

**BEST PRACTICE RECOMMENDATIONS FOR
HOLISTIC STRATEGIES TO PROMOTE
AND MAINTAIN SKIN INTEGRITY**

Recommendations from an expert working group

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FOREWORD

The skin is the largest organ of the human body. The functions of the skin are to protect us from external insults and to maintain internal homeostasis. During an individual's lifespan, there may be periods of enhanced skin vulnerability, which render the individual more prone to the development of skin problems. Critical phases are very early in life (when the skin is not fully mature), when individuals are suffering from dermatological or other systemic and chronic diseases, at advanced age, and at the end of life. The International Skin Tear Advisory Panel (ISTAP) has identified key knowledge gaps in prevention and management of skin problems in these critical phases, in order to improve practice and clinical outcomes.

ISTAP recognised a need for guidance that focuses on the shared risk factors and preventative strategies for common skin conditions faced by individuals with increased skin vulnerability:

- Skin tears
- Pressure ulcers
- Moisture-associated skin damage (MASD)
- Skin changes at end of life.

The aim of this document is to define the concepts related to skin vulnerability and to guide clinicians in their efforts to identify shared risk factors for skin conditions and ways to maintain or promote skin integrity. The intention is not to summarise these individual skin conditions, as this already exists in the literature, but to bring them together by focusing on their common risk factors, and formulating a synergistic prevention approach that will break down barriers in practice. The Skin Safety Model (Campbell et al, 2016) presented a holistic model that identified multiple skin injuries resulting from skin frailty, and multiple and intersecting factors; this document builds on that existing work.

ISTAP brought together a group of international experts, who met in October 2019, to discuss this new approach and agree on best practice recommendations that will guide practice and improve outcomes.

Following the meeting, a draft document was produced, which underwent extensive review by the expert working group. Additional international experts were consulted to reflect practice in healthcare settings across different parts of the world.

This document should provide healthcare professionals with the information and resources they need to provide appropriate care to at-risk individuals with fragile skin.

Dr Karen Campbell and Professor Dimitri Beekman, ISTAP and expert working group co-chairs

For further information on ISTAP, see: www.skintears.org

Concepts related to skin vulnerability: A Babylonian confusion of tongues!

There is a lack of cohesive terminology and definitions around skin vulnerability. Although the concept of 'skin integrity' is widely used in many different areas and healthcare contexts, a formal definition is lacking so far (Kottner et al, 2019a). Currently, there are many terms used and some crossover in meaning exists, including: skin frailty, skin fragility, skin integrity, tissue resilience, skin failure, and dermatoporosis (Kaya & Saurat, 2007). Agreement has yet to be reached in the literature regarding the definition of the individual terms or the concept of skin vulnerability (Ayello et al, 2019; Kottner et al, 2019b).

The North American Nursing Diagnosis Association (NANDA, 2018) international nursing diagnosis classification contains two skin integrity-related diagnoses. 'Impaired skin integrity' is defined as 'altered epidermis and/or dermis', and 'risk for impaired skin integrity' is defined as 'susceptible to alteration in epidermis and/or dermis, which may compromise health'. Similar to the medical perspective, skin integrity is here defined as an alteration from the 'normal'. However, this conceptual approach may be too simplistic. Kottner et al (2019a) define skin integrity as the combination of an intact cutaneous structure and a functional capacity that is high enough to preserve it.

'Skin failure' has previously been suggested as a term, but this has been differently defined in relation to the dermatological literature (Irvine, 1991) and the pressure ulcer literature (Langemo & Brown, 2006). There has been, in particular, ongoing discussion around the interrelated concepts of 'skin failure', skin changes at the end of life, pressure ulceration and the criteria for labelling unavailability; therefore, clarity regarding definitions and terms is paramount (Kottner et al, 2019b).

'Skin frailty' is the suggested umbrella term for at-risk, vulnerable skin. This was debated and agreed by the expert working group. It was agreed that this clarification in terms could represent a paradigm shift to more cohesive thinking around the concepts of skin frailty. A proactive approach needs to be taken to protect frail skin and prevent damage, and for individuals, families and carers to benefit from education that, where possible, allows them to help maintain their own skin integrity.

It is important not to conflate skin frailty with overall 'frailty', which is a term that may carry negative connotations for some people. While consensus on an exact definition of 'frailty' has not been reached, as it can neither be classified as a result of the ageing process nor as a disease (Bergman et al, 2007), it can be characterised as 'a health condition of decreased functional reserves leading to a vulnerable state with the inherent risks of a multitude of adverse outcomes' (Junius-Walker et al, 2018).

Frailty is an umbrella term that encompasses interacting physical, psychological, social, environmental, and economic factors; these components were described as interacting factors — i.e. they influenced and were influenced by other components of the frailty umbrella and increased the vulnerability of older adults to negative outcomes such as hospital admission and falls (Coker et al, 2019). 'Frailty' can be seen as a dynamic or changeable state, depending on the interaction of these factors. Poor physical health or mental health, and associated factors — i.e. changes in physical/mental health, physical environment and social circumstances (such as a bereavement) — can give rise to temporary changes in the appearance of frailty (Lang et al, 2009; Coker et al, 2019).

It is also important to note that, while skin frailty may be associated with ageing, it does not only apply to older individuals, nor should it be seen as purely a result of ageing. See Table 1 for examples of particular groups that may be at risk of skin frailty, and how this may impact the individual and their health.

Table 1: Patient groups at risk of skin frailty (adapted from Wounds UK, 2018)

Patient group	Skin changes	Potential problems
Older adults	Becomes thinner, loses elasticity, reduced blood supply, subcutaneous fat decreases, skin hydration decreases, reduction of the dermal-epidermal layer (diminishing adherence of epidermis on dermis; Moncrieff et al, 2015; Levine, 2020)	Skin tears, pressure ulcers, infection, inflammation, dryness/flaking, itching, cellulitis, diabetic ulcers, possible nutrition issues; possible issues relating to dementia
Individuals with mobility issues/paralysis	Alterations to vascular supply, temperature control, maceration/moisture, loss of collagen, lack of muscle/atrophy, impaired sensation due to damaged nerves in the skin (Rappl, 2008)	Skin tears, pressure ulcers, infection, inflammation
Children/neonates	Immature skin; intrinsic changes due to pressure duration, shear and friction, poor perfusion and maceration (Inamadar & Palit, 2013)	Nappy/diaper dermatitis, skin tears, pressure ulcers
Individuals with spina bifida and cerebral palsy	Decreased skin perfusion, cutaneous reaction to drugs, perineal dermatitis and inflammation due to incontinence (Inamadar & Palit, 2013)	Pressure ulcers; possible incontinence-associated dermatitis
Bariatric patients	Altered epidermal cells, increased water loss, dry skin, maceration, increased skin temperature, and reduced lymphatic flow and perfusion (Shipman & Millington, 2011).	Pressure ulcers, skin tears, diabetic ulcers, psoriasis, moisture lesions, intertrigo
Oncology patients	Radiation leads to inflammation, epidermis damage, decreased perfusion (NHS, 2010)	Pressure ulcers, reduced wound healing, skin infections, cellulitis, radiodermatitis
Chronic illness and other issues	Skin changes due to chronic illnesses - e.g. renal, liver, cardiovascular; medications; malnutrition; stomas and devices; psychosocial issues (Wounds UK, 2018)	Skin tears, pressure ulcers, infection, inflammation, moisture lesions; other related issues

Skin frailty:
Key points

- Skin frailty is the chosen umbrella term, which differs from overall frailty
- Skin frailty represents a risk/threat to the skin, not necessarily a wound/break/disruption
- Skin frailty affects all ages, particularly the extremes of age (i.e. neonatal and older individuals), and is known to be multifactorial
- Focus on skin frailty should represent a holistic, person-centred approach that improves outcomes for individuals with frail skin, by triggering an integrated strategy.

Skin frailty can be multifactorial and can be the result of the cumulative effect of a combination of intrinsic and extrinsic factors (Moncrieff et al, 2015). Within those intrinsic and extrinsic risk factors, additionally, some may be modifiable and some non-modifiable.

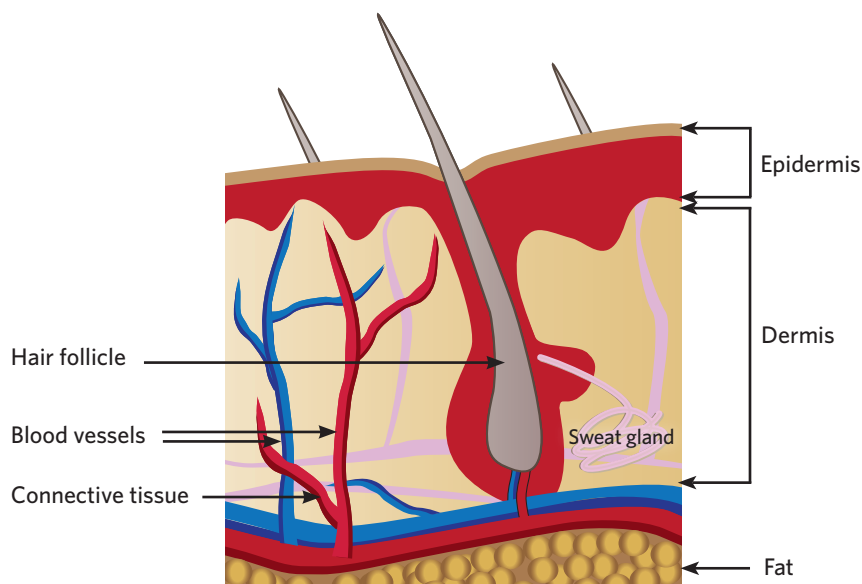
The expert working group identified the need for standardised definitions for each of the concepts related to skin vulnerability, in order to avoid confusion and provide greater clarity to identification and ongoing management in appropriate individuals. This will enable greater focus on the common/synergistic risk factors involved. Additionally, it has been noted that care must be taken when selecting terms and labels before introducing them into the literature, and that clarity is essential in order to raise awareness and improve outcomes (Kottner et al, 2019b).

The importance of the skin

The skin is the largest organ of the body and accounts for 15% of body weight (Wingerd, 2013). See Figure 1 for a representation of the main layers of the skin. The primary function of healthy skin is to act as a barrier against chemical, physical and mechanical hazards, and invasion from micro-organisms and allergens (Proksch et al, 2008). In healthy individuals, the skin is strong, resilient and has a remarkable capacity for repair (Wounds UK, 2018).

The main functions of the skin include thermoregulation, innate and adaptive immune functions, sensory perception, vitamin D production, and many more. In addition, the skin's outer appearance and capacity for sensation are important factors for wellbeing, self-esteem, cosmetic attractiveness, and communication (Kottner et al, 2019a).

FIGURE 1 | The main layers of the skin



Healthy skin performs a number of functions, including:

- Protection: acting as a barrier, preventing damage to internal tissues from trauma, ultraviolet (UV) light, toxins, pathogens and allergens (Butcher & White, 2005)
- Barrier to infection: in addition to providing a physical barrier of intact skin, the presence of sebum, natural antibiotic chemicals in the epidermis (antimicrobial peptides) and a well preserved surface acidic environment also help to prevent infection (Günnewicht & Dunford, 2004)
- Sensory perception: nerve endings within the skin respond to stimuli such as tissue injury (which causes pain), temperature, vibration, touch and itch (Wounds UK, 2018)
- Temperature regulation: enabling either heat insulation or cooling of the body (Timmons, 2006)
- Communication, through touch and physical appearance: providing clues to the individual's state of physical wellbeing (Flanagan & Fletcher, 2003)

- Production of vitamin D in response to sunlight: this is important for calcium homeostasis and in developing and maintaining bone mass (Butcher & White, 2005)
- Production of melanin: this is responsible for skin colouring and protection from sunlight radiation damage (Wounds UK, 2018).

Skin frailty, causing the skin to be vulnerable and at risk, may be triggered by a number of factors (Wounds UK, 2018). For example, the normal ageing process causes changes in the skin that make it more fragile and susceptible to damage (LeBlanc et al, 2018), due to thinning of the epidermis, loss of collagen and elastin, and overall loss of moisture (Levine, 2020). Other factors that may contribute to skin frailty include UV radiation damage, genetic conditions such as ichthyosis (dry skin), some medications, and irritants from dressings, maceration from incontinence, and repeated skin cleansing (Wounds UK, 2018).

Skin changes that make the skin vulnerable to injury can be classified as extrinsic, such as environmental damage (e.g. regular soap use, sun exposure or smoking) or pressure, or intrinsic, such as ageing, the effects of skin conditions (e.g. psoriasis or atopic eczema) or an underlying illness (Moncrieff et al, 2015; LeBlanc et al, 2018). Additionally, these risk factors can also be modifiable or unmodifiable.

Therefore, it is important to remember that skin frailty may be due to a number of different factors and affect different groups and individuals. Risk of skin frailty, and possible resultant issues, may change for different individuals at different times, meaning that it is vital to assess and reassess individuals. Wherever possible, depending on the combinations of risk factors and their nature (i.e. intrinsic/extrinsic or modifiable/unmodifiable), steps should be taken to reduce the individual's risk.

Skin frailty: *Key points*

- The skin should not be overlooked as an important (and the body's largest) organ, which affects overall health and provides many vital functions
- Skin frailty can be caused by a multitude of factors and affect many different groups and individuals
- Risk factors for skin frailty may be intrinsic or extrinsic, and modifiable or unmodifiable.

Development of a risk framework for skin frailty

If an individual's skin has an enhanced vulnerability, they are at increased risk of damage to the skin. This can encompass a range of issues, including (but not limited to):

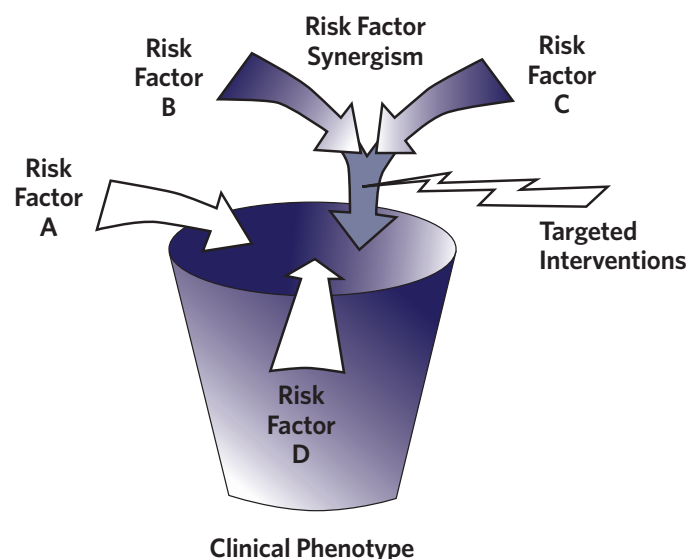
- Skin tears
- Pressure ulcers
- Moisture-associated skin damage (MASD)
- Skin changes at end of life.

There is growing evidence that these distinct skin conditions may be linked — e.g. MASD as a risk factor for pressure ulcers (Woo et al, 2017; Gray & Giuliano, 2018), or synergistic reductions in skin tears and pressure ulcers (Bale et al, 2004). Skin changes at end of life represent a unique set of circumstances; however, the principles relating to skin frailty remain the same. Palliative wounds may also link to skin frailty issues: it should be noted that palliative wounds include, but are not limited to, oncology and end-of-life wounds. Palliative wounds include all wounds that will not close and must be managed as such: encompassing chronic and non-healing wounds, as well as palliative care wounds.

Skin frailty: a synergistic approach

An integrative approach should be taken, tackling the synergy of the main risk factors for these conditions (Campbell et al, 2016). This represents a new approach, which should mean that risk factors are reduced overall and the incidence of all of these conditions is decreased, leading to improved outcomes for patients. The aim is to move away from a 'silo' way of thinking, and to consider all of these conditions in the broader context of skin frailty. See conceptual model in Figure 2.

FIGURE 2 | Interactive concentric model focusing on risk factor synergisms (adapted from Inouye et al, 2007)



Skin tears

Skin tears are the most common wound among elderly people (the normal skin ageing process means that elderly people will have at-risk skin, although they are not the only group who will have at-risk skin). It is important to note that skin tears can be seen in individuals of all ages, including children (for example, particularly those with kwashiorkor).

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). Classification is based on the severity of "skin flap" loss. A flap in skin tears is defined as a portion of the skin (epidermis/dermis) that is unintentionally separated (partially or fully) from its original place due to shear, friction, and/or blunt force' (LeBlanc et al, 2018). This concept is not to be confused with tissue that is intentionally detached from its place of origin for therapeutic use — e.g. surgical skin grafting (Van Tiggelen et al, 2019). In individuals with skin frailty, less force is required to cause a traumatic injury, meaning that the risk of skin tears is increased (LeBlanc et al, 2018).

Skin tears can occur on any part of the body, but are most often found on the extremities, such as upper or lower limbs or the dorsal aspect of the hands (LeBlanc and Baranoski, 2011). They can be painful wounds, affecting the individual's quality of life, increasing risk of hospitalisation or increasing hospitalisation time (LeBlanc et al, 2018). In a review of patient and skin characteristics associated with skin tears, the most common patient characteristics were found to be a history of skin tears, impaired mobility and impaired cognition, while the skin characteristics associated with skin tears included senile purpura, ecchymosis and oedema (Rayner et al, 2015; Strazzieri-Pulido et al, 2017).

Pressure ulcer

In Europe, the term 'pressure ulcer' is widely used, while in South-East Asia, Australia and New Zealand, the term 'pressure injury' has been adopted. The United States is transitioning to the term 'pressure injury', as this is recommended by the US National Pressure Injury Advisory Panel. However, discussions regarding terminology continue. Although none of these terms comprehensively describes the full aetiology of these wounds, they all refer to the same phenomenon. The terminology remains the subject of ongoing discussion and debate. For the purpose of this document, the term 'pressure ulcer' is used throughout the text.

A pressure ulcer is defined as localised damage to the skin and/or underlying tissue, as a result of pressure, or pressure in combination with shear. Pressure ulcers usually occur over a bony prominence, but may also be related to a medical device or other object (EPUAP, 2019). While substantial advances have been made in understanding pressure ulcer aetiology, there are still many areas of uncertainty — including appropriate risk assessment, early detection and the most effective treatment (NPUAP et al, 2014; EPUAP, 2019; Kottner et al, 2019b).

Pressure ulcers remain a significant source of morbidity and mortality, and continue to pose a significant burden for patients and healthcare systems (Coleman et al, 2014). Pressure ulcers can occur as a result of immobilisation or being bed-bound for extended periods of time (Lindgren et al, 2004). This can also often be a result of a combination of comorbidities or general poor health (including skin health); prolonged chronic disease and overall frailty can contribute to reduced mobility, and potential weight loss, which in turn can lead to increased risk of pressure ulcers (Jaul et al, 2018). However, the vast majority of pressure ulcers are avoidable, meaning prevention is the main priority, although this presents a significant challenge in clinical practice (Edsberg et al, 2014; Mervis & Phillips, 2019).

Prevention of pressure ulcers should include use of appropriate support surfaces, frequent repositioning, nutrition, moisture management and prophylactic use of multi-layer, silicone-coated foam dressings (Mervis & Phillips, 2019). Assessment and monitoring of skin health, an often overlooked aspect, should provide a cornerstone to pressure ulcer prevention strategies.

Development of a risk framework for skin frailty (Continued)

Moisture-associated skin damage (MASD)

MASD is a complex and increasingly commonly recognised condition (Woo et al, 2017). MASD is a type of irritant-contact dermatitis, and common irritants can include urine, stool, intestinal liquids from stomas and exudate from a wound. There are four different types of MASD: incontinence-associated dermatitis (IAD), intertriginous dermatitis (ITD), peri-wound skin damage and peri-stomal MASD (Gray et al, 2011). The development and severity of MASD depends on a number of factors, and is commonly found in individuals who may be affected by the following intrinsic risk factors: excessive perspiration, increased dermal metabolism (elevated local temperature), abnormal skin pH, history of atopy (genetic susceptibility to contaminants/irritants), deep body folds, dermal atrophy and inadequate sebum production (Gray et al, 2011; Bianchi, 2012). It can also be caused by extrinsic risk factors, such as incontinence, perspiration, chemical/biological irritants, or other environmental factors (Bianchi, 2012).

Overexposure of the skin to moisture can compromise the integrity of its barrier function, making it more permeable and susceptible to damage (Woo et al, 2017). Individuals with MASD experience persistent symptoms that affect quality of life, including pain, burning and pruritis (Woo et al, 2017).

Emerging evidence now highlights the links between MASD and other skin conditions such as dermatitis, cutaneous infection and pressure ulcers (Jones et al, 2008; Woo et al, 2009; Woo et al, 2017).

Skin changes at end of life

There is a lack of consensus around terminology relating to skin changes at end of life, and it has been acknowledged that clarity is needed in this area (Ayello et al, 2019).

Individuals who are at end of life experience skin changes and have specific care requirements (Latimer et al, 2019). These skin changes are related to increased overall skin frailty, and are often also known as 'skin failure' (Rivera & Stankiewicz, 2018). Skin failure was defined by Langemo and Brown (2006) as: 'an event in which the skin and underlying tissue die due to the hypoperfusion that occurs concurrent with severe dysfunction or failure of other organ systems'.

The SCALE document (Sibbald et al, 2010) states that the physiological changes of dying can cause unavoidable skin or soft tissue changes, despite care interventions that meet or exceed the standard of care. Diminished tissue perfusion (local ischaemia), impaired skin oxygenation, decreased local skin temperature, mottled discoloration, and skin necrosis are all recognised as part of the SCALE process and may evolve into skin failure if two or more internal organs are also involved.

In the days or weeks prior to their death, some individuals at end of life develop a skin integrity breach known as a Kennedy terminal ulcer (KTU), or the '3:30 syndrome', which is a subset of pressure ulceration. While it is agreed that KTUs are unavoidable, they are often not easily recognised by clinicians due to a lack of awareness of their existence (Nesovic, 2016). This can prevent accurate diagnosis and management, which impacts on the individual in terms of pain and comfort at their end of life (Latimer et al, 2019). KTUs present as small black spots due to hypoperfusion and appear very quickly, then grow in size, often within a few hours (Ayello et al, 2019).

The SCALE document (Sibbald et al, 2010) recommends that a total skin assessment should be carried out regularly to document any and all areas of concern, consistent with the wishes and

condition of the patient and their family, friends and support persons. Skin changes at end of life may vary from person to person and, although they are considered an unavoidable part of the dying process, not every person at end of life will have skin failure (Ayello et al, 2019). Equally, it should be noted, that some situations estimated as end of life may reverse, and it is possible that these patients may ultimately recover from skin failure (Ayello, 2019).

There is a recognised need for increased investigation and awareness around skin changes at end of life, focusing on patient-centred holistic strategies as part of ongoing care, which could contribute to increased patient comfort and quality of life (Latimer et al, 2019). As skin changes at end of life relate to skin frailty, they are included within the scope of the proposed integrated approach to the individual's skin.

Risk framework development: *Key points*

- Consideration of the concept of skin frailty should encompass an integrated approach, that approaches the skin as a whole and incorporates synergistic risk factors linked to the individual's overall health and wellbeing
- The conditions that may relate to skin frailty include (but are not limited to): skin tears, pressure ulcers, MASD and skin changes at end of life
- It is acknowledged that there may be other conditions related to skin frailty; however, the evidence base for the four major conditions is stronger
- Acceptance that there is a synergistic relationship between these factors could help to optimise outcomes for patients and ensure that skin health is a focus and, thus, risk for all of these conditions is reduced.

Focus on promoting skin health and skin injury prevention

Focusing on the importance of the skin and taking steps to promote optimal skin health, particularly in individuals with vulnerable skin, is of key importance to optimising skin integrity outcomes. Skin frailty is complex and multi-dimensional, and requires a holistic approach in order to prevent skin injury. Optimising skin integrity outcomes should be underpinned by addressing individual needs and preferences, identifying and addressing intrinsic and extrinsic risk factors, ongoing assessment and evaluation, and developing and delivering evidence-based, person-centred care.

Assessment

It is widely accepted that it is important to take into consideration the overall picture of individuals (e.g. their mobility, nutritional status, socio-economic and psycho-social factors). Holistic assessment is key to this; therefore, if it were possible to incorporate a full comprehensive skin assessment as one process, there should be no need for separate assessment tools (e.g. for skin tear or pressure ulcer risk) — a common-sense, integrated approach is much more useful (see Table 2).

Table 2. Key components of a comprehensive skin assessment (adapted from Wounds UK, 2018)

- Skin assessment
- Patient medical history
- Does the patient have intrinsic risk factors for vulnerable skin, such as old age, diabetes, atopy (heightened immune response to allergens) or thin skin?
- Is the skin intact?
- Does the patient have wound-related risk factors such as varicose eczema, infection, high exudate levels/excessive moisture, oedema or pitting?
- Is there a skin condition present? Is there anything unusual, such as a rash or dryness, or is the skin sore or itchy? How does the skin feel to the patient?
- Assessment of the patient's knowledge about his/her skin condition
- Skin condition history:
 - How long has the patient had the condition?
 - How often does it occur?
 - Are there seasonal variations?
 - Is there a family history of skin disease?
 - Could the patient's occupation/hobbies affect their skin (e.g. chemical exposure, repeated hand washing)?
 - What medication is the patient taking (particularly long-term medication such as corticosteroids)?
 - Are there any known allergies?
 - Is there exposure to any other extrinsic risk factors (e.g. increased sun exposure, tobacco, alcohol)?
 - Previous and past treatments and effectiveness
 - Are there any treatments, actions or behaviours that influence the condition?
 - Is there any odour present?
- Apply gentle touch/pressure to the skin to gather information about the skin's texture
- Using your fingertips, check the temperature of the skin (or use non-contact infrared thermography)
- Ideally, carry out the skin examination in a warm, private room (although it is recognised that this may not be possible)

A full holistic skin assessment should be conducted at the first visit or on admission to the clinical setting, and ongoing inspection of the skin should be incorporated into an integrated and documented daily care regimen, to ensure any changes in the individuals' health/skin status are identified (Wounds UK, 2015). It is important to note that clear, consistent and accurate documentation is a key part of this.

If an individual is deemed to be at risk, the risk reduction programme checklist (Table 3) should be implemented.

RISK FACTOR	ACTION
Skin	<ul style="list-style-type: none"> <input type="checkbox"/> Inspect skin and investigate previous history of skin frailty <input type="checkbox"/> If patient has dry, fragile, vulnerable skin, assess risk of accidental trauma <input type="checkbox"/> Manage dry skin and use emollient/moisturiser to rehydrate limbs twice daily/as required <input type="checkbox"/> Implement an individualised skin care plan using a skin-friendly cleanser (not traditional soap) and warm (not hot) water <input type="checkbox"/> Prevent skin trauma from adhesives, dressings and tapes (use silicone tape and cohesive retention bandages) <input type="checkbox"/> Consider medications that may directly affect skin (e.g. topical and systemic steroids) <input type="checkbox"/> Be aware of increased risk due to extremes of age <input type="checkbox"/> Discuss use of protective clothing (e.g. shin guards, long sleeves or retention bandages) <input type="checkbox"/> Avoid sharp fingernails or jewellery during patient contact
Mobility	<ul style="list-style-type: none"> <input type="checkbox"/> Encourage active involvement/exercises if physical function is impaired <input type="checkbox"/> Avoid friction and shearing (e.g. use glide sheets, hoists), using good manual handling techniques as per local guidelines <input type="checkbox"/> Conduct falls risk assessment and prevention <input type="checkbox"/> Ensure that sensible/comfortable shoes are worn <input type="checkbox"/> Apply clothing and compression garments carefully <input type="checkbox"/> Ensure a safe environment — adequate lighting, removing obstacles <input type="checkbox"/> Use padding for equipment (as per local policy) and furniture <input type="checkbox"/> Assess potential skin damage from pets
General health	<ul style="list-style-type: none"> <input type="checkbox"/> Educate patient and carers on skin frailty risk and damage prevention <input type="checkbox"/> Actively involve the patient/carer in care decisions where appropriate <input type="checkbox"/> Optimise nutrition and hydration, referring to dietitian if necessary <input type="checkbox"/> Refer to appropriate specialist if impaired sensory perception is problematic (e.g. diabetes) <input type="checkbox"/> Consider possible effects of medications and polypharmacy on the patient's skin

Focus on promoting skin health and skin injury prevention (Continued)

The individual's overall medical and skin-specific history (e.g. skin conditions and any history of skin issues or past skin damage) should be an important element of assessment, and action should be taken accordingly. As is assessing the individual's capacity and capability for being involved in their own care, as self-care for the skin can be a powerful tool as part of a skin care regimen (see 'Self Care' section, page 15). If family or carers are involved, they can also be educated in skin care and how they can help.

Skin care

Regular moisturising should be viewed as a vital part of skincare in individuals with frail skin, in order to promote general skin health and reduce the risk of skin damage (Wounds UK, 2015). This can help to restore the barrier function of the skin, reduce itching, and increase the level of hydration. The benefits of moisturising to treat specific skin conditions are well recognised, but in patients at risk of skin breakdown, this should also be used as part of a full everyday skin care routine (Wounds UK, 2018). The use of moisturisers has been found to aid prevention of forms of skin damage including skin tears and superficial pressure ulcers (Bale et al, 2004; Carville et al, 2014). Any potential moisture damage can be minimised or eliminated by using a wicking fabric.

Moisturising products are available in various forms (creams, ointments and lotions), as well as liquid body wash and gels, which should be pH-balanced (i.e. with a pH level of 4.5–6.5) fragrance-free and non-sensitising (Wounds UK, 2018). They can be used at all stages of the bathing regimen for people with frail skin, for washing as well as moisturising. If necessary, products can be used that have additional ingredients (e.g. humectants such as urea, glycerol or isopropyl myristate) that have moisture-attracting properties, actively drawing water from the dermis to the epidermis, replacing lost moisture in the skin (Wounds UK, 2015).

Other factors should also be considered when caring for at-risk skin, such as reducing sun exposure, minimising frequency of bathing, taking care that water temperature is not too hot, and patting the skin dry with a soft towel rather than rubbing (LeBlanc et al, 2018; Wounds UK, 2018).

The use of suitable products should be incorporated into a standard approach to skin care to aid with moisture management, and using liquid body wash instead of soap for cleansing can help protect and hydrate vulnerable skin at risk from damage (Wounds UK, 2018). Therefore a full skincare plan is recommended for suitable individuals, which includes the use of a combination of soap-free wash products, as well as 'leave-on' creams and ointments (Wounds UK, 2018).

Moisturising for skin at risk of MASD

It is recognised that excessive moisture is damaging; however, replenishing natural moisture is important and can be accomplished through applying moisturisers, making sure that these are used appropriately and do not risk additional maceration.

In some cases, it may be beneficial to use products containing amino acids, ceramides and essential fatty acids (Woo et al, 2017). However, cost and availability should be considered where necessary, and the correct products used for the correct patients.

Importantly, excessive moisture should not be seen as an implementation barrier to using moisturising products as these serve to protect the skin and improve its overall integrity (Woo et al, 2017).

A protective barrier (e.g. spray/cream) is recommended to help prevent skin from further breakdown (Benbow, 2012), alongside appropriate products to aid incontinence management (Wounds UK, 2018).

Skin damage prevention: Key points

- Holistic assessment and ongoing monitoring of individuals are key
- Emollient therapy should be a part of a daily regimen for individuals with fragile, at-risk skin
- Self-care should be encouraged wherever possible, which can increase engagement with treatment and improve outcomes
- A pH level of 4.5–6.5 should be maintained to preserve the acid mantle.

Self care

In suitable individuals, moisturising can be incorporated into the individual's own daily routine: for example, they can be instructed to apply emollients or moisturisers themselves (or increase an existing moisturising routine) and optimise their own bathing regimen to incorporate suitable skincare measures that will reduce risk of damage.

A cluster randomised controlled trial evaluated the effectiveness of a twice-daily moisturising regimen as compared to 'usual' skin care for reducing skin tear incidence in an aged care facility (Carville et al, 2014). This study found that application of a commercially available, standardised pH neutral, perfume-free moisturiser on the extremities, applied twice daily, reduced incidence of skin tears by almost 50%.

A further study that introduced twice-daily application of pH-friendly (pH 4.5–6.5), non-perfumed moisturiser to the extremities in patients aged 65 or older with at-risk skin, found that incidence of skin tears was reduced (Finch et al, 2018). Care staff applied the moisturiser twice daily in patients where this was required; where possible, patients or their relatives were provided with education on application and encouraged to apply the moisturiser themselves. The time of application of moisturiser was recorded with each application: documentation and consistency are key to success. The study produced evidence to support the benefits of this regimen, which was a relatively low-cost intervention that reduced overall costs and improved care outcomes.

Involving the individual in their own care is key to the success of any care regimen. Patient choice and acceptability are particularly important in emollient product selection. The properties and benefits of emollients can vary and be suitable for different individuals – for example, ointments may be more effective as they have a high oil content, but they can be heavier and greasier on the skin; emollients containing humectants may be more cosmetically acceptable for some individuals (Wounds UK, 2015).

It is important that a holistic view is taken on self-care, ensuring that the patient is as healthy as possible. Nutrition and hydration are key to skin health and can help to prevent skin damage. Mobility should also be encouraged wherever possible. Polypharmacy issues should also be taken into consideration where necessary, as some medications can cause changes to the skin that need to be managed appropriately (LeBlanc et al, 2018).

A self-care checklist can be given to encourage patients to monitor their own skin health and holistic wellbeing (Table 4).

Table 4. Self care checklist for patients with vulnerable skin (adapted from Wounds UK, 2015)

- Have I been given an individualised skin care plan?
- Am I using an emollient every day?
- Am I eating sensibly and drinking enough water?
- Am I keeping as active and mobile as possible?
- Have I thought about wearing clothing to protect my skin - e.g. long sleeves, shin guards or tubular bandages?
- Has my environment been made as safe as possible - e.g. adequate lighting, no obstacles and using padding on furniture if required?
- Am I wearing sensible/comfortable shoes to avoid falls?

Implementation in practice

It is vital that considering skin frailty as a whole, taking a new approach that incorporates all aspects of skin health and the associated risks, translates into changing practice, becoming more integrated throughout the multidisciplinary team and throughout all stages of care. This should result in thorough holistic assessment as a starting point, and then continuous monitoring and further interventions where necessary. The outcome should be that all patients with at-risk skin are cared for, so that the risk of skin damage is reduced.

The Skin Safety Model (Campbell et al, 2016) proposed a unified framework that offered a unique perspective on the diverse yet interconnected antecedents contributing to a range of skin injuries in vulnerable older hospital patients (Figure 3).

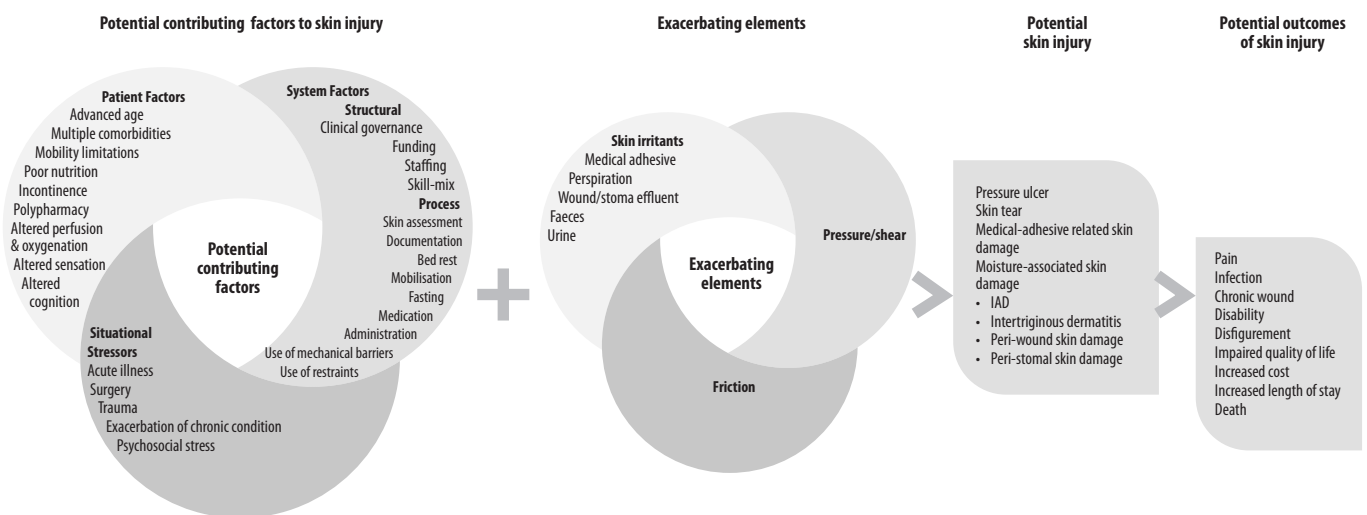


FIGURE 3 | The Skin Safety Model (Campbell et al, 2016)

In order to implement these principles, care must be seen as a whole. The principles for care of at-risk skin should be evidence-based, consistent, fundamental dimensions of care as follows:

1. Person-centred care that prioritises the needs and preferences of the individual, their family and carers
2. Comprehensive holistic assessment, formulation of a care plan, implementation and ongoing evaluation
3. Ongoing pain assessment management and evaluation
4. Maximising activities of daily living (ADL)
5. Promotion and facilitation of mobility, including repositioning and use of appropriate equipment
6. Promotion and maintenance of continence and appropriate continence care
7. Promotion and facilitation of optimum nutrition and hydration
8. Full individualised skin care regimen.

Person-centred care

The needs and preferences of the individual, their family and carers should be prioritised. Individuals will vary in their needs and, for instance, in their capacity for self care. It is vital that all care is tailored to the individual.

Comprehensive holistic assessment

See section on page 12 for more information on holistic assessment and what this should include. It should be emphasised that clear and precise documentation, with evidence of shared decision-making and treatment goals between the individual and clinician (including issues such as concordance), is key. Assessment should be consistent and include all of the elements listed in the assessment format; however, it is important to remember that care should be tailored to the individual and this includes assessment. It is vital to listen to the individual and ensure that any psychosocial or socioeconomic issues are identified.

Pain assessment and management

Currently, there is no gold-standard tool for the assessment of pain; however, healthcare professionals should use an appropriate assessment tool that relates to their patient population. Assessment of pain should not be overlooked as part of the overall patient evaluation. It is important to understand the individual's perspective on their own pain, rather than making any assumptions based on their skin health or wound.

Assessment should form the cornerstone for optimal pain management in practice, and measures should be taken where necessary according to patient need and suitability (Fink, 2000).

Maximise activities of daily living (ADL)

Basic ADL are commonly considered to be activities such as bathing, dressing, toileting and eating; whereas instrumental ADL refer to more complex tasks such as cooking and cleaning. In the presence of any one of the four main conditions discussed, individuals may have a compromised capacity to perform the ADL required for independent living. Maximising ADL performance where possible (involving an occupational therapist in some cases) is associated with significant benefits to quality of life, familial relationships and reduced care costs (Ciro, 2014).

Mobility

In suitable individuals, encouraging exercise or increased mobility may be beneficial. Referral to physiotherapy, or consulting physiotherapy colleagues about an individual's needs, may be advised.

Incidental activities are those where physical activity occurs as part of regular daily activities, for example, walking to the toilet, transferring and dressing. Performing regular daily incidental activities may be the easiest exercise for many individuals to undertake (Victoria State Government, 2019).

Where possible, individuals should be encouraged to:

- dress (consider the possibility of wearing their normal day clothes and footwear)
- get out of bed and move around, with supervision or assistance and an appropriate gait aid if required
- sit out of bed as soon as it is considered safe to do so, as much as possible as appropriate to their condition
- walk to the toilet, with supervision or assistance if required

Implementation in practice (Continued)

- eat meals out of bed, preferably in a communal dining room if available and appropriate
- undertake or participate in showering and other grooming and self-care activities.

Staff interventions to assist may include:

- supervising or assisting older people during walking, transfers and ADL if required
- creating a continence and mobility plan that fits with patients sitting out of bed for meals
- adjusting bed height to allow for safe, independent transfers
- in the in-patient care setting, orienting patients to the ward, showing them where the toilet is
- providing a culture that encourages incidental exercise
- providing aids to assist with optimal transfers and mobility
- avoiding use of bed rails, which may limit mobility and be a hazard
- improving understanding of the risks of restricting mobility and providing strategies to prevent de-conditioning.

Continence

Wherever possible, the cause of incontinence should be identified and eliminated, and treatment options examined (Wishin et al, 2008). This should include evaluation of bladder and kidney function regarding urinary incontinence, and that of the intestine and colon in the case of faecal incontinence (Beele et al, 2017). If treatment is not possible, it is recommended that suitable incontinence products are used and non-invasive behavioural interventions implemented (Beeckman et al, 2018). Behavioural interventions may include nutritional and fluid management, mobility enhancement, and different toileting techniques (Wishin et al, 2008). Evidence suggests that structured toileting and exercise interventions can improve incontinence and skin status in elderly nursing home residents (Bates-Jensen et al, 2003). It is recommended to reassess the type and frequency of incontinence on regular basis, to tailor incontinence management and estimate the risk for skin lesions, such as IAD (Beeckman et al, 2018).

Nutrition and hydration

Good nutrition is regarded as a major strategy for maintaining skin integrity and health, and to ensure optimal healing (Kottner et al, 2013). A nutritional assessment should be used, such as the Malnutrition Universal Screening Tool (MUST, 2018) to ensure the patient's nutrition and hydration is adequate to maintain skin integrity or promote healing. Monitoring should be ongoing and the patient educated about the importance of nutrition and hydration where necessary and appropriate.

Gentle skin cleansing

Cleansing should be an important part of any standard skincare regimen. Ensuring that cleansing is gentle and not damaging to the skin in any way is particularly key in skin frailty. The process of cleansing itself can be detrimental to the skin barrier (Voegeli, 2008; Ananthapadmanabhan et al, 2013). Excessive cleansing can cause skin dryness and skin irritation, also influencing the pH and, hence, the bacterial flora (Beele et al, 2017); many soaps have a high pH level and can be damaging to the skin. Drying the skin by rubbing causes additional friction and should be avoided (Voegeli, 2008). Therefore, an optimal balance must be found between removing irritants and preventing additional irritation due to frequent cleansing, which is particularly pertinent in any patients where IAD may be an issue (Beeckman et al, 2018).

Traditional washing with water and soap should be avoided as it will change the barrier and increase

skin pH (Kuehl et al, 2003; Beele et al, 2017). Soap-free liquid wash products may be a good substitute for soap in some patients (Wounds UK, 2018) – see p14 for more information on general skin care. Skin cleansers containing non-ionic surfactants, reflecting the pH-range of the acid mantle of healthy skin, are also preferable due to their gentleness (Nix, 2000; Kuehl et al, 2003).

Where possible, it is recommended to use pH-balanced no-rinse cleansers, such as soft, disposable non-woven cloths, that may also simplify care and improve patient comfort (Gray et al, 2012; Kottner et al, 2013; Beeckman et al, 2016; Beeckman et al, 2018).

Moisturise and protect skin

Moisturising and protecting the skin also represent a key step in reducing risk. Leave-on moisturising products may be useful for these purposes (see page 14 for more information).

Leave-on products can be used for both prevention (as a barrier between the stratum corneum and any moisture or irritant), and treatment (to promote healing and allow the skin barrier to recover; Beeckman et al, 2016). Leave-on products including skin moisturisers should be applied according to the manufacturer's instructions; suitability for use on damaged or denuded skin should be supported by the manufacturer's safety data. Recent systematic reviews have concluded that the application of leave-on products (moisturisers, skin protectants, or a combination) seems to be more effective than water and soap (Beeckman et al, 2016; Pather et al, 2017).

Skin moisturisers aim to repair or strengthen the skin's barrier, retain and/or increase its water content, reduce trans-epidermal water loss (TEWL), and restore or improve the intercellular lipid structure (Beeckman, 2017). A skin barrier product aims to prevent skin breakdown by providing an impermeable or semi-permeable barrier on the skin (Beeckman et al, 2009; Kottner & Beeckman, 2015; Beeckman et al, 2016).

Skin protectants should be applied regularly and by patting gently to avoid friction, in the appropriate quantity to avoid softening of the skin; in individuals where IAD may be an issue, this should be carried out ideally before the exposure, and applied to all skin areas coming into contact, with urine and/or faeces (Kottner and Beeckman, 2015; Beele et al, 2017).

Care with device application and removal

In vulnerable skin, the insertion site of a medical device (Moreiras-Plaza, 2010) or the location of the device placement can cause additional susceptibility to tissue damage (Ong, 2011; Hogeling et al, 2012). Devices can cause rubbing or create pressure on the soft tissues (Jaul, 2011), which can result in pressure ulceration (WUWHS, 2016). Adhesive tapes used to secure the device may also irritate susceptible skin, especially if oedema then develops around the device; however, appropriate selection of the medical adhesive tape (e.g. based on silicone technology) may prevent skin complications (Black et al, 2010; WUWHS, 2016).

A number of strategies have been proposed to prevent device-related pressure ulcers, including:

- Correct positioning and care of the equipment. This includes correct selection of the securement device and medical adhesive as per manufacturers' guidelines (Apold & Rydrych, 2012; Boesch et al, 2012)
- Use of thin hydrocolloids, film dressings or barrier products underneath the device to reduce

Implementation in practice (Continued)

moisture, friction and shear (Weng, 2008; Huang et al, 2009; Jaul, 2011; Iwai et al, 2011; Boesch et al, 2012)

- Use of pressure-reducing dermal gel pads (Large, 2011).

If a wound has occurred, it is also important to take care when applying and removing dressings, in order to avoid medical adhesive-related skin injury (MARSI). Tips for dressing application and removal in vulnerable skin include (LeBlanc et al, 2018):

- Consider using dressings that are atraumatic on removal
- Take time to remove dressings slowly ('low and slow')
- Mark the dressing with an arrow to indicate the correct direction of removal and make sure this is clearly explained in the notes where relevant (e.g. in skin tears)
- Adhesive removers can be used when removing the dressing to minimise trauma
- Use a dressing that is designed to be in direct contact with the periwound skin
- Alternatively, consider using a skin barrier product to protect the surrounding skin (e.g. to prevent maceration if a wound has high exudate levels, or prevent skin stripping when removing the adhesive/dressing or securement device)

Implementation in practice: *Key points*

- Principles of skin care should take an evidence-based, person-centred approach
- Assessment should trigger monitoring and an individualised care plan for individuals who are at risk
- Promoting skin health and preventing skin injury in vulnerable individuals should be a priority in all aspects of care.

Conclusions

There is an imperative for improving skin integrity outcomes in individuals with skin frailty. The skin is the largest organ, has multiple functions and is important to overall health. A holistic, person-centred approach to skin health can break down care silos, and improve skin integrity outcomes and quality of life in those with skin frailty. Essential elements in this approach to skincare include thorough holistic assessment and continued monitoring, consideration of multiple, inter-related factors that encompass individual need and preference, general health status, mobility, nutrition, continence status and socio-economic/psycho-social issues.

It is clear there is a need for increased awareness about the skin and its importance to overall health in specific patient groups who may be at risk of skin damage due to their skin frailty. The skin is a vital organ and should be treated as such, and is also an important indicator of overall health and wellbeing, and represents a huge opportunity to prevent a number of complications that may otherwise be missed. While we have focused on specific conditions and their synergistic risk factors, there are many more.

There is also huge scope for individual involvement from patients and their carers/relatives. Self-care regimens in at-risk individuals have been found to have a beneficial effect on outcomes, both in terms of patient health and quality of life, and as a relatively low-cost way of improving systems and making cost savings (Finch et al, 2018).

This new approach should encourage a way of thinking that encompasses all aspects of skin health, viewing skin issues through the lens of skin frailty rather than as separate conditions. This should in turn improve outcomes, most importantly, for the individual.

References

- Ananthapadmanabhan K, Subramanyan K, Nole G (2013) A global perspective on caring for healthy stratum corneum by mitigating the effects of daily cleansing: report from an expert dermatology symposium. *Br J Dermatol* 168(Suppl 1): 1-9
- Apold J, Rydrych D (2012) Preventing device related pressure ulcers: Using data to guide statewide change. *J Nurs Care Qual* 27(1): 28-34
- Ayello EA, Levine JM, Langemo D et al (2019) Reexamining the literature on terminal ulcers, SCALE, skin failure and unavoidable pressure injuries. *Adv Skin Wound Care* 32(3): 109-21
- Bale S, Tebble N, Jones V, Price P (2004) The benefits of implementing a new skin care protocol in nursing homes. *J Tissue Viability* 14(2):44-50
- Bates-Jensen BM, Alessi CA, Al Samarrai NR, Schnelle JF (2003) The effects of an exercise and incontinence intervention on skin health outcomes in nursing home residents. *J Am Geriatr Soc* 51(3): 348-55
- Beeckman D (2017) A decade of research on incontinence-associated dermatitis (IAD): Evidence, knowledge gaps and next steps. *J Tissue Viability* 26(1): 47-56
- Beeckman D, Schoonhoven L, Verhaeghe S et al (2009) Prevention and treatment of incontinence-associated dermatitis: literature review. *J Adv Nurs* 65(6): 1141-54
- Beeckman D, Smet S, Van den Bussche K (2018) Incontinence-associated dermatitis: why do we need a core outcome set for clinical research? *Wounds International* 9(2): 21-5
- Beeckman D, Van Damme N, Schoonhoven L et al (2016) Interventions for preventing and treating incontinence-associated dermatitis in adults. *Cochrane Database Syst Rev*. CD011627
- Beele H, Smet S, Van Damme N, Beeckman D (2017) Incontinence-associated dermatitis: pathogenesis, contributing factors, prevention and management options. *Drugs Aging* 35(1): 1-10
- Benbow M (2012) Skin care of the incontinent patient. *J Commun Nurs* 26(2): 31-7
- Bianchi J (2012) Causes and strategies for moisture lesions. *Nurs Times* 108(5): 20-2
- Black JM, Cuddigan JE, Walko MA et al (2010) Medical device related pressure ulcers in hospitalised patients. *Int Wound J* 7(5): 358-65
- Boesch RP, Myers C, Garrett T et al (2012) Prevention of tracheostomy-related pressure ulcers in children. *Pediatrics* 129(3): 792-7
- Butcher M, White R J (2005) The structure and functions of the skin. In: RJ White (ed) *Skin Care in Wound Management: Assessment, Prevention and Treatment*. Wounds UK Books, Aberdeen
- Campbell J, Coyer F, Osborne S (2016) The Skin Safety Model: Reconceptualising skin vulnerability in older patients. *J Nurs Scholarship* 48(1): 14-22
- Carville K, Leslie G, Osseiran-Moisson R et al (2014) The effectiveness of a twice-daily skin-moisturising regimen for reducing the incidence of skin tears. *Int Wound J* 11(4): 446-53
- Ciro CA (2014) Maximizing ADL performance to facilitate aging in place for people with dementia. *Nursing Clinics* 49(2): 157-69
- Coker JF, Martin ME, Simpson RM, Lafortune L (2019) Frailty: an in-depth qualitative study exploring the views of community care staff. *BMC Geriatrics* 19: 47
- Coleman S, Nixon J, Keen J et al (2014) A new pressure ulcer conceptual framework. *J Adv Nurs* 70: 2222-34
- Edsberg LE, Langemo D, Baharestani MM et al (2014) Unavoidable pressure injury: state of the science and consensus outcomes. *J Wound Ostomy Continence Nurs* 41: 313-34
- European Pressure Ulcer Advisory Panel, National Pressure Injury Advisory Panel, Pan Pacific PU Panel (2019) Prevention and treatment of pressure ulcers/injuries: Clinical practice guideline. Available online at: <https://www.eupap.org/pu-guidelines/> (accessed 14.01.2020)
- Finch K, Osseiran-Moisson R, Carville K et al (2018) Skin tear prevention in elderly patients using twice-daily moisturiser. *Wound Practice and Research* 26(2): 99-109
- Fink R (2000) Pain assessment: the cornerstone to optimal pain management. *Proc (Bayl Univ Med Cent)* 13(3): 236-9
- Flanagan M, Fletcher J (2003) Tissue viability: Managing chronic wounds. In: Booker C, Nicol M (eds) *Nursing adults: The practice of caring*. Mosby, St Louis
- Gray M, Black JM, Baharestani MM et al (2011) Moisture-associated skin damage: overview and pathophysiology. *J Wound Ostomy Continence Nurs* 38(3): 233-41
- Gray M, Beeckman D, Bliss DZ et al (2012) Incontinence-associated dermatitis: a comprehensive review and update. *J Wound Ostomy Continence Nurs* 39(1): 61-74
- Gray M, Giuliano KK (2018) Incontinence-associated dermatitis, characteristics and relationship to pressure injury: A multisite epidemiologic analysis. *JWOCN* 45(1): 63-7
- Günnewicht B, Dunford C (2004) *Fundamental aspects of tissue viability nursing*. Southampton: Quay
- Hogeling M, Fardin SR, Frieden IJ, Wargon O (2012) Forehead pressure necrosis in neonates following continuous positive airway pressure. *Pediatr Dermatol* 29(1): 45-8
- Huang TT, Tseng CE, Lee TM, et al (2009) Preventing pressure sores of the nasal ala after nasotracheal tube intubation: from animal model to clinical application. *J Oral Maxillofac Surg* 67: 543-51
- Inamadar AC, Palit A (2013) *Critical care in dermatology*. Jaypee Medical Publishing, Delhi
- Inouye SK, Studenski S, Tinetti ME, Kuchel GA (2007) Geriatric syndromes: Clinical, research, and policy implications of a core geriatric concept. *JAGS* 55: 780-91
- Irvine C (1991) 'Skin failure' - a real entity: discussion paper. *J R Soc Med* 84(7): 412-3
- Iwai T, Goto T, Maegawa J, Tohna I (2011) Use of a hydrocolloid dressing to prevent nasal pressure sores after nasotracheal intubation. *Br J Oral Maxillofac Surg* 49: e65-6
- Jaul E (2011) A prospective pilot study of atypical pressure ulcer presentation in a skilled geriatric unit. *Ostomy Wound Manage* 57(2): 49-54
- Jaul E, Barron J, Rosenzweig JP, Menczel J (2018) An overview of comorbidities and the development of pressure ulcers among older adults. *BMC Geriatrics* 18(305): 1-11
- Jones JE, Robinson J, Barr W, Carlisle C (2008) Impact of exudate and odour from chronic venous leg ulceration. *Nurs Stand* 22(45): 53-8
- Junius-Walker U, Onder G, Soleymani D et al (2018) The essence of frailty: A systematic review and qualitative synthesis on frailty concepts and definitions. *Eur J Intern Med* 56: 3-10
- Kayer G, Saurat JH (2007) Dermatoporosis: a chronic cutaneous insufficiency/fragility syndrome. Clinicopathological features, mechanisms, prevention and potential treatments. *Dermatology* 215(4): 284-94
- Kottner J, Beeckman D (2015) Incontinence-associated dermatitis and pressure ulcers in geriatric patients. *G Ital Di Dermatol Venereol* 150(6): 717-29
- Kottner J, Beeckman D, Vogt A, Blule-Peytav U (2019a) Chapter 11: Skin Health and Skin Integrity. In: *Innovations and Emerging Technologies in Wound Care 1st Edition*. Editor: A. Gefen. p183-92
- Kottner J, Lichtenfeld A, Blume-Peytavi U (2013) Maintaining skin integrity in the aged: a systematic review. *Br J Dermatol* 169(3): 528-42
- Kottner J, Sigauco-Roussel D, Cuddigan J (2019b) From bed sores to skin failure: Linguistic and conceptual confusion in the field of skin and tissue integrity. *Int J Nurs Studies* 92: 58-9
- Kuehl B, Fyfe K, Shear N (2003) Cutaneous cleansers. *Skin Therapy Lett* 8(3): 1-4

- Lang PO, Michel JP, Zekry D (2009) Frailty syndrome: a transitional state in a dynamic process. *Gerontology* 55(5): 539-49
- Langemo DK, Brown G (2006) Skin fails too: acute, chronic and end-stage skin failure. *Adv Skin Wound Care* 19(4): 206-11
- Large J (2011) A cost-effective pressure damage prevention strategy. *Br J Nurs* 20(6 Suppl): 22-5
- Latimer S, Shaw J, Hunt T et al (2019) Kennedy Terminal Ulcers: A scoping review. *J Hospice Palliat Nurs* 21(4): 257-63
- LeBlanc K, Baranoski S (2011) Skin tears – state of the science: Consensus statements for the prevention, prediction, assessment and treatment of skin tears. *Adv Skin Wound Care* 24(9): 2-15
- LeBlanc K, Campbell K, Beeckman D (2018) Best practice recommendations for the prevention and management of skin tears in aged skin. *Wounds International*. Available online at: <https://www.woundsinternational.com/resources/details/istap-best-practice-recommendations-prevention-and-management-skin-tears-aged-skin> (accessed 6.12.2019)
- Levine J (2020) Clinical aspects of aging skin: Considerations for the wound care practitioner. *Adv Skin Wound Care* 33(1): 12-9
- Lindgren M, Unosson M, Fredrikson M, Ek AC (2004) Immobility – a major risk factor for development of pressure ulcers among adult hospitalized patients: a prospective study. *Scand J Caring Sci* 18(1): 57-8
- Malnutrition Advisory Group (2018) The 'MUST' Report. Nutritional Screening for Adults: A Multidisciplinary Responsibility. Available at: www.bapen.org.uk (accessed 21.01.2020)
- Mervis JS, Phillips TJ (2019) Pressure ulcers: Prevention and management. *J Am Acad Dermatol* 81(4): 893-902
- Moncrieff G, Van Onselen J, Young T (2015). The role of emollients in maintaining skin integrity. *Wounds UK* 11(1):68-74
- Moreiras-Plaza M (2010) Abdominal wall skin pressure ulcer due to a peritoneal catheter. *Perit Dialysis Int* 30(2): 257-8
- National Health Service (2010) Skincare of patients receiving radiotherapy. NHS Quality Improvement Scotland
- National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel, PPPI (2014) Prevention and treatment of pressure ulcers: Clinical practice guideline. Cambridge Media, Osborne Park, Western Australia
- Nesovic AV (2016) Kennedy Terminal Ulcer: A retrospective chart review of ulcers in the hospice setting and educating providers and nurses on the importance of skin changes at life's end. Bozeman, MT: Nursing, Montana State University
- Nix DH (2000) Factors to consider when selecting skin cleansing products. *J Wound Ostomy Continence Nurs* 27(5): 260-8
- North American Nursing Diagnosis Association (2018) Nursing Diagnoses, Definitions and Classification. Available at: www.nanda.org/nanda-i-publications/ (accessed 25.11.2018)
- Ong JC, Chan FC, McCann J (2011) Pressure ulcers of the popliteal fossae caused by thromboembolic deterrent stockings (TEDS). *Ir J Med Sci* 180(2): 601-2
- Pather P, Hines S, Kynoch K, Coyer F (2017) Effectiveness of topical skin products in the treatment and prevention of incontinence-associated dermatitis: a systematic review. *JBI Database Systematic Rev Implementation Reports* 15(5): 1473-96
- Proksch E, Brandner JM, Jensen JM (2008) The skin: an indispensable barrier. *Exp Dermatol* 17(12): 1063-72
- Rappl LM (2008) Physiological changes in tissues denervated by spinal cord injury tissues and possible effects on wound healing. *Int Wound J* 5: 435-44
- Rayner R, Carville K, Leslie G, Roberts P (2015) A review of patient and skin characteristics associated with skin tears. *J Wound Care* 24(9): 406-14
- Rivera J, Stankiewicz M (2018) A review of clinical incidents: skin failure in the dying patient. *J Stomal Ther Aust* 38(1): 12-4
- Shipman AR, Millington GWM (2011) Obesity and the skin. *Br J Dermatol* 165(4):743-50
- Sibbald RG, Krasner DL, Lutz J (2010) SCALE: Skin changes at life's end: final consensus statement. October 1, 2009. *Adv Skin Wound Care* 23(5): 225-36
- Strazzieri-Pulido KC, Peres GRP, Campanili T et al (2017) Incidence of skin tears and risk factors. *J Wound Ostomy Continence Nurs* 44: 29-33
- Timmons J (2006) Skin function and wound healing physiology. *Wound Essentials* 1: 8-17
- Van Tiggelen H, LeBlanc K, Campbell K et al (2019) Standardizing the classification of skin tears: validity and reliability testing of the International Skin Tear Advisory Panel Classification System in 44 countries. *Br J Dermatol* Oct 12. doi: 10.1111/bjd.18604.
- Victoria State Government (2019) Maintaining and improving mobility and self-care. Available online at: <https://www2.health.vic.gov.au/hospitals-and-health-services/patient-care/older-people/falls-mobility/mobility/mobility-improving> (accessed 16.12.2019)
- Voegeli D (2008) The effect of washing and drying practices on skin barrier function. *J Wound Ostomy Continence Nurs* 35(1): 84-90
- Weng MH (2008) The effect of protective treatment in reducing pressure ulcers for non-invasive ventilation patients. *Intensive Crit Care Nurs* 24(5): 295-9
- Wingerd B (2013) The human body: Concepts of anatomy and physiology (3rd ed). London: Lippincott, Williams and Wilkins
- Wishin J, Gallagher TJ, McCann E (2008) Emerging options for the management of fecal incontinence in hospitalized patients. *J Wound Ostomy Continence Nurs* 35(1): 104-10
- Woo KY, Beeckman D, Chakravarthy D (2017) Management of moisture-associated skin damage: A scoping review. *Adv Skin Wound Care* 30(11): 494-501
- Woo KY, Coutts PM, Price P et al (2009) A randomized crossover investigation of pain at dressing change comparing 2 foam dressings. *Adv Skin Wound Care* 22: 304-10
- World Union of Wound Healing Societies (2016) Role of dressings in pressure ulcer prevention. Available online at: <https://www.woundsinternational.com/resources/details/consensus-document-role-dressings-pressure-ulcer-prevention1> (accessed 14.01.2020)
- Wounds UK (2015) All-Wales guidance for the prevention and management of skin tears. Available online at: <https://www.wounds-uk.com/resources/details/prevention-and-management-skin-tears> (accessed 6.12.2019)
- Wounds UK (2018) Best practice statement: Maintaining skin integrity. Available online at: <https://www.wounds-uk.com/resources/details/maintaining-skin-integrity> (accessed 26.11.2019)

Appendix

Literature summary				
Area of focus	Author/journal details	Type	Purpose	Outcomes
Skin tears	Van Tiggelen H et al (2019) <i>British J of Dermatology</i> Oct 12. doi: 10.1111/bjd.18604	Multi-country study	To measure the validity and reliability of the International Skin Tear Advisory Panel (ISTAP) Classification System internationally	A definition for the concept of a "skin flap" in the area of skin tears was developed and added to the initial ISTAP Classification System consisting of three skin tear types.
				The overall agreement with the reference standard was 0.79 (95% CI 0.79-0.80) and sensitivity ranged from 0.74 (95% CI 0.73-0.75) to 0.88 (95% CI 0.87-0.88). The inter-rater reliability was 0.57 (95% CI 0.57-0.57). The Cohen's Kappa measuring intra-rater reliability was 0.74 (95% CI 0.73-0.75).
				The ISTAP Classification System is supported by evidence for validity and reliability. It should be used for a systematic assessment and reporting of skin tears in clinical practice and research globally.
Skin tears	Carville et al (2014) <i>Int Wound J</i> 11(4):446-53	Randomised controlled trial	To evaluate the effectiveness of a twice-daily moisturising regimen as compared to 'usual' skin care for reducing skin tear incidence	The application of moisturiser twice daily reduced the incidence of skin tears by almost 50% in residents living in aged care facilities.
Skin tears	Finch K et al (2018) <i>Wound Prac Res</i> 26(2): 99-109	Prospective interventional study	To measure the prevention of skin tears in elderly patients using twice-daily moisturisers. Setting: 580-bed private hospital in Brisbane, a purposive sample of patients aged 65 years or older invited to participate.	Monthly skin tear incidence rates were calculated as number of skin tears/patient-occupied bed days x 1000. Overall, 762 eligible patients were enrolled in the intervention group and their outcomes compared with 415 patients in the historical control group.
				In total, 104 patients developed at least one skin tear (intervention group: n=60, the control group: n=60, the control group: n=44).
				An overall 185 skin tears were reported (mean=1.79 skin tears/patients, SD=1.55, range=19). The average monthly incidence rate in the intervention group was 4.35 per 1000 occupied bed days (89 skin tears over 6 months).
				The results indicate the efficacy of twice-daily application of moisturiser when applied to the extremities of elderly patients for the prevention of skin tears.

Literature summary (Continued)				
Area of focus	Author/journal details	Type	Purpose	Outcomes
Skin tears	Kaya G and J Saurat (2010) <i>European Geriatric Medicine</i> 1(4): 216-219	Literature review	To identify the potential epidemics of dermatoporosis - a new concept proposed to cover different manifestations and implications of chronic cutaneous insufficiency/fragility syndrome.	Chronic systemic or topical steroid therapy and chronic exposure to ultraviolet irradiation appear to be the major causes of dermatoporosis. CD44-hyaluronate molecular pathways play an important role in the pathogenesis.
				Further research and clinical trials are needed to find preventive or therapeutic solutions for dermatoporosis.
Skin tears	Koyano Y et al (2016) <i>International Wound Journal</i> 14(4): 691-697	Prospective cohort study	To identify skin properties that may be used to predict the development of a ST among elderly patients. Conducted at a long-term medical facility in Japan over an 8-month period, patients aged 65 and older ($n=149$).	A total of 52 skin tears were recorded among the 21 patients, resulting in an incidence rate of 1.13/1000 person-days.
				A predictor of skin tears was dermis thickness (HR = 0.52, 95% confidence interval = 0.33-0.81; p -value = 0.004). The cut-off point for dermis thickness was 0.80mm (area under the curve = 0.77, 95% confidence interval = 0.66-0.88; p -value = 0.006).
				Results suggest that measuring the dermis thickness at baseline is an easy and accurate way to identify a high-risk patient.
Skin tears	LeBlanc K et al (2018) <i>ISTAP Best Practice Recommendations for the prevention and management of skin tears in aged skin</i> . London: Wounds International	Best practice statement	The International Skin Tear Advisory Panel (ISTAP) convened a group of experts to provide internationally recognised recommendations for the prevention and management of skin tears, with updated definitions and terminology.	Despite an increased focus on the issue of skin tears in recent years, there are still gaps in knowledge awareness and areas where further research is needed.
				The group identified primarily that standardised terminology is necessary in order to assist with correct identification and subsequent management of skin tears. As well as a validated and standardised classification system in order to facilitate best practice care from the earliest possible stage.
				Prevention should be the aim, wherever possible.
				Products selected for use should: manage the skin tear appropriately, avoid further trauma to the skin and take into consideration fragile surrounding skin.
				Effect of skin tears on patients' quality of life is not fully known - gaining knowledge of patient' experience and perspectives therefore requires further research.
				Skin tears can cause pain, complications and delayed healing. Prevention and appropriate management is vital.

Appendix (Continued)

Literature summary (Continued)				
Area of focus	Author/journal details	Type	Purpose	Outcomes
Skin tears	LeBlanc K et al (2016) <i>Eur Wound Manag Assoc J</i> 16(1): 17-23	Case studies	Three case studies were used to review the relationship between pressure ulcers and skin tears using demographic factors, co-morbidities, predisposing factors, cause of wound, description of the evolution of the wound, and other variables.	These cases highlight the challenges of differentiating skin tears and pressure ulcers. In all three cases, skin tears were misdiagnosed as pressure ulcers, and these misdiagnoses resulted in delayed implementation of skin tear prevention strategies.
				Identifying and classifying skin tears and pressure ulcers as distinct separate wound types can pose a clinical challenge to health care professionals.
				The National Pressure Ulcer Advisory Panel (NPUAP), European Pressure Ulcer Advisory Panel (EPUAP), Pan Pacific Pressure Injury Alliance (PPPIA), and ISTAP, maintain that despite the similarities in wound appearances and challenges in diagnosis, it is critical that these wounds are properly diagnosed.
Skin tears	Lewin G et al (2015) <i>Int Wound J</i> 13(6): 1246-51	Case-control study	To identify the risk factors associated with the development of skin tears in older people. 453 patients (151 cases and 302 controls) were enrolled in a case-control study in a 500-bed metropolitan tertiary hospital in Western Australia between Dec 2008 and June 2009. Case eligibility: skin tear which had occurred in the last 5 days or a skin tear which had developed during hospitalisation.	The most parsimonious model for predicting skin tear development comprised six variables: ecchymosis (bruising); senile purpura; haematoma; evidence of a previously healed skin tear; oedema; and inability to reposition oneself independently.
				The ability of these six characteristics to predict who among older patients could subsequently develop a skin tear now needs to be determined by a prospective study.
Skin tears	Rayner R et al (2015) <i>J Wound Care</i> 24(9): 406	Systematic literature review	To identify studies that reviewed patient and skin characteristics associated with skin tears. Focused on English Literature between 1980 and 2013, using the following databases: PubMed, Medline, CINAHL, Embase, Scopus, Evidence Based and Medicine Reviews (EBM). Search terms included aged, skin, tears or lacerations, skin tearing, geri tear, epidermal tear and prevalence.	343 articles found using the search terms. After abstract review, nine were found to be relevant to the search.
				Principle findings from these eight published articles and one unpublished study revealed that the most common patient characteristics were a history of skin tears, impaired mobility and impaired cognition.
				Skin characteristics associated with skin tears included senile purpura, ecchymosis and oedema.
				This review provides an overview of identified patient and skin characteristics that predispose the elderly to skin tears and exposes the lack of research within this domain.

Literature summary (Continued)

Area of focus	Author/journal details	Type	Purpose	Outcomes
Skin frailty	Persico I et al (2018) <i>J Am Geria Soc</i> 66(10): 2022-30	Systematic review and meta-analysis	To evaluate the relationship between frailty and delirium. Participants aged 65 or older. Two authors independently reviewed all English-language citations, extracted relevant data, and assessed studies for potential bias. Articles involving pediatric or neurosurgical populations, alcohol or substance abuse, psychiatric illness, head trauma, or stroke, as well as review articles, letters, and case reports were excluded.	Identified 1,626 articles from our initial search, of which 20 fulfilled the selection criteria ($n=5,541$ participants, mean age 77.8).
				Eight studies were eligible for meta-analysis, showing a significant association between Q2 frailty and subsequent delirium (RR = 2.19, 95% CI = 1.65-2.91).
				There was low variability among studies in the measures of association between frailty and delirium (12 2.24, p -value Q-statistic = .41) but high heterogeneity in the methods used to assess the two conditions.
				This systematic review and meta-analysis supports the existence of an independent relationship between frailty and delirium, although there is notable methodological heterogeneity between the methods used to assess the two conditions.
Skin frailty	Clegg A et al (2013) <i>Lancet</i> 381: 752-62	Systematic literature review	To develop more efficient methods to detect and severity grade frailty as part of routine clinical practice, particularly methods with utility for primary care.	Distinction of frail elderly people from those who are not frail should be an essential part of assessment in any healthcare encounter, that could result in an invasive procedure or potentially harmful medication.
				The most evidence-based process to detect and severity grade frailty is the process of comprehensive geriatric assessment. This is a resource intensive process and new research is urgently required to find equally reliable but more efficient and responsive methods for routine care.
Skin frailty	Junius-Walker U et al (2018) <i>Eur J Intern Med</i> 56: 3-10	Systematic literature review	The ADVANTAGE Group aims to analyse the diverse frailty concepts to uncover the essence of frailty as a basis for a shared understanding. Eligible publications were reviewed using concept analysis that led to the extraction of text data for the themes "definition", "attributes", "antecedents", "consequences", and "related concepts".	78 publications were included in the review, and 996 relevant text passages were extracted for analysis. Five components constituted a comprehensive definition: vulnerability, genesis, features, characteristics, and adverse outcomes.
				Each component is described in more detail by a set of defining and explanatory criteria. An underlying functional perspective of health or impairments is most compatible with the entity of frailty.
				Findings facilitate a focus on the relevant building blocks that define frailty. They point to the commonalities of the diverse frailty concepts and definitions.

Appendix (Continued)

Literature summary (Continued)				
Area of focus	Author/journal details	Type	Purpose	Outcomes
Pressure ulcers	Ayello E et al (2019) <i>Adv Skin Wound Care</i> 32(3): 109-21	Literature review	To synthesise the literature regarding pressure ulcers that are found in patients at the end of life and to clarify the terms used to describe these conditions. Consensus around appropriate terminology is essential to reduce confusion among stakeholders and ensure appropriate patient care.	There is agreement that skin changes at end of life are real clinical phenomena seen in practice, the pathophysiology of skin changes in dying and palliative care patients is incomplete.
				There is also a need to agree on definitions and terms, and to begin to define diagnostic criteria for skin failure as well as skin changes at end of life, in order to avoid confusion and impeding communication between clinicians, especially across disciplines.
				Terminology therefore needs to be consistent and subject to validation in the clinical setting. This article provides a platform for further dialogue.
Pressure ulcers	Jackson D et al (2019) <i>Int J Nurs Studies</i> 92: 109-20	Observational study review	To review observational studies reporting medical device-related pressure ulcers to identify the medical devices commonly associated with pressure ulcers.	29 studies (17 cross-sectional; 12 cohort) comprising data on 126,150 patients, were eligible for inclusion in this review. The mean ages for patients were approximately 36.2 years (adults) and 5.9 years (children).
				The estimated pooled incidence and prevalence of medical device-related pressure ulcers were 12% (95% CI 8-18) and 10% (95% CI 6-16) respectively. These results should be interpreted with caution given the high levels of heterogeneity observed between included studies.
				Commonly identified medical devices associated with the risk of developing medical device-related pressure ulcers include respiratory devices, cervical collars, tubing devices, splints, and intravenous catheters
Pressure ulcers	Jaul E et al (2018) <i>BMC Geriatrics</i> 18: 305	Literature review	To describe chronic and acute conditions which are risk factors in elderly patients for developing pressure ulcers.	Multiple chronic diseases and complicating factors which are associated with immobility, tissue ischaemia, and undernutrition can cause pressure ulcers in community settings, hospitals, and nursing facilities.
				Identifying the key risk factors and impact of comorbidities and associated geriatric conditions on the susceptibility of the elderly patient is of critical importance for the prevention of pressure ulcers.

Literature summary (Continued)				
Area of focus	Author/journal details	Type	Purpose	Outcomes
Pressure ulcers	Kottner J et al (2018) <i>Clinical Biomechanics</i> 59: 62-70	Systematic literature review	To provide an up-to-date and in-depth discussion of microclimate in the context of pressure ulcer prevention, to link current ideas from dermatological biomechanical, laboratory, and clinical practice perspectives, and to discuss current and future prevention technologies from a microclimate perspective.	An object on the skin surface provides an impedance to convective heat loss, an object on the skin surface provides an impedance to evaporative moisture loss.
				Microclimate is an effect-modifier or an indirect risk factor for pressure ulcer development. Effects of 'microclimate interventions' on pressure ulcer prevention are unclear.
				The term 'microclimate management' should not be used.
Pressure ulcers	Mervis J & Phillips T (2019) <i>J Am Acad Dermatol</i> 81(4): 893-902	Continuing education article	Prevention has been a primary goal of pressure ulcer research. This article focuses on prevention and management, with an emphasis on the evidence for commonly accepted practices.	Pressure ulcers continue to be a significant burden for patients and society, with the need for ongoing effective prevention and treatment strategies.
				High-quality studies comparing many of the available interventions are still needed.
				Pressure ulcers undoubtedly require a multifaceted approach that optimises pressure relief, nutrition status, and proper wound care, as well as nonsurgical and surgical treatments as needed.
MASD	McNichol L et al (2018) <i>Adv Skin Wound Care</i> 31(11): 502-13	Literature review	To consider the evidence on IAD. Best practice strategies for the management of skin damage from IAD (both prevention and treatment) are provided. A mnemonic to help clinicians translate IAD evidence into practice is introduced. Workplace experiences supplement this evidence synthesis. Approaches to assist in translation of this knowledge and evidence into practice are also provided.	IAD remains an important practice concern.
				Information and guidelines about IAD exist in the literature, but getting time-constrained clinicians to adopt them into their routine practice is a challenge.
				Care for IAD requires a combination of process and products that are consistently used. Simplified decision-making tools and algorithms are necessary to assist providers in assessing for IAD and implementing prevention and treatment options.
				This review supports using various products designed to protect skin, cleansing the skin soon after an incontinence episode, and using newer absorptive products that wick wetness away from the skin to decrease skin damage from IAD.

Appendix (Continued)

Literature summary (Continued)				
Area of focus	Author/journal details	Type	Purpose	Outcomes
MASD	Metin A et al (2015) <i>Clin Dermatol</i> 33(4): 437-47	Review article	To discuss superficial infections, which are widespread, regardless of age and gender, in populations all around the world. The prevalence of fungi can vary according to the patients and certain environmental factors.	<p>Underventilated and moist areas exposed to friction are especially sensitive to fungal infections e.g. the lids, external auditory canal, behind the ears, navel, inguinal region, and axillae (also called flexures).</p> <p>Fungi can both directly invade the skin, leading to infections, and indirectly stimulate immune mechanisms due to tissue interaction and their antigenic characters and contribute to the development or exacerbation of secondary bacterial infections, seborrheic dermatitis, atopic dermatitis, and psoriasis.</p> <p>"Superficial fungal infections can be classified and studied as dermatophyte infections, candidal infections, Malassezia infections, and other superficial infections independently from the involved skin fold areas."</p>
MASD	Woo K et al (2017) <i>Adv Skin Wound Care</i> 30(11): 494-501	Scoping review	To identify and provide a narrative integration of the existing evidence related to the management and prevention of MASD	<p>37 articles were considered appropriate for this review. Findings included functional definitions and prevalence rates of the four types of MASD, assessment scales for each, and seven evidence-based strategies for the management of MASD.</p> <p>Based on this scoping review of literature, the authors propose key interventions to protect and prevent MASD including the use of barrier ointments, liquid polymers, and cyanoacrylates to create a protective layer that simultaneously maintains hydration levels while blocking external moisture and irritants.</p>
MASD	Zulkowski K et al (2017) <i>Adv Skin Wound Care</i> 30(8): 372-81	Continuing education article	To examine the superficial skin issues related to MASD, medical adhesive-related skin injury, and skin tears. Similarities, differences, prevention, and treatment will be described.	<p>Any skin irritation should be documented with subsequent care planning and appropriate treatment. Clinicians should determine the cause or causes of the irritation to find the proper solutions.</p> <p>Moisture under dressings or stoma products, adhesive product use in the same skin area or improper placement and removal, moisture between skin folds, incontinence, and patient factors all influence whether a problem will develop.</p> <p>Many epidermal skin issues can and should be prevented. Any skin issue should be tracked and seen as an opportunity for improvement in care. All staff should understand their roles in prevention and what to report.</p> <p>Patient and family education are equally important to avoid additional skin problems after facility discharge.</p>

Literature summary (Continued)

Area of focus	Author/journal details	Type	Purpose	Outcomes
MASD	Gray M and Weir D (2007) <i>J Wound Ostomy Cont Nurs</i> 34(2): 153-57	Literature review	To identify effective interventions for preventing and managing maceration of/in the periwound skin	Application of a skin protectant (no-sting film barrier petrolatum-based or zinc-based skin protectant) to the periwound skin reduced the risk of periwound skin maceration. (Strength of Evidence: Level 1)
				There is insufficient clinical evidence to determine whether composite or foam dressings are more effective than hydrocolloid dressings for the prevention of periwound skin maceration. (Strength of Evidence: Level 3)
				Limited evidence suggests that silver-impregnated foam dressing may be more effective than a foam dressing for the prevention of periwound skin maceration. (Strength of Evidence: Level 2)
				Insufficient evidence to conclude that unprocessed honey, negative pressure wound therapy and compression therapy is effective for the prevention of periwound skin maceration. (Strength of Evidence: Level 5)
				Research is urgently needed to identify and evaluate strategies for managing existing periwound maceration.
Skin frailty	Conroy S and Elliott A (2017) <i>Medicine</i> 45(1): 15-18	Comprehensive geriatric assessment	A problem with the concept of frailty is the search for a suitable operational definition that can be used in clinical practice. Many definitions exist in literature, but there is no agreement on the best measure which is explored in this article.	The more popular of these definitions include Fried's model of frailty and the Frailty Index.
				Identification of frailty is recommended to target interventions and help improve outcomes.
End-of-life skin changes	Latimer S et al (2019) <i>J Hospice Palliative Nurs</i> 21(4): 257-63	Scoping review	To identify and map the published literature on Kennedy terminal ulcers in terms of its definition, prevalence, assessment, treatment, management, health care costs, and quality of life for patients in all health care settings.	Kennedy terminal ulcer prevalence data are limited, with no validated assessment tools available.
				Kennedy terminal ulcers may be misclassified as pressure injuries, potentially resulting in financial penalties to the institution. This scoping review revealed significant knowledge and clinical practice gaps in patient assessment, management and treatment of Kennedy terminal ulcers.
				Timely patient education may help to make informed care and quality end-of-life decisions.
				Further research is needed to inform clinical practice to improve patient care.

