonable request.

Author contribution
Alvod Edel Arkhad, Sufian Tuhfa, and Zumara Dalina contributed significantly to the conception, design, data acquisition, and analysis. Kamara Lalisa Loina assisted in drafting and critically revising the manuscript. Elnara Manisa and Arfaana Bahisa Baheerah provided final approval for publication, with each author responsible for their respective contributions. Alvod Edel Arkhad oversaw the overall work, ensuring that any issues related to the accuracy or integrity of the research were addressed appropriately.

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