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Risk of skin tears associated with nursing interventions: A systematic review

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ABSTRACT

Background: Skin tears are a significant problem for patients and healthcare professionals. They can cause pain, impact quality of life, and become chronic and infected. The risk of skin tears is associated with dependence in daily life activities and with nursing interventions.
Objectives: To examine which nursing interventions increase the risk of skin tears.
Design: Systematic review. Data sources: The MEDLINE, CINAHL, Scopus, and Cochrane Library databases were searched in March 2022.
Publication years: Publications included were from 2012 to 2022.
Results: Seventeen articles were included in the final analysis reporting nursing interventions associated with the risk of skin tears. Hygiene with cold water and soap, not applying leave-on products to moisten/protect dehydrated skin, and wearing short sleeves were found to be associated with skin tears. Transferring patients into and out of bed in a rough manner and wearing jewelry or long nails can increase the risk of skin tears. Removal of adhesive dressings or bandages can also cause skin tears.
Conclusion: Nursing staff need to know which interventions put their patients at risk of skin tears and which interventions are recommended to prevent skin tears. Nursing care can affect the health of the patient's skin.

1. Introduction

Skin tears are defined as "traumatic wounds caused by mechanical forces, including removal of adhesives. Severity may vary by depth (not extending through the subcutaneous layer)" [1]. They can occur as "partial thickness wounds with separation of the epidermis from the dermis or as full thickness lesions with separation of both the epidermis and the dermis from underlying structures " [2,3]. Skin tears are initially acute wounds that heal quickly but can also become chronic, especially in people with pre-existing comorbidities or when a misdiagnosis or mismanagement cause the development of secondary infections [4]. Skin tears penetrate the dermis, containing nerve endings, causing pain [4]. Pain associated with other factors such as stress, chronic or disability conditions, dependence on others, or hospitalization can impact quality of life [1,4].

The prevalence of skin tears has been studied in different contexts. In long-term care it varies from 2.23 to 92%, in the community from 4.5 to 19.5%, in acute cases from 6.2 to 11.1%, and in palliative care from 3.3 to 14.3% [1]. The prevalence is unknown in the ICU and the operating room [1]. Prevalence is highest in the oldest age groups, infants, and young children, and critically or chronically ill patients [1]. Skin tears can occur anywhere on the body, but the extremities are most affected [5–7], for the largest anatomical exposure to trauma and for the thinning of blood vessel walls and the reduction of blood supply to the extremities [1].

Intrinsic and extrinsic factors increase the risk of skin tears [8,9]. Intrinsic risk factors include age and skin characteristics [9]. Skin with reduced epidermal-dermal cohesion; senile purpura, bruises, hematomas and cutaneous xerosis in the elderly predispose to the development of skin tears [10,11]. Other intrinsic factors identified are the female gender; the presence of sensory, motor and balance deficits; altered mental state; malnutrition and dehydration; the presence of

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edema; comorbidities [9]. Among the extrinsic risk factors for skin tears is dependence on others in activities of daily living [1]. Patients who require assistance in activities of daily living, such as mobility, washing, dressing, are more at risk of skin tears due to manipulation and forces or trauma [1]. Accidental falls are an additional extrinsic factor to consider, as falls can cause trauma to the skin [1]. Other extrinsic risk factors for the development of skin tears are the use of adhesives, aids (orthoses/prostheses), wheelchairs, and feeding tubes [7,9,12]. Among the extrinsic factors related to care by nurses or even family members, it is necessary to distinguish risk factors from protective factors. A risk factor is an aspect of personal behavior or lifestyle, a congenital or hereditary feature that, based on epidemiological evidence, is associated with a health condition [13]. A protective factor is associated with the prevention or alleviation of a health condition [13]. A nursing intervention could be a protective factor for skin health but can also be a risk factor if procedures, frequency, or products are inappropriately chosen.

To reduce the incidence of skin tears, it is necessary to know exactly which nursing interventions increase the risk of skin tears. The purpose of this review was therefore to examine which nursing interventions, particularly those related to hygiene and clothing, exercise, and adhesive dressings, increase the risk of skin tears [1,7].

The research question was " Which interventions and actions related to nursing care increase the risk of skin tears in patient populations admitted to acute care hospitals, nursing homes, and long-term care?"

2. Materials and methods

2.1. Design

A mixed methods systematic review according to JBI [14] and the systematic and integrative approach of Pluye and Hong, where studies conducted with different methods can answer the same research questions and be easily summarized [15].

The conduct and results of this systematic review are reported in line with the PRISMA guidelines and checklist (Preferred Reporting Items for Systematic Review and Meta-Analysis).

2.2. Search strategy

The systematic search was conducted on the following databases: MEDLINE (PubMed), CINAHL, Scopus, and Cochrane Library, to include a combination of databases and a nursing – specific database [16]. Language limit was not applied. Online translation tools and language skills of researchers were used during searching and screening. Database searches were conducted in March 30^{t} and 31, 2022.

The first and second authors conducted the research with the assistance of a library technician. The search terms, including free-text and indexed terms, were “skin tears,” “skin integrity,” “adhesive dressing,” “skin care,” “skin hygiene,” “device associated mobilization,” and “nursing care.” The Boolean operator OR was used to combine search terms of the same concept, and the Boolean operator AND was used to combine the concept. Supplementary File 1 shows the search strategy for MEDLINE (PubMed), CINAHL, Scopus, and Cochrane Library.

2.3. Studies selection

Items identified during the database search were imported into the reference management software Mendeley to perform duplicate removal. Duplicates were removed using the duplicate search function and manual search. Articles were then imported into Rayyan, a free web and mobile app, that helps expedite the initial screening of abstracts and titles using a process of semi-automation [17] First two authors (SC and BB) screened all the papers against the inclusion/exclusion criteria and selected the most appropriate papers. Any disagreements were resolved by consensus, and in case of disagreement, two reviewers (DB and ML) were consulted. The full texts of the selected articles were independently evaluated by the first two authors (SC and BB) against the inclusion criteria. Any disagreements were resolved by the other reviewers (DB and ML). Twenty-seven articles were excluded because they did not meet the criteria, were excluded studies investigated other types of lesions, non-skin tears, or the association between skin tears and other risk factors not related to nursing activities, such as the age of the patients or specific clinical conditions.

Studies were included if they met the following criteria:

- They addressed nursing interventions such as mobilization, hygiene, dressings, and adhesive dressings.
- Study design: systematic review, experimental or quasi-experimental studies, observational studies, qualitative studies.

Studies were excluded if they met the following criteria:

- Case series, editorials, expert opinions, studies on the development and/or validation of tools, reviews without method descriptions.

2.4. Data extraction

Included studies were analyzed and subjected to critical appraisal. Data extracted independently by two reviewers (SC and BB) were entered into the data extraction tables and, in case of discrepancies reviewed by other two reviewers (DB and ML). Extracted data included authors, title, year of publication, place of publication, purpose of the study, and results answering the study question (see Table 1 for data extracted). If information was unclear or missing, the corresponding authors of the published papers were contacted to fill in the gaps.

2.5. Quality assessment

Quality assessment was performed independently by two reviewers (SC and BB) and double-checked by two reviewers (DB and ML). Methodological quality was assessed using the Joanna Briggs Institute critical appraisal instrument appropriate for each study [18]. Critical appraisal tools included key criteria for assessing methodological rigor in the design and conduct of the studies included in the review. Each document was evaluated by considering the extent to which each criterion applicable to our study was met [18]. The criteria relating to the inclusion in the samples, the measurement of the variables/outcomes analyzed, and the methods used to analyze/combine the data, were considered essential for each type of study [18].

2.6. Summary of data

Results were presented in a narrative summary. Quantitative results of the reviewed studies were reported, with the statistical significance indicated in the results. Given the heterogeneity of the included studies, statistical data were not subjected to meta-analysis. The final synthesized results were divided according to nursing interventions associated with the risk of skin tears. Synthesis was performed by the first two authors (SC and BB), who compared the data to be reported. Disagreements were resolved by consensus and other two reviewers were consulted in the event of no agreement (DB and ML).

3. Results

A systematic database search identified a total of 1170 papers (381 in MEDLINE, 561 in CINAHL, 210 in Scopus, and 18 in the Cochrane Library). After duplicates were removed, 717 papers were analyzed by title, 224 papers were selected and analyzed by abstracts, and 45 papers were read in full. Seventeen papers were included in the review and analysis. Fig. 1 shows the review process using the PRISMA flowchart.

Table 1
Data extracted from the reviewed papers.

Title, first author, country, year	Aims	Method –Population	Nursing activities	Results related to the interventions/ nursing actions associated with skin tears
What is the impact of topical preparations on the incidence of skin tears in older people? A systematic review. Awank Baki, UK, 2021	To determine the impact of topical preparations on the incidence of skin tears in older people	Systematic review – Older people	Hygiene	The incidence of skin tears was reported in five studies: Bank and Nix (2006), moisturizing cream and shower gel against routine care; Birch and Coggins (2003), cleanser without rinsing against just soap and water; Carville et al. (2014), moisturizing lotion against habitual care; Hunter et al. (2003), moisturizing cream and shower gel against habitual care; Gillis et al. (2016), body wash with disposable gloves versus normal care. Forty-one percent (n = 333/812) of participants in the standard group developed skin tears, and 26% (n = 217/841) of participants in the treatment groups developed skin tears. A meta-analysis was undertaken to determine the OR of the development of skin tears in the standard groups versus treatment. The OR was 2.09 (95% CI: 1.67–2.63; p = 0.00001).
The impact of care practices and health demographics on the prevalence of skin tears and pressure injuries in aged care. Brimelow, Australia, 2018	To determine whether differences in care practices and demographics between two long-term aged care facilities affected the incidence of residents' skin wounds	A retrospective analysis of care plans and clinical outcomes at two aged care homes, Australia, was conducted for a six-month period in 2016 – Older people in LTC	Hygiene, clothing	A total of 75 skin tears were documented in residence 1 and 54 in residence 2. Skin tears were higher in residents whose care did not include the use of heel guards (U = 122, p = 0.040) and anti-embolic stockings (U = 95, p = 0.049). ANOVA showed that skin tears varied according to the daily use of emollients (F [4.77] = 2.79, p = 0.035). The use of emollients other than Sudocrem, Avagard, or a combination of Sudocrem and Avagard was associated with a higher incidence of skin tears (p = 0.013, 0.014, 0.036). The use of a daily barrier cream and/ or a moisturizer reduced the number of skin tears compared to other skin care products or none at all (p = 0.035).
The effectiveness of a twice-daily skin-moisturizing regimen for reducing the incidence of skin tears. Carville, Australia, 2014	To evaluate the effectiveness of a twice-daily moisturizing regimen as compared to "usual" skin care for reducing skin tear incidence	A cluster randomized controlled trial conducted across 14 residential aged care facilities in metropolitan Perth, Western Australia – Older people in residential aged care facilities	Leave-on products	The study intervention involved applying a standardized, commercially available, pH-neutral (pH 5–6) moisturizing lotion twice daily to the extremities of the body from top to bottom. A total of 424 residents developed skin tears: 172 (40.57%) residents were in the intervention group, and 252 (59.3%) residents were in the control group. A total of 1396 skin tears were recorded among the 424 residents (mean = 3.29 skin tears/resident, SD ± 3.99, range = 1–36). The resident with the most skin tears in the control group had 36, while the resident with the most skin tears in the intervention group had 26 skin tears over the six-month period. The monthly incidence rate in the intervention group was equal to 5.76 per 1000 bed days occupied; in the control group it was 10.57 per 1000 bed days occupied.
Hygiene and emollient interventions for maintaining skin integrity in older people in hospital and residential care settings. Cowdell, UK, 2020	Evaluate the effects of hygiene and emollient interventions for maintaining skin integrity in elderly people in hospital and residential settings	Systematic review – Older people in hospital and residential care setting	Leave-on products	Only one study, Carville et al. (2014), (N = 1164) considered the frequency of skin tears and reported a one-month incidence rate of 5.76 per 1000 beds occupied in the intervention group (moisturizer) compared with

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Table 1 (*continued*)

Title, first author, country, year	Aims	Method –Population	Nursing activities	Results related to the interventions/ nursing actions associated with skin tears
				10.57 in the control group ($p = 0.004$). Regular care plus the application of a commercially available, pH-neutral, fragrance-free moisturizer reduces skin tears compared to usual care.
Skin cleansing practices for older people: a systematic review. Cowdell, UK, 2015	To locate, summarize, and critically analyze current knowledge about skin hygiene practices for older people	Systematic review – Older people	Hygiene	Mason, comparing the use of an emollient antibacterial soap and a simple antibacterial soap among residents of a LTC facility, showed a rate of skin tears per resident per month down from 37% at month 2–33% per month. Birch and Coggins examined the effects of switching from using soap and water to a no-rinse bath formula on the appearance of skin tears and reported a decrease in skin tears from 13 to 1 in 10 weeks.
Skin tear prevention in elderly patients using twice-daily moisturizer. Finch, UK, 2018	To test the effectiveness of the twice-daily application of moisturizer to the extremities of elderly hospitalized patients in anticipation that a significant reduction in skin tears would be demonstrated	Prospective interventional study and results were compared to historical controls – Older people in acute-care setting	Hygiene	A non-scented, pH-friendly moisturizer was applied twice daily to the extremities. The mean monthly incidence rate in the intervention group was 4.35 per 1000 days in bed occupied (96 skin tears in 12 months), which was significantly lower ($p = 0.006$) than those found in the historical control group of 6.61 per 1000 days in bed occupied (89 skin tears in 6 months). The results indicate the effectiveness of twice-daily application of moisturizer to the extremities of elderly patients for the prevention of skin tears.
Prevalence of skin tears in elderly patients: a retrospective chart review of incidence reports in 6 long-term care facilities. Hawk, USA, 2018	To ascertain the prevalence of skin tears among the elderly in 6 LTC facilities in a region of southwestern Pennsylvania	Retrospective chart review design – Older people in LTC	Mobilization	The majority (111, 93%) had mobility limitations. Falls accounted for 38 skin tears (31.9%), followed by propelling in a wheelchair ($p = 0.008$). Regarding the two most common reasons for sustaining skin tears, the proportion of skin tears caused by falls was significantly greater than the proportion of skin tears caused by propelling in a wheelchair.
Ensuring healthy skin as part of wound prevention: an integrative review of health professionals' actions. Kennedy, Australia, 2018	Provide a synthesis of the best available recent primary or secondary research evidence on early preventative activities taken to increase skin health and reduce the incidence of facility-acquired skin tears and pressure ulcers in community, residential, and healthcare institutions	Systematic review – Healthcare professionals	Leave-on products	The use of nutrient-based skin care products or the twice-daily application of a commercially available, pH-neutral, odorless moisturizing lotion resulted in a significant reduction in skin tears and estimated cost savings of $44.10 per long-term facility resident (based on a two-week treatment estimate).
Maintaining skin integrity in the aged: A systematic review. Lichterfeld-Kottner, Germany, 2020	Summarize the empirical evidence about the effects and effectiveness of non-drug topical skin care interventions to promote and maintain skin integrity and skin barrier function in the aged, and to identify outcome domains and outcome measurement instruments in this field	Systematic review – Aged people	Hygiene, leave-on products	Skin cleansers containing syndets or amphoteric surfactants compared with standard soap and water improved skin dryness. Lipophilic leave-on products containing humectants decreased skin dryness and reduced pruritus. Products with pH 4 improved the skin barrier.
Risk factors associated with skin tear development in the Canadian long-term care population. LeBlanc, Canada, 2021	To examine the risk factors associated with skin tear development in the Ontario LTC population	A prospective study design – Older people in LTC	Mobilization	Dependence on others for ADL was associated with the risk of developing skin tears (higher ADL scores; RR = 1.13; 95% CI, 1.08–1.18; $p < 0.001$). Those who need care from others with ADL are hypothesized to be at higher risk due to a number of factors, including, but not limited to, the potential need for assistive devices, loss of flexibility resulting in difficulty in dressing, and need for assistance in bed transfer and movement.

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Table 1 (*continued*)

Title, first author, country, year	Aims	Method –Population	Nursing activities	Results related to the interventions/ nursing actions associated with skin tears
A descriptive cross-sectional international study to explore current practices in the assessment, prevention and treatment of skin tears. LeBlanc, Canada, 2014	Explore current practices in the detection, prevention, and treatment of skin tears	A descriptive, cross-sectional, online, international observation study – Healthcare professionals	Mobilization, adhesive dressing, hygiene	Respondents ranked equipment-related injuries, patient transfer, and falls as the top three causes of skin tears following dressing-related skin tears and skin tears related to routine activities such as dressing, bathing, repositioning, and transfers. The times when skin tears occur most are during peak activity hours of 6 a.m.–11 a.m. and 3 p.m.–9 p.m.
Prevalence of skin tears in a long-term care facility. LeBlanc, Canada, 2013	Investigate the prevalence of skin tears in long-term hospitalization (LTC)	A cross-sectional, quantitative study design – Older people in LTC	Mobilization, ADL dependence	Skin tears were caused by blunt force trauma associated with hitting objects and similar circumstances in 41 (36%), ADL in 22 (20%), and other causes in 9 (8%). Higher scores (indicating more severe deterioration in ADL performance) were associated with a higher risk of skin tears, as well as greater dependence on others for daily care ($\chi 2 = 53.903$; $p < 0.0001$). Individuals with high ADL scores were about three times more likely to have skin tears. No statistically significant relationship was found between wheelchair dependence and the presence of skin tears ($\chi 21 = 2.17$; $p = 0.14$).
Identification of risk factors associated with the development of skin tears in hospitalized older persons: a case-control study. Lewin, Australia, 2015	To identify the characteristics of older people that were strongly associated with an increased risk of developing a skin tear	A non-matched case-control study design was used to allow simultaneous investigation of multiple aetiologic factors – Older people in acute-care setting	Mobilization	The inability of patients to reposition themselves autonomously in bed was associated with the onset of skin tears RR 3.34 (2.21–5.06) $p < 0{\cdot}0001$. The mechanism suggested here is that in vulnerable individuals, exposure to repeated manual manipulation to aid in repositioning increases the potential for trauma to the skin.
Twice-daily moisturizer application for skin tear prevention among older adults in acute care. Mornane, Australia, 2021	Evaluate the impact of a commercially available skin and body lotion (MoliCare, Hartmann, Australia) to reduce skin tears among patients in two wards at St John of God Ballarat Hospital, Australia	Monocentric case-control observational study – Older people in acute-care setting	Leave-on products	Results show no statistically significant data or data trends suggesting that twice-daily application of moisturizer for the elderly has a direct impact on reducing the overall incidence of skin tears.
Skin tears and risk factors assessment: a systematic review on evidence-based medicine. Serra, Italy, 2017	To systematically evaluate the main risk factors involved in development of skin tears	Systematic review – Older people	Mobilization, adhesive dressing	History of falls, reduced mobility and consequent inability to perform ADL, and mechanical trauma have often been found in the medical history of patients with skin tears. Frictional forces associated with patient/ resident transfer activities and associated with wound dressings, adhesive plasters, or bandages may be responsible for the onset of skin tears. Skin tears can often occur when healthcare professionals manage patients or remove adhesive dressings because they apply external forces to the skin, especially in the elderly.
Incidence of skin tears and risk factors: a systematic literature review. Strazzieri-Pulido, Brazil, 2017	To identify and evaluate research on the incidence and risk factors associated with skin tears in adults and elderly persons	Systematic review – Adults and older people	Mobilization, adhesive dressing	The most frequently reported risk factors for skin tears were advanced age ($n = 4$), reduced mobility ($n = 3$), accidental falls and injuries ($n = 3$), history of skin tears ($n = 2$), cognitive impairment/dementia ($n = 2$), and transfer dependency ($n = 2$). Other risk factors cited included being bedridden, unable to change position, the use of wheelchairs, dependence in ADL, and the summer season. The incidence of skin tears was lower in winter (11%) than in summer (44%); this finding may be associated with wearing clothing that increases extremity exposure during the hottest

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Table 1 (*continued*)

Title, first author, country, year	Aims	Method –Population	Nursing activities	Results related to the interventions/ nursing actions associated with skin tears
				summer season. Most skin tears were caused by objects that fell on the legs or were out of sight.
The prevalence and associated factors of skin tears in Belgian nursing homes: A cross-sectional observational study. Van Tiggelen, Belgium, 2019	To determine the point prevalence of skin tears and to identify factors independently associated with skin tear presence in nursing home residents	A cross-sectional observational study was designed – Older people in nursing home	Mobilization, adhesive dressing	Dependence on transfers was associated with the development of skin tears ($\chi2 = 112{,}835$, $p < 0.001$). During transfer, skin lesions can be caused by medical devices, such as beds, bed rails, lifters, and casters, as well as the assistance of others. The use of adhesives/dressings was the factor most strongly associated with the presence of skin tears (OR = 7.05; 95% CI = 2.74–18.14; $p < 0.001$). In residents with adhesives/dressings on the extremities, the odds of having skin tears were 7.05 times higher than in residents without adhesives/ dressings. Removal of adhesive/ dressing can cause skin tears due to force applied to the skin surface.

Notes: $\chi2$: chi-square; DF: degrees of freedom; OR: odds ratio; CI: confidence interval; ADL: activities of daily living; RR: relative risk; LTC: long-term care.

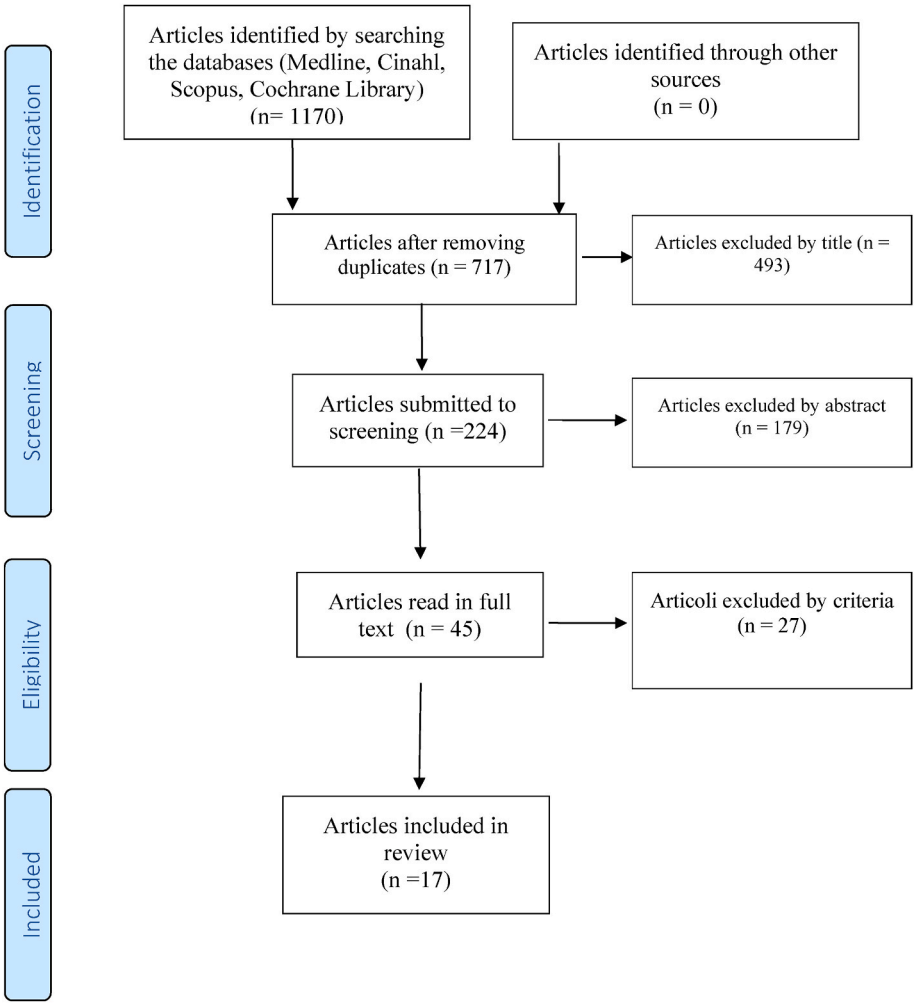

Fig. 1. Prisma flow chart of research process.

3.1. General description of the studies

The included studies were seven reviews [19–25], eight observational studies [4,12,26–31], and two interventional studies [2,32]. The methodological quality of the included articles overall was between moderate and high. All studies were published in the English language. Populations included in the studies were adult and older people [25], older people [19,20,23,24], older people in nursing homes/aged care facilities [2,12,31], older people in acute care settings [26,27,32], older people in long-term care [28–30], and older people in hospital and residential care settings [21]. Two studies explored healthcare professionals' practices [4] and actions [22]. In the papers included in this systematic review the risk of skin tears resulted related to skin hygiene [4,19,20,23,33]., skin care [2,21,22,26,31,32], patient dressing [4,25], adhesive dressing application [4,12,24], and patient transfer and mobilization [4,12,24,25,27–30].

3.2. Risk of skin tears related to skin hygiene

Skin care influences the onset of skin tears for both the actions associated with washing and the application of creams or other emollient products [4]. Regarding washing hygiene practices, three reviews report primary studies in which different actions, methods, products, and their results on skin tears were compared [14,23,33].

Awank Baki et al.'s review reports the comparison between the use of a moisturizer and a shower gel versus soap and water [5,19,34]; a no-rinse detergent against soap and water [30]; and disposable cloths versus soap and water [19,36]. Awank Baki et al. found that 41% (n = 333/812) of the participants in the standard group developed skin tears, and 26% (n = 217/841) of the participants in the treatment groups developed skin tears [19]. In Awank Baki et al.'s meta-analysis, the odds ratio of the standard groups versus the treatment groups was found to be 2.09 (95% CI: 1.67 to 2.63; p = 0.00001) [19].

Cowdell and Steventon reported how Mason [37] examined the use of non-softening soaps and softening soaps in residents of a long-term care hospital in a four-month longitudinal study in which the type of detergent changed over a period of months [20]. The rate of skin rupture when emollient soap was used was 37% at month 2 and 33% at month 4, with not statistically significant but clinically relevant reduction compared with the months with non-emollient soap [20,37]. From the study by Birch and Coggins [35], Cowdell and Steventon report that the no-rinse cleansing group at 10 weeks of the study reduced the number of skin tears from 13 to 1 [20,37].

Lichterfeld-Kottner et al. reported that the use of both emollient soaps and no-rinse cleansers reduced the risk of skin tears compared with bathing with regular soap and water [23]. The use of cleansers and wipes containing surfactants such as amphoteric or dimethicone and emollients has a positive effect on the skin and protects it from tearing. The protective mechanism is related to the increase in the integrity of the stratum corneum and the resulting greater resistance to disruption of the skin barrier [23].

3.3. Risk of skin tears related to the application of leave-on products

Among the nursing interventions associated with the risk of skin tears are those related to the application of leave-on products consisting of moisturizers, skin protectors/barriers, and other functions combined or not in a single product, including creams, emollients, and lotions, which are applied and remain on the skin [38]. In Finch et al.'s prospective interventional study, the effectiveness of applying a non-perfumed moisturizer with neutral pH to the extremities twice a day was investigated [32]. Overall, 762 eligible patients were enrolled in the intervention group, and their results were compared with 415 patients in the historical control group. In total, 104 patients developed at least one skin tear (intervention group: n = 60, control group: n = 44), and there were 185 skin tears overall. The mean monthly incidence rate in the intervention group was 4.35. per 1000 days in bed occupied (96 skin tears in 12 months), lower (p = 0.006) than the historical control group of 6.61 per 1000 days in bed occupied (89 skin tears in 6 months). The results demonstrate the risk of skin tears associated with non-application of moisturizer to the extremities of elderly patients [32].

Carville et al. conducted a randomized, cluster-controlled clinical trial comparing the twice-daily application of a standardized, commercially available, pH-neutral (pH 5–6) moisturizing lotion by applying it to the extremities of the body [2]. A total of 424 residents developed skin tears: 172 (40.57%) residents were in the intervention group, and 252 (59.43%) residents were in the control group [2,21]. A total of 1396 skin tears were recorded, with an average of 3.29 skin tears/resident (SD ± 3.99, range = 1–36) [2]. The resident with the most lesions in the control group had 36 skin tears, while in the intervention group the resident with the most injuries had 26 skin tears [2]. The monthly incidence rate in the control group was 10.57 per 1000 bed days occupied, and in the intervention group it was 5.76 per 1000 bed days occupied [2,21].

In a retrospective observational study conducted in two nursing homes, Brimelow and Wollin compared care and clinical outcomes through the analysis of care plans to determine whether differences in care practices affect the incidence of skin tears in residents [31]. A total of 75 skin tears developed in Home 1 and 54 in Home 2. ANOVA showed that skin tears varied according to daily use of emollients (p = 0.035). The use of a daily barrier cream and/or a moisturizer reduced the number of skin tears compared to other skin care products or none (p = 0.035) [31].

A single-center, case-control observational study conducted by Mornane et al. evaluated the impact of a skin lotion on the onset of skin tears among patients in two Australian wards [26]. The results were not statistically significant (p = 0.778), so they did not suggest that twice-daily application of moisturizer for older adults has a direct impact on reducing the overall incidence of skin tears [26]. Among the studies that met the inclusion criteria, Kennedy et al. reaffirmed how the application of nutrients, or the twice-daily application of a commercially available, pH-neutral, odorless moisturizing lotion leads to significant reduction in skin tears [22]. They also report an estimated cost savings, based on a two-week treatment, of $44.10 per long-term facility resident [22].

3.4. Risk of skin tears related to clothing

Strazzieri-Pulido et al.'s systematic review reports that the incidence of skin tears is higher in summer than in winter and links this finding to the wearing of clothing that increases extremity exposure during the hottest part of the year in summer [25]. LeBlanc et al. report how skin tears are related to dressing activities and reliance on others for dressing [4]. Abrupt maneuvers, bending or balance problems, or loss of flexibility in activities may be among the causes of injury [4].

3.5. Risk of skin tears related to adhesive dressings

Risk factors attributable to nursing interventions include the use of dressings and adhesive dressings [4]. Residents with adhesives/dressings on their extremities are 7.05 times more likely to have skin tears than residents without adhesives/dressings [12]. The use of adhesives/dressings was the factor most strongly associated with the occurrence of skin tears in Van Tiggelen et al.'s study (OR = 7.05; 95% CI = 2.74–18.14; p < 0.001) [12]. Removal of an adhesive/dressing may result in skin tears due to the force applied to the skin surface. When a dressing is removed, a force is applied to the skin that can be more damaging the more sensitive the skin is. The outermost layer of the epidermis may be inadvertently removed along with the dressing [12]. This frictional force may be associated not only with wound dressings, but also with the application of adhesive plasters or bandages, which can cause skin tears during removal, especially in people with sensitive skin

and in the elderly [12,24].

3.6. Risk of skin tears related to patient transfer and mobilization

In LeBlanc et al.'s international cross-sectional, online, descriptive observational study designed to examine practices in the assessment, prevention, and treatment of skin tears, respondents ranked equipment-related injuries, patient transfers, and falls as the top three causes of skin tears [4]. The moments when skin tears are most common are the peak activity times of 6:00 a.m. to 11:00 a.m. and 3:00 p.m. to 9:00 p.m., underscoring that the activity associated with helping patients can lead to skin tears [4]. In a cross-sectional observational study to determine the point prevalence of skin tears and identify factors associated with skin tears in nursing homes, transfer activities were associated with the development of skin tears ($\chi 2 = 112.835$, DF = 2, $p < 0.001$) [12]. During transfers, skin injuries can be caused by medical equipment, such as beds, bed rails, lifts, and wheelchairs, as well as the care provided by others [12,28,29]. Patient transfers can cause mechanical trauma or excessive frictional forces on the skin, resulting in skin tears [24,28,29]. In a case-control study, inability to position themselves in bed was associated with the occurrence of skin tears (<0.0001) [27]. In the study, the authors assume that in vulnerable individuals, repetitive manual manipulation to promote repositioning increases the risk of skin trauma and lacerations [27]. Hawk and Shannon reported in a retrospective observational study that the majority (93%) of people with skin tears had limited mobility [30]. Falls caused 31.9% of skin tears, followed by wheelchair use ($p = 0.008$) [30]. Risk factors most frequently cited in the reviews analyzed included limited mobility, falls, accidental injury, and dependence on transfers [24,25]. Other risk factors cited include bed confinement, inability to change position, use of wheelchairs, and dependence in activities of daily living [25].

4. Discussion

The aim of this systematic review was to assess how specific nursing interventions (hygienic care, the application of leave-on products, clothing, the application/removal of dressings) increase the risk for skin tear development. Most importantly, the included research shows that patients who depend on others for all or part of their care are at greatest risk for skin tears. Patients who are dependent on others often experience skin tears during activities of daily living, such as clothing, bathing, and repositioning/transferring, and the results of this systematic review are consistent with the results of wider literature [39]. Nursing interventions to care for the most dependent patients are related to hygiene, which is a major aspect of nursing care [20,21,24]. Findings suggest that one risk factor for skin tears is the use of hot water with harsh soaps for hygiene. For skin hygiene, the results of this systematic review suggest that caregivers should instead use lukewarm water with pH-neutral and hypoallergenic cleansers. Three systematic reviews report favorable results from studies that examined the use of cleansers or disposable wipes compared with routine care [19,20,23]. Awank Baki et al.'s meta-analysis shows a significant result in favor of alternative interventions to soap and water ($p = 0.00001$) [19]. Washing with aggressive products is a risk factor that promotes epithelial cell loss, especially in elderly patients who have senile purpura, bruising and hematoma, cutaneous xerosis, or lower skin resistance to trauma [10,11]. The results of this systematic review suggest that when it comes to hygiene, it is advisable to choose a gentle cleanser [10,11]. Lichterfeld-Kottner et al. suggest that this has a protective effect related to increasing the integrity of the stratum corneum and the resulting greater resistance to skin barrier disruption [23]. The nurse, nursing assistant, or healthcare professional should avoid friction and shear and be careful to use good manual handling techniques. Patients should be encouraged to self-hygiene and use gentle touch when washing [1].

The results of this systematic review suggest that skin hydration is a risk. According to the retrospective study by Brimelow and Wollin, daily use of an emollient on dry skin reduces the incidence of skin tears [31]. The results are consistent with the study by Woo and LeBlanc, who hypothesize an effective reinforcement action of the skin barrier function by moisturizing products [40]. Carville et al. demonstrated the protective effect of a moisturizing regime consisting of two applications per day of a neutral emollient product, defined as a standardized, commercially available, pH-neutral (pH 5–6) moisturizing lotion, with a consistent reduction in skin tears [2]. Cowdell et al. are congruent with the study by Carville's findings on the effectiveness of using emollient products to treat xerosis and prevent possible skin tears. Therefore, not applying emollients to the skin, especially to the limbs, is an important risk factor for skin tears [21]. Skin care should be encouraged in appropriate patients, including the use of leave-on products consisting of moisturizers, skin protectors/barriers, and other functions combined or not in a single product, including creams, emollients, and lotions, which are applied and remain on the skin [38]. Skin care should be incorporated into the daily routine of patient care. If the patients are able to self-care, they should be educated in skin hydration and oral hydration [1].

Patients needing help in activities of daily living may have difficulty clothing themselves, and bending over can cause trauma lacerations because they lose their balance [4]. Assistance with clothing can also result in injury due to improper manipulation of the limbs [4]. It is therefore necessary to teach patients to sit while changing, to wear comfortable and safe footwear to avoid tripping, and to avoid sharp fingernails and jewelry [1,3]. Caregivers also need to be educated in this regard [1,3]. The use of short sleeves and increased skin exposure are also risk factors for skin tears, so it is important to encourage the use of long dresses and long sleeves. Positive and protective factors against skin tears associated with nursing interventions include the use of anti-embolic stockings, which are worn to reduce deep vein thrombosis, reduce exposure to shear factors, and protect the skin from tears [31].

Nursing interventions related to impaired mobility involving patient manipulation and the use of patient transfer aids and devices are among the activities most at risk of causing skin tears [12,25,27,30]. Activities related to mobilization may be as diverse as transfer from/to a sitting position from bed to chair or from chair to chair; transfer from/to a supine lateral position; repositioning in bed; repositioning in a wheelchair or other chair; transport in bed, on a stretcher, or in a wheelchair; supporting the patient while walking; or supporting the patient who has fallen to the ground [1]. During transfer, skin lesions can be caused by medical devices, such as beds, bed rails, lifters, and wheelchairs, as well as by carers [12]. Patient transfer activities can cause mechanical trauma because the patient may hit metal parts, the bed, aids, or walls, or they can cause excessive frictional force on the skin, resulting in tearing [24,25,27,30]. During mobilization, the nurse, assistant nurse, or caregiver should encourage active patient involvement, reducing manipulation and patient transfer aids use. To reduce the risk of skin tears, mobilization, transferring, and repositioning must be performed with safe patient handling and equipment [1]. Preventative mechanisms should include padding bed rails, wheelchair arms, and legs as well as wearing long sleeves, pants, and gloves whenever possible to provide extra protection [41]. It is important to select and use aids appropriately and to involve the patient in a fall and injury prevention program, which includes the removal of obstacles and the right lighting [1,41].

Among nursing activities, the application of adhesive dressings and bandages is another risk factor for skin tears, removal of an adhesive/dressing may result in skin tears due to the force applied to the skin surface [12,24]. From the studies reviewed, even when this force does not produce a clearly visible lesion, detachment of different amounts of cell layers of the epidermis always occurs [12,24]. Repeated application and removal of the adhesive material compromise the barrier function of the skin [12,24]. This frictional force may be associated not only with wound dressings but also with the application of adhesive plasters or bandages [12,24]. Adhesive-induced skin tears are more common in patients in extreme life situations, such as the elderly and premature

infants [12,24]. The literature reports a lack of knowledge among healthcare professionals regarding the recognition of patients at risk for adhesive skin tears, in terms of their treatment and management [12, 24]. To avoid skin tears due to adhesives, dressings, bandages and tapes, Leblanc et al. recommend marking the dressing with an arrow to indicate the correct direction of removal, possibly using adhesive solvents during removal, removing the adhesives slowly, and protecting the skin with a barrier product or emollients [1]. LeBlanc et al. they also recommend replacing adhesive dressings with silicone tape and cohesive sealing dressings [1].

4.1. Limitations

MEDLINE, CINAHL, Scopus, and Cochrane Library were searched, but it is possible that some studies may not have been identified, but the use of a systematic mixed method approach with a comprehensive search strategy ensured that the widest possible research was undertaken, and all relevant studies identified. We accepted systematic reviews and randomized controlled trials to keep the level of studies high, but we also included observational studies that provide lower level of evidence. Our goal was to investigate, in a review of several available studies, care interventions that are associated with the risk of skin tears. For this purpose, broad inclusion criteria were used, and mixed method systematic review approach was used. This approach is limited compared to the methods for carrying out systematic reviews according to the Cochrane Collaboration [42]. Mixed methods approach integrating results from different studies provides a useful and complete framework for those dealing with patients at risk of skin tears or having to make choices regarding the location of the resources.

5. Conclusion

The results of the review highlight how nursing interventions can impact the risk of skin tears. Nurses, assistant nurses, and caregivers who care for dependent people in activities of daily living or who educate people about self-care should consider the findings of this review. For this reason, the results of this systematic review suggest that using cold water and soap in hygiene, not applying leave-on products to moisten/protect dehydrated skin, leaving the limbs uncovered with short sleeves, and manipulating and transferring patients into or out of bed put the skin at risk of tears. At the organizational level, the nursing staff must be educated on the knowledge and prevention of skin tears.

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Declaration of competing interest

None.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jtv.2022.11.006.

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