

## REVIEW

# What is the evidence on skin care for maintaining skin integrity and prevention of wounds? An integrative review

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## Abstract

**Aim** To synthesise evidence regarding skin care to maintain skin integrity and prevent wounds.

**Methods** An electronic search of key terms (skin care or skin integrity) was undertaken of articles published between 1 January 2018 until 30 September 2023. A narrative integrative review synthesised results.

**Results** In all 73 articles met the inclusion criteria. The topics included cleansers, moisturisers, and/or barrier products (n=33), health service interventions related to skin care (n=15), and the impact of dressings on skin integrity (n=12). Eight encompassed multiple interventions, three examined self-management and two foot skin care.

**Conclusion** Strong evidence on skin management to prevent wounds is limited. Moderate evidence supported the use of mild, non-alkaline cleansers and low pH moisturisers with humectants to improve skin integrity and prevent skin tears; in addition to prompt cleansing, use of topical barrier leave-on products and absorbent products to prevent incontinence-associated dermatitis. The choice of prophylactic dressing is not a one-size-fits-all decision but rather a nuanced clinical decision that must consider the specific needs and circumstances of each patient. Use of person-centred care, evidence-based interventions by healthcare providers, and involvement of the interprofessional teams emerged as central themes of skin care for prevention of wounds.

**Keywords** moisturisers, prevention, skin care, skin integrity

**For referencing** O'Brien J, Parker CN, Bui U, MacAndrew M, Mitchell J, Finlayson K. What is the evidence on skin care for maintaining skin integrity and prevention of wounds? An integrative review. *Wound Practice and Research*. 2024;32(1):25-33.

**DOI** <https://doi.org/10.33235/wpr.32.1.25-33>

Submitted 15 February 2024, Accepted 28 February 2024

## Introduction

The skin, comprising 15% of the body weight,<sup>1</sup> is the largest organ of the body and plays a multifaceted role in safeguarding the body against various hazards, facilitating thermoregulation, sensory perception, and contributing to vitamin D production.<sup>2</sup> Beyond its physiological functions, the significance of skin extends to well-being and self-image, influencing both mental and physical health<sup>3</sup>.

Skin in certain age groups, such as neonates and older people, is susceptible to damage from changes in the environment and health conditions. The skin of neonates has thinner layers of epidermis, dermis and hypodermis with a higher pH than mature skin and continues to develop in the first few months of their life.<sup>4-6</sup> Premature

infants are at even higher risk due to less connective tissue between the epidermis and dermis and exposure to medical tapes and devices.<sup>5</sup> As we grow older, this largest organ of the human body also undergoes chronological ageing leaving the skin less elastic and moisturised with reduced adipose tissue, which can be exacerbated by the lifelong consequences of the environment.<sup>7,8</sup> Exposure to excessive moisture or dryness, or mechanical trauma triggers such as shear and pressure, can lead to wounds, such as skin tears and pressure injuries.<sup>4,8,9</sup>

Conducting a comprehensive, holistic assessment of the skin and maintaining ongoing monitoring and reassessments allows health professionals to tailor interventions to promote skin integrity based on individual needs. The term 'skin frailty' or 'frailty syndrome' compared to skin integrity is an emerging

concept that has been growing in significance and serves as an umbrella concept, encapsulating vulnerabilities that pose a threat to the skin without necessarily resulting in wounds.<sup>10</sup> Frailty syndrome is often accompanied by symptoms of weakness, fatigue, anorexia, undernutrition, weight loss, low muscle mass, balance and gait abnormalities and severe deconditioning.<sup>10</sup> Skin frailty specifically acknowledges the skin as important, with a need to promote optimal skin care.<sup>10</sup> Risk factors for skin frailty include age, mobility issues, specific medical conditions, and chronic illnesses.<sup>10</sup> A person-centered, holistic strategy is advocated to address skin frailty, considering synergistic risk factors related to an individual's health and well-being.

The skin is resilient, resistant to injury and if injured, has an exceptional ability to repair itself and heal. Risk factors for loss of skin integrity include age, cognitive impairment, dehydration, poor nutrition, obesity, certain medications (e.g., immunosuppressives, anti-inflammatories, anti-coagulants), incontinence, chronic disease, critical illness, impaired mobility, impaired circulation, and radiation therapy.<sup>11</sup> The skin can become susceptible to breakdown, particularly due to excessive pressure, shear, friction, trauma or moisture and common injuries can range from minor scrapes, cuts, tears, blisters or burns to more serious wounds such as:

- Pressure injuries (PIs): “localised injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear and/or friction”<sup>12(p16)</sup>
- Skin tears: traumatic wounds as a result of shearing or friction forces which separate the epidermis from the dermis, or which separate both the epidermis and dermis from underlying structures<sup>13(p20)</sup>
- Leg ulcers: an ulcer on the lower extremity that has not healed and may be due to venous, arterial or mixed aetiology<sup>14</sup>
- Incontinence-associated dermatitis (IAD): “an inflammation of the skin due to contact with urine or stool”<sup>15(p2)</sup>

The excessive burden of the breakdown of skin integrity into these common wounds is highlighted internationally, with an estimated pooled prevalence for chronic leg ulcers of 0.32%,<sup>16</sup> incidence of pressure injuries varying across settings<sup>17</sup> and ranging from 3.3% to 12.8%<sup>17</sup>; and prevalence of IAD ranging from 4.3% to 21.3% within hospitals.<sup>18</sup> In 2023, Wilkie et al<sup>19</sup> highlighted the significant costs of wound care in Australia, and Queen and Harding (2023)<sup>20</sup> provided the estimates of wound care costs internationally being as high as US\$126,86 billion. These are mostly direct costs and don't consider indirect costs, such as travel and time off work and the huge impact that occurs on quality of life (QoL).<sup>19,20</sup> Chronic wounds significantly decrease QoL which has physical, social and psychological implications.<sup>21</sup>

This integrative review aims to highlight the current evidence on skin care strategies, which are aimed at the prevention of wounds. By understanding and addressing skin care within the context of a comprehensive, integrative approach, healthcare professionals can optimise outcomes for individuals with frail skin and impacts can be made for consumers, healthcare professionals and health systems.

## Method

A systematic approach was used to conduct the search for literature on skin care. The databases searched included CINAHL, Medline, Cochrane Library, Joanna Briggs Institute and PsychInfo. Professional organisation websites included: Wounds Australia, European Wound Management Association, National Pressure Injury Advisory Panel, European Pressure Ulcer Advisory Panel, International Wound Infection Institute, Wounds UK, Wounds International, Wound Healing Society, World Union of Wound Healing Societies, National Institute for Health and Care Excellence guidelines, Wounds Canada, Registered Nurses' Association of Ontario, Scottish Intercollegiate Guidelines Network, Association for the Advancement of Wound Care, and Wound, Ostomy, and Continence Nurses Society.

Keywords used to conduct the search were 'skin care' OR 'skin integrity' in title or abstract fields, with limiters of human research, peer reviewed research, and published in English between 1 January 2018 and 30 September 2023. This review updated earlier reviews and evidence summaries up to 2018.<sup>22</sup>

Inclusion criteria were evidenced-based guidelines or evidence summaries; systematic reviews; original research studies (including all quantitative or qualitative designs); or international consensus documents or position statements which were focused on skin care strategies aimed at maintaining skin integrity and preventing wounds. Only articles published in English were included. Exclusion criteria were case reports or case series, general literature reviews or educational articles, editorials, conference abstracts or proceedings, studies on dermatological diseases, studies on specialist skin conditions (e.g. peri-stomal skin), studies on cosmetic skin interventions, laboratory-based non-human studies, and studies which were already included in evidence-based guideline summaries or systematic reviews. One reviewer independently screened the titles and abstracts of all articles from the initial search, based on the inclusion criteria. Two reviewers double-checked the full text of final documents for eligibility for inclusion.

## Results

A total of 2778 papers were identified. After removing duplicates, the abstracts and titles were screened against the inclusion criteria: 73 articles were included in the final narrative synthesis. The designs and methods of data collection varied, including three best-practice guidelines, one consensus document, seven evidence summaries, 17 systematic/scoping or umbrella reviews, and 45 original

studies (18 randomised controlled trials (RCTs), 19 quasi-experimental, six descriptive and two qualitative studies). The included articles were varied regarding interventions, with the majority focused on cleansers, moisturisers or topical barrier products (n=33), and the next largest group on health service interventions related to skin care (n=15). Twelve studies considered dressings, two studies aimed to identify best evidence on foot care, and three studies focused on self-management. An additional eight articles explored multiple interventions. Further detail is provided below within each intervention theme. Results were grouped and reported under four domains which focused on the interventions studied:

- Cleansers, moisturisers and barrier products;
- Health service interventions;
- Dressings; and
- A group of study topics with limited study numbers.

#### Cleansers, moisturisers, and skin barrier products

The largest group of studies in this review (n=33) explored cleansers, moisturisers, and/or topical skin barrier products to protect and maintain skin integrity across the life span. Several studies (n=13) were conducted with neonates/infants, including those at high risk e.g., very preterm infants, as well as healthy term infants. They included two systematic reviews, a scoping review, eight RCTs, one quasi-experimental and one mixed methods survey study in both hospital and home settings.

The reviews covered the effect of topical oils on neonatal skin,<sup>23</sup> effect of skin care practices on healthy term babies' skin,<sup>24</sup> and a scoping review on skin care in neonates and infants.<sup>6</sup> The systematic review of topical oils (n=5683, mostly preterm infants) reported 11 of 14 studies were of moderate quality and found topical oils (sunflower (8), coconut (5), almond (2), olive (1), mustard (1), vegetable (1)) improved skin condition and barrier function of skin compared to 'standard care' or 'no oil application' groups.

A meta-analysis was not possible due to the variation in types of oils and outcome measures.<sup>23</sup> A systematic review on skin care for healthy term babies identified 26 studies, including 16 RCTs.<sup>24</sup> Eleven of the 20 quantitative studies were of moderate or strong quality. The authors concluded that there was no evidence of differences in outcomes (e.g., skin hydration, pH, skin assessment scores, erythema, colonization) between wash products and water, or baby wipes and water, and that use of emollients may help skin hydration.<sup>24</sup> Some small meta-analyses were undertaken however variations in outcome measures and interventions meant these were restricted to a maximum of three studies.<sup>24</sup> A scoping review of 42 studies<sup>6</sup> identified 13 skin care goals related to maintaining skin integrity and skin barrier function, with skin care interventions covering bathing/washing, wiping and topical leave-on products (e.g., emulsions, gels, oils). Many outcome domains were found (57), e.g.,

dryness, erythema, nappy/diaper dermatitis, oedema, excoriation, trans epidermal water loss (TEWL) and overall skin condition.<sup>6</sup> Eight RCTs investigated topical oils, baby cleansing wipes, timing of bathing, or timing of moisturising. Of these, five RCTs, (four with preterm infants, ranging from 72–995 participants) of sunflower seed oil, almond oil, liquid Vaseline, coconut oil, or a general moisturiser, all found improved skin hydration and condition or pH compared to the control groups.<sup>25–29</sup> Two studies explored the impact of baby cleansing wipes on nappy rash, one trial compared three different wipes, finding the one with fewest ingredients was associated with improved outcomes.<sup>30</sup> While a pre/post study of wipes containing grapefruit seed extract found decreased incidence and severity of nappy rash.<sup>31</sup> No differences in outcomes between four-day or two-day bathing groups were observed in a small RCT (n=32) with preterm infants, with regards to effects of bathing periods on skin condition and axillary skin colonisation.<sup>32</sup> An RCT with newborn infants (n=80) found waiting 10 minutes postbath before moisturising, in comparison to moisturising immediately after bathing, resulted in significantly improved skin moisture after 60 minutes.<sup>33</sup> The last study found in this group was a mixed methods survey (n=973) which established that 79% of parents cleansed with each nappy change. In cleansing 60% used water alone, while 23% used a baby wash liquid, 16% used baby wipes, 6% used baby lotion, 3% used soap and 2% used body wash liquid.<sup>34</sup>

Twenty documents were identified on cleansers, moisturisers, or barrier products for skin care in adults. Five systematic reviews were included, one on bed bath methods, three on cleansers and moisturisers, and one on topical aloe vera; in addition to a scoping review of absorbent products to prevent IAD. The review of bed bath methods (25 studies) concluded in a narrative synthesis that applying a hot towel helped protect the skin barrier function, and post-bath moisturiser contributed to skin integrity.<sup>35</sup> There was a broad range of outcome measures, ranging from skin characteristics to patient comfort and nurse satisfaction.<sup>35</sup>

Three systematic reviews evaluated the impact of cleansers and moisturisers on skin integrity in older adults. A review and meta-analysis of seven studies (mean sample n=275) included long-term care facilities, aged-care facilities, and rehabilitation centres. It found significantly reduced odds of skin tears in those receiving interventions, including body wash, no-rinse cleansers, emollient soap and moisturisers.<sup>36</sup> Another review in residential care settings (6 studies, n=1598) concluded that the studies provided only low quality evidence, with no conclusions.<sup>37</sup> The third review (of 63 experimental or quasi-experimental studies) concluded that low-irritant cleansers and leave-on products with humectants and low pH improved dryness and the skin barrier, and skin protection products helped prevent IAD.<sup>8</sup> This review, however, also found a large number of outcome measures and heterogeneity of study designs.<sup>8</sup> The review of aloe vera found only two older studies on prevention of

wounds (2003, 1996), with inconclusive results.<sup>38</sup> A scoping review (12 studies) explored the effect of absorbent products on skin integrity,<sup>39</sup> however reported insufficient evidence to support the effectiveness of one product category over another for maintaining skin integrity in persons with urinary or fecal incontinence.

Eight original research studies involving adults were identified: five RCTs, two pre/post quasi-experimental studies and an observational study. The RCTs found use of a mild cleanser and moisturiser improved dry skin compared to cleanser alone (n=52)<sup>40</sup>; a pH 4 emulsion accelerated skin barrier recovery compared to a pH 5.8 formulation in older adults (n=10)<sup>41</sup>; a hand cream for healthcare workers containing aluminum chloralhydrate improved skin integrity after two weeks of use, as assessed by a tool measuring erythema, dryness, itching, scaling, fissuring (n=60)<sup>42</sup>; and two trials found use of a skin barrier film around catheter insertion sites underneath transparent dressings resulted in significantly less skin integrity issues<sup>43</sup> or significantly reduced risk of skin tears.<sup>44</sup> A controlled experimental study of a pH-compatible cleansing cloth did not find any significant difference in development of pressure injuries,<sup>45</sup> while a small quasi-experimental study found use of a moisturiser with sunflower seed oil, panthenol and shea butter improved skin hydration in older adults.<sup>46</sup> The observational study found significantly higher trans-epidermal water loss (TEWL) and lower hydration after tape-stripping skin on heels in young healthy volunteers,<sup>47</sup> with no difference between application of moisturisers or emollients over a week, however there was no control group.<sup>47</sup>

There were several documents based on collated research: e.g. evidence summaries (n=5) and an expert consensus document (n=1). The evidence summaries provided information on cleansing practices in older adults, skin care to prevent skin tears in older adults, dry skin in older adults, skin hygiene to prevent skin tears in older adults, and skin care products for prevention and treatment of IAD.<sup>7,48–51</sup> The consensus document defined concepts, such as skin vulnerability, and recommended a comprehensive holistic skin assessment and a plan to address any risks by moisturising regularly; using pH balanced, perfume-free, liquid cleansers; reducing sun exposure/bathing frequency, avoiding hot water, and patting skin dry.<sup>52</sup>

The findings or recommendations regarding skin care are consistent in the evidence summaries, including:

- use mild, low pH (4-5) cleansers to decrease dryness<sup>7,49</sup>
- consider use of washcloth with cleansing, moisturising and protecting properties to treat IAD<sup>48</sup>
- use lipophilic moisturisers with humectants to decrease dryness<sup>7,49</sup> and prevent skin tears in older adults,<sup>50</sup> twice-daily moisturising may prevent skin tears<sup>50</sup>
- use leave-on products to treat IAD,<sup>48</sup> use leave-on products and avoid soap to prevent IAD,<sup>49</sup> and use absorbent products to prevent IAD<sup>48</sup>

- implement skin care protocols and standardised unscented pH balanced products<sup>51</sup>
- educate older adults, family, carers and healthcare professionals on prevention of skin tears<sup>51</sup>

In addition to the 33 articles specifically on cleansers, moisturisers or topical barrier products, a small number of documents were found which examined multiple interventions, including recommendations on cleansers, moisturisers or barrier products. Of these, a systematic review identified five studies of moderate quality which found film-forming skin protectants or emollients improved skin condition scores for neonates in neonatal intensive care units (NICU).<sup>5</sup> An evidence-based guideline, evidence summary and systematic review on preventing PIs recommended the use of non-alkaline, pH appropriate soaps or cleansers, keep skin hydrated, use of barrier products to protect skin from excessive moisture, cleansing promptly after incontinence, and/or use of high absorbency products in persons with incontinence.<sup>12,53,54</sup> Guidelines for management of lower extremity venous disease recommended educating patients and caregivers to use mild soaps, emollients for skin hydration and avoid sensitising topical agents<sup>55</sup>; while an umbrella review of 12 systematic reviews on skin integrity found barrier films or lipophilic leave-on products helped prevent IAD.<sup>56</sup> A systematic review on skin integrity in end-of-life care found similar recommendations, e.g., to use soap-free, pH balanced cleansers and unperfumed or allergen-free, pH balanced leave-on moisturisers and barrier products.<sup>57</sup>

In summary, regarding cleansers, moisturisers and topical barrier products, there were roughly equal numbers of documents on neonates, older adults, and adults of all ages, including systematic reviews and small numbers of RCTs of moderate quality. However, all the systematic reviews were limited in their findings by many inconsistent outcome measures and low-quality evidence in the included studies. Despite these limitations there were consistent findings or recommendations to use mild, non-alkaline cleansers and low pH/pH balanced moisturisers with humectants regularly to improve skin integrity, hydration and prevent skin tears; in addition to prompt cleansing, use of topical barrier leave-on products and absorbent products to help prevent IAD.

### Health service interventions

Fifteen original studies were identified; one systematic review, a controlled trial, nine pre/post or multiphase implementation studies, one validation study, one retrospective review, one Delphi survey and one mixed-methods study. Most studies evaluated the impact of structured protocols or 'bundles' of interventions to prevent skin breakdown.

A systematic review of 17 studies exploring pressure injury prevention bundles for critically ill patients mostly found decreased incidence of pressure injuries, however a meta-analysis could not be taken due to the variation in methods.<sup>58</sup>

The pre/post studies evaluated implementation of local guidelines and education, multi-component 'bundles' or programs, or structured skin care protocols. Studies on guideline and/or education interventions found improved nurses' or care staff knowledge,<sup>59,60</sup> in addition to improvement of dry skin and decreased TEWL.<sup>60</sup> Evaluations of multi-component 'bundles' or program implementations reported:

- Increased knowledge scores<sup>61,62</sup>
- Significantly decreased odds ratios for facial pressure injuries in healthcare workers from masks after implementing a bundle (skin protection, material use, skin inspection, cleansing, hydration)<sup>63,64</sup>
- reduced incidence of hospital acquired pressure injuries (HAPIs),<sup>65</sup> medical-device related PIs in critical care units,<sup>66</sup> and PIs in intensive care units<sup>67,68</sup>
- and reduced skin tear numbers, which was maintained three months post-implementation.<sup>62</sup>

A controlled trial and quasi-experimental pre/post study evaluated implementation of structured skin care protocols, in intensive care unit settings. Both studies found reduced incidence of IAD in the intervention group or 'post' groups, compared to earlier or 'pre' groups receiving routine care.<sup>69,70</sup>

Other studies looked at factors influencing implementation of evidence-based skin care. A validation study involving 14 nurse specialists, identified 32 activities. Eleven were validated as priority interventions by the experts, however most were not described in the North American Nursing Diagnosis Association as priority nursing interventions for risk of impaired skin integrity in hospitalised patients.<sup>71</sup> A Delphi survey (n=235) developed an instrument to assess barriers and facilitators and to survey staff on delivery of skin hygiene care. It found barriers included agitated/confused residents, time, workload, and relatives' unrealistic expectations; while a facilitator was knowledge of skin care.<sup>72</sup>

In addition to the articles specifically on health service interventions related to skin care, four documents were identified which examined multiple interventions, including recommendations for health care strategies. A clinical practice guideline recommended implementing structured multi-faceted programs, evidence-based protocols, feedback and reminder systems and clinical decision support tools to prevent PIs.<sup>12</sup> An umbrella review (12 systematic reviews)<sup>56</sup> concluded structured skin care programs were better than unstructured skin care with soap/water in preventing skin tears, xerosis and IAD and maintaining skin integrity. One systematic review of two studies found reminder systems in patient care plans were promising and effective in decreasing the incidence of PIs.<sup>73</sup> Another systematic review (27 studies) recommended undertaking comprehensive assessment including wishes and concerns of patients and family for promoting skin integrity in end-of-life care.<sup>57</sup>

In summary, the findings highlight the benefits of structured over unstructured skin care programs, demonstrating their effectiveness in preventing skin tears, xerosis, and IAD, and maintaining overall skin integrity. Studies also emphasised the importance of comprehensive assessments, including patient and family preferences, and identified various factors influencing the implementation of evidence-based skin care, such as knowledge and environmental constraints.

## Wound dressings

Twelve studies were found which investigated dressings in relation to skin care. This included 11 studies investigating PI prevention<sup>74-84</sup> and one study in relation to venous leg ulcers (VLU) periwound skin care.<sup>85</sup> A systematic literature review on the surrounding skin management of VLU<sup>85</sup> highlighted the importance of considering skin management in relation to dressings. Repetitive changing of dressings was noted to be a particular challenge to peri-wound skin care, often resulting in tissue damage along with allergic contact dermatitis that quite often required further medical treatment (i.e., corticosteroids).<sup>85</sup> Silicone dressings were noted to be of benefit if there was a need for repetitive dressing changes.<sup>85</sup>

For the prevention of PIs, three RCTs concluded that prophylactic use of silicone dressings significantly reduced the development of PIs at pressure sites of coccyx, sacrum and buttocks.<sup>80,81,83</sup> Foam dressings were also found in a quality improvement (QI) project, an evaluation of best practice guidelines and an RCT to reduce the incidence of PIs.<sup>75,78,82</sup> A QI project of 295 participants determined that hydrocolloid dressings reduced the risk of nasal bridge, stage two PIs in patients requiring non-invasive ventilation.<sup>76</sup> Hydrocolloid dressings were also found to effectively reduce the incidence of facial PIs for health care staff wearing masks during COVID-19, when combined with 3M Cavilon No-Sting Barrier film.<sup>74</sup> However, a retrospective cohort study found no significant differences when using a hydrocolloid dressing for the prevention of all areas at risk of PIs in adult patients with cardiovascular problems.<sup>84</sup> Within the paediatric population, an adhesive foam as part of a bundle of care for tracheostomies has been shown to reduce the incidence of skin breakdown,<sup>77</sup> and an RCT concluded that hydrocolloid dressings significantly reduced the occurrence of nasotracheal tube-related PIs.<sup>79</sup>

In addition to the articles above, focused specifically on dressings, four documents were identified which encompassed multiple interventions, including recommendations for prophylactic dressings. A clinical practice guideline supported use of soft silicone multi-layered foam dressing for prevention of PIs.<sup>12</sup> A systematic review included six studies investigating prophylactic dressings for hospitalised adults and found dressings of silicone, foam and polyurethane film were effective in reducing PIs.<sup>73</sup> Another systematic review recommended the use of protective dressings on vulnerable parts of the face to reduce PIs from PPE.<sup>54</sup> The review included 13 studies, however most (11)

relied on expert consensus.<sup>54</sup> The third systematic review identified five studies of mostly moderate quality examining PI prevention dressings for neonates in the NICU which included hydrocolloids and polyurethane-based dressings, finding they were effective in preventing respiratory device-related nasal PIs.<sup>5</sup> To summarise the findings on dressings in skin care, the effectiveness of silicone, foam, and hydrocolloid dressings in PI prevention and managing periwound skin in VLU was evident, with specific applications ranging from reducing injuries in healthcare workers wearing PPE to addressing skin care needs in pediatric and cardiovascular patients.

### Other interventions

Five documents investigated other interventions for skin care in adults or older people,<sup>86,87</sup> people with a spinal cord injury (SCI),<sup>88</sup> or neonates.<sup>89,90</sup> A best practice guideline<sup>86</sup> and an evidence summary<sup>87</sup> focused on foot and lower limb care in adults with, or at risk of peripheral arterial disease (PAD), or older people with diabetes respectively. The best practice guideline recommended protection of skin on lower extremities from trauma and providing appropriate foot care for those with PAD, including skin cleansing, foot inspection and prompt assessment of lesions.<sup>86</sup> The evidence summary of eight studies recommended that carers be aware of risk factors such as callus build-up; daily skin checks and regular foot checks by health professionals.<sup>87</sup>

One systematic review examined the effectiveness of self-management interventions on skin care for people with SCI, using behaviour change techniques (BCTs).<sup>88</sup> The most common BCTs were 'instructions on how to perform behavior' (16 interventions), 'credible source' (12 interventions), and 'social support (unspecified)' (9 interventions). However, evidence to support intervention effects on these outcomes was limited, particularly for clinical outcomes.<sup>88</sup>

Two studies were specifically related to mothers' skin care practices with neonates, exploring mothers' experience in participating in the research, and its impact on their practice of caring for their newborn babies.<sup>89,90</sup> The study found that family, friends and internet were the most common sources of information on baby skincare.<sup>89,90</sup>

### Discussion

This integrative review provides a summary of the current literature on maintaining skin integrity and skin care interventions to prevent wounds. While numerous articles focused on cleansers, moisturisers and topical barrier products, nearly half of the identified documents were compilations of original research, i.e., systematic reviews, evidence summaries or consensus documents. Twelve of the 17 original studies were RCTs, with over half of these with neonates and in hospitals. Older adults are known to be at higher risk of loss of skin integrity, however only two of the 17 original research studies were conducted with this population. In contrast, half of the systematic reviews

and evidence summaries focused on this group, reflecting its importance. The systematic reviews of either neonate or adult skin care interventions were unable to conduct meta-analyses due to heterogeneity in methods and outcome measures. The need for high quality, well-designed studies and core outcome measures was identified in 2019 in a scoping review of research methods for chronic wounds<sup>91</sup> and remains an issue. However within these constraints there were consistent results to support the benefits of mild, non-alkaline cleansers and low pH moisturisers with humectants to improve skin integrity, hydration and prevent skin tears; similarly to support use of topical barrier leave-on products and absorbent products to prevent IAD.

Studies on health care services highlighted the efficacy of structured skin care programs in maintaining skin integrity and preventing wounds. An umbrella review and various systematic reviews support the advantages of structured care, particularly in reducing skin tears, xerosis, and IAD. Despite these promising findings, a notable challenge arises from the range in research methods, hindering a comprehensive meta-analysis. Implementation of guidelines, education, and multi-component 'bundles' markedly improved healthcare workers' knowledge and patient outcomes, evident in the decreased incidence of PIs and skin tears. The studies also highlight the complexity of care in end-of-life scenarios, emphasising the need to tailor strategies to individual patient and family preferences. Furthermore, the research delves into the pragmatic aspects of implementing these protocols, identifying both barriers (such as resident agitation and time constraints) and facilitators (like enhanced staff knowledge).

This integrative review highlights complexities and nuances in prophylactic dressing choices, with each type presenting unique benefits and challenges. The effectiveness of prophylactic dressings in preventing PIs is particularly notable. Silicone dressings, for instance, appear as a preferred option in cases necessitating frequent changes, with their efficacy in reducing PIs in high-risk areas being substantiated by RCTs. Foam dressings also demonstrate benefit, as evidenced by their successful use in a QI project and an RCT, highlighting their role in reducing the incidence of PIs. However, the performance of hydrocolloid dressings presents a more complex picture, demonstrating efficacy in certain contexts, such as preventing nasal bridge PIs, but showing inconclusive results in cardiovascular patient care.

The critical issue of skin care among healthcare workers during the COVID-19 pandemic was reflected in research underlining the effectiveness of hydrocolloid dressings, particularly when used in conjunction with barrier films, in mitigating facial PIs caused by prolonged PPE use. In the paediatric population, the studies draw attention to the effectiveness of adhesive foam in reducing skin breakdown, particularly in tracheostomy care, and the role of hydrocolloid dressings in minimising nasotracheal tube-related PIs. A systematic review highlights the barriers to preventing PIs in neonates in the NICU, pointing out issues with certain

dressings types which may need to be considered in future research. The studies on dressings highlight the need for a more tailored approach to dressing selection, emphasising the need requirement to balance efficacy with patient-specific considerations to optimise skin care outcomes.

This integrative review also considered a range of single study skin care interventions across different demographics, each highlighting unique aspects and challenges of skin care management. The importance of foot and lower limb skin care and a lack of studies on the topic highlighted the need for further research in this area. A lack of studies on clinical outcomes on self-management strategies in individuals with SCI also emphasises the need for further research on BCTs to empower patients. In neonatal skin care, the findings draw attention to the reliance of new mothers on non-professional sources like family, friends, and the internet. This observation points to a potential need for more structured guidance and support from healthcare professionals in neonatal skin care. The disparity in the sources and nature of skin care guidance across these groups highlights the necessity for tailored interventions that acknowledge the unique circumstances and requirements of each group.

## Conclusion

This review identified disparity in the amount and quality of evidence on skin care strategies for prevention of wounds among differing populations and conditions. Although there were several studies and reviews on dressings for prevention of PIs and effectiveness of moisturisers and topical products in neonatal populations, there was a paucity of well-designed original research studies addressing skin care strategies in some high-risk groups, including older adults, persons with SCI, and adults with lower limb vascular disease. In addition, the discussion surrounding end-of-life skin care underscores the need for more research, especially focusing on patient-centered and holistic strategies.

There is substantial variability regarding outcome domains in skin care research. Our results support the need of developing core outcome sets in the field of skin care in healthy skin. This review, therefore, not only supports recommendations for use of low pH moisturisers with humectants, use of topical barrier leave-on products, the superiority of structured skin care and use of specific dressings in maintaining skin integrity but also calls for continued research and refinement in its application, addressing these gaps across varied healthcare environments.

## Conflict of interest

The authors declare no conflicts of interest.

## Ethics statement

An ethics statement is not applicable.

## Funding

The authors received no funding for this study.

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