ISTAP

BEST PRACTICE RECOMMENDATIONS **2021**

BEST PRACTICE RECOMMENDATIONS FOR

PREVENTION AND MANAGEMENT OF PERIWOUND SKIN COMPLICATIONS

Recommendations from an expert working group

Wounds International

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FOREWORD

Periwound management is an important but sometimes overlooked area, despite the impact it has on wound bed preparation and wound healing. Periwound breakdown delays wound healing and increases pain. It is imperative that conditions and risk factors are identified early to prevent the risk of wound progress declination.

There has been confusion around definitions of the periwound, and gaps in assessment and management.

It must be recognised that any individual with a wound is at risk for periwound complications. In addition to delayed healing, further complications relating to the periwound may include infection, detrimental effects on an individual's quality of life, and increased healthcare costs.

A group of experts, all from the International Skin Tear Advisory Panel (ISTAP), convened on a virtual platform in December 2020 to clarify definitions of the periwound and formulate guidelines for prevention and management of periwound complications.

The initial meeting resulted in this best practice document, including key statements relating to the periwound. The document and statements were then circulated to an external review panel, with the level of agreement for the statements set at 80%.

The document aims to raise awareness of issues relating to the periwound and to enable all clinicians to consider the periwound appropriately when managing wounds. A proactive, evidence-based approach should be taken for all individuals with wounds, in order to minimise the risk of periwound complications and improve outcomes.

Kimberly LeBlanc (Chair)

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

Defining the periwound

FIGURE 1 | Dry periwound skin (courtesy of Kim LeBlanc)

A wound is defined as a breakdown in the protective function of the skin and loss of continuity of epithelium, with or without loss of underlying connective tissue – i.e. muscle, bone, nerves (Leaper and Harding, 1998). A wound may be described in many ways; by its aetiology, anatomical location, whether it is acute or chronic, by its presenting symptoms or the tissue types present in the wound bed.

The term 'periwound' is frequently used to describe the area surrounding a wound; however, no clear definition or consensus exists to outline where the periwound starts and ends. This can also vary depending on the wound type, with different issues and implications to consider in different types of wounds with differing aetiologies (see Figures 1–7), such as:

- Chronic wounds
- Traumatic wounds
- Surgical incisions
- Surgical dehiscence
- Skin tears
- Incontinence-associated dermatitis
- Venous leg ulcers
- Pressure ulcers/injuries
- Diabetic foot ulcers
- Highly exuding wounds
- Cutaneous fistulae.

It was agreed that a wound can be defined as any disruption in skin integrity. 'Periwound' refers to the area around the wound and this area may or may not be demarcated visually.

In the literature, the periwound has been referred to as 'the defensive zone that contains the wound' (Dowsett et al, 2015), and defined as the area within 4cm of the wound edge (Thayer et al, 2016). It should be noted that it is impossible to quantify this area according to distance, as the size of the area may be related to the underlying wound pathology, dressing, device, treatment (e.g. radiation) or other factors (e.g. skin conditions, skin microbiome, hypersensitivity, atopic dermatitis).

Furthermore, while most skin damage in the periwound is related to the wound, there is a need to identify the underlying pathology in case of other causes that need to be managed.

As such, the expert panel agreed the definition for periwound is as follows:

The periwound is the area around a wound that may be affected by wound-related factors and/or underlying pathology.

Why is the periwound important?

FIGURE 2 | Macerated periwound skin (courtesy of Kim LeBlanc)

FIGURE 3 | Fistula and skin damage (courtesy of Heidi Hevia Campos)

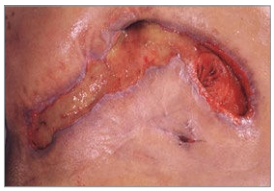

FIGURE 4 | Colostomy and fistula (courtesy of Heidi Hevia Campos)

FIGURE 5 | Pyoderma gangrenosum (courtesy of Heidi Hevia Campos)

The skin surrounding a wound is particularly vulnerable and, although it may appear healthy, periwound complications frequently occur (Bianchi, 2012). According to Hunter et al (2013), the integrity of the periwound skin may be an important determinant in decreasing wound size. There are several wound-related factors that may result in periwound damage, such as exposure to exudate and the matrix metalloproteinases (MMPs) that exudate contains, infection, dressing adherence or allergic reactions (Bianchi, 2012). Types of periwound damage include maceration, denudement, excoriation, erosion, skin stripping and allergic reactions affecting the skin. Skin irritation can also lead to excoriation (Bianchi, 2012); pruritis (itch) can also occur, which may lead to further issues.

Periwound damage can contribute to (Park et al, 2008; Santos et al, 2017; Woo et al, 2017):

- Delayed healing
- Wound deterioration and increased wound size
- Increased infection risk
- Pain and discomfort
- Reduced quality of life
- Increased treatment time and associated costs.

Promoting periwound health can (Woo et al, 2017):

- Improve healing
- Decrease infection risk
- Reduce dressing frequency and associated cost
- Reduce pain and discomfort, and improve quality of life.

CONSENSUS STATEMENT

Periwound damage is a risk factor for delayed wound healing and may increase the risk of wound infection.

Periwound complications can delay healing in a variety of ways, which in turn increases the risk of infection; increased bacterial burden can in turn increase inflammatory response and delay healing, creating a vicious cycle. For example, in the case of surgical wounds, periwound damage may lead to increased risk of surgical site infections and wound dehiscence (Sandy-Hodgetts et al, 2020). Such post-surgical wound complications are one of the leading global causes of morbidity following surgery (Sandy-Hodgetts et al, 2020), with mortality affecting 1–4% of individuals following gastrointestinal surgery (Pearse et al, 2012; Collaborative GS, 2017).

Healthcare costs have been found to increase when periwound complications develop, such as delayed healing, increased wound size, increased pain and additional care time; careful monitoring and ongoing assessment of both the wound and periwound skin will aid in identifying skin changes and ensuring early intervention with appropriate and cost-effective treatment options (Bianchi, 2012). Any individual with a wound may develop periwound complications, but especially individuals with fragile skin. There are direct wound-related factors that may cause periwound damage (see below), plus additional risk factors that may increase an individual's likelihood of developing complications (see p8). It is important to note that, while measures should be taken to mitigate risk, not all periwound skin damage is avoidable.

Wound-related factors associated with periwound damage

The production of exudate is vital to wound healing, promoting healing by (WUWHS, 2019):

- Providing a moist wound environment

Why is the periwound important? (Continued)

FIGURE 6 | Ileostomy (courtesy of Heidi Hevia Campos)

FIGURE 7 | Ileostomy (courtesy of Heidi Hevia Campos)

- Enabling the diffusion of immune mediators and growth factors across the wound bed
- Acting as a medium for the migration of tissue-repairing cells across the wound bed
- Supplying essential nutrients for cell metabolism
- Promoting autolytic debridement of dead or damaged tissue.

However, if not managed effectively, exudate can cause damage to the periwound skin (WUWHS, 2019). The periwound is particularly vulnerable to moisture-associated skin damage (MASD) when wound drainage volume exceeds the fluid-handling capacity of the dressing (Fletcher et al, 2020a). Other factors need to be considered, such as the moisture vapour transmission rate (MVTR) of dressing material, microclimate, moisture level in the environment, the type of interface (ability to lock in fluid), and lateral movement of fluid, plus time between dressing changes due to nursing resources. While a moist, hydrated wound bed is optimum, too much moisture ('hyper-hydration') can lead to maceration, damaging the skin (WUWHS, 2019).

In lower limb wounds, compression is an additional factor that can affect the skin. Compression is the gold-standard for most lower limb wounds based on perfusion and aetiology. However, it is important to ensure that exudate can be handled appropriately under compression, so that exudate is not forced out from the wound, potentially damaging the periwound skin (WUWHS, 2019). Additionally, compression therapy for venous leg ulcers is likely to be particularly effective in reducing exudate production, because compression therapy opposes leakage of fluid from capillaries into the tissues/wound bed and reduces oedema (Wounds International, 2015).

Skin breakdown, erythema and erosion commonly occur in skin that has been damaged by wound exudate (Bianchi, 2012). Maceration may also occur when moisture is trapped against the skin for a prolonged period, which may appear as a white margin around the wound, causing the skin to soften and wrinkle (Lawton and Langøen, 2009). Maceration may increase risk of friction damage, infection, and skin breakdown, which may result in enlargement of the wound or delayed healing (Colwell et al, 2011).

Non-healing wounds have higher levels of inflammatory molecules, which stimulate the production of enzymes that degrade proteins (proteases), than healing wounds do (Gibson et al, 2009). The raised levels of proteases (human and microbial) interfere with the healing process by degrading growth factors, hindering cellular proliferation and migration and disrupting the newly formed extracellular matrix (WUWHS, 2019).

Exposure to inflammatory mediators such as MMPs can cause damage in the wound bed and to the periwound, such as breakdown of the extracellular matrix (Holloway et al, 2020). This is due to the proteins enveloping and destroying the corneocytes (the outermost layer of skin cells) damaging epidermal barrier function (Langøen and Bianchi, 2012). Additionally, the pro-inflammatory cytokines in exudate can cause additional damage to the corneocytes, further reducing skin barrier function (Wolcott et al, 2008). Increased pH levels can also cause prolonged inflammation and compromise barrier function (Watret and Rodgers, 2005).

As well as direct wound-related factors, research shows that multiple keratin layers of the stratum corneum are removed by tape stripping on healthy skin (Sølberg et al, 2018), precipitating further skin damage (Colwell et al, 2011; Woo et al, 2017) known as medical-adhesive related skin injury (MARSI). While MARSI can occur across all demographic groups, those with risk factors for vulnerable skin (e.g. older people or those with skin conditions or comorbidities)

may be particularly affected (Beeckman et al, 2020). MARSI has been found to affect over a quarter (27%) of individuals with postoperative wounds, impacting negatively on outcomes and significantly adding to the cost of treatment. A shift to using more silicone adhesives could reduce the economic burden of postoperative complications and improve outcomes by reducing MARSI-associated pain (Upton et al, 2019). Significant intraindividual variation exists in relation to the number of consecutive tape strippings and to the depth of skin that may be damaged(Sølberg et al, 2018). See p12 for more information on dressing removal techniques.

A survey also found that folliculitis (inflammation of the hair follicles) is a form of MARSI that is under-recognised in practice and lags behind all other types of MARSI-related skin damage in terms of awareness (Ousey and Wasek, 2016), which can be categorised as a broad form of periwound skin damage.

Other wound types may be susceptible to other types of damage to the periwound skin, such as hyperkeratotic skin in leg ulcers, calluses in diabetic foot ulcers (which may be exacerbated by footwear, for example), skin damage associated with pressure ulcers/injuries, or rolled edges in chronic wounds.

CONSENSUS STATEMENT

Healthcare professionals and caregivers/individuals should manage modifiable intrinsic and extrinsic factors to promote and maintain skin integrity in the periwound, minimise damage and support healing.

CONSENSUS STATEMENT

Not all periwound damage is avoidable.

CONSENSUS STATEMENT

Exudate management is key to avoiding periwound damage.

Factors associated with periwound complications

While periwound complications can occur in any individual with a wound, there are factors that can put the individual at increased risk, which must be assessed and managed accordingly. Many of these risk factors can be divided into intrinsic and extrinsic (factors relating directly to the individual, or to their environment, circumstances and healthcare setting), and modifiable and non-modifiable (whether they can be changed or not). See Table 1 for a list of common risk factors.

Table 1. Factors associated with periwound complications (Beeckman et al, 2020; Cowdell et al, 2020)

Factor	Intrinsic	Extrinsic	Modifiable	Non-modifiable
Use of medications or treatments that can adversely affect the skin (e.g. topical and systemic corticosteroids, chemotherapy agents, radiation therapy, antibiotics) by causing thinning or dryness or infections		✓	✓	✓
Xerosis, inflammation of the skin (psoriasis, dermatitis) and other skin conditions (e.g. scleroderma)	✓		✓	✓
Factors related to the individual (e.g. hydration status, bathing frequency, host response, skin flora)	✓	✓	✓	
Individual's environment		✓	✓	
Sun exposure		✓	✓	
Skin hygiene that may affect skin condition (i.e. changes in pH, over-washing, rubbing the skin, non-pH-balanced soaps) and routine skin care		✓	✓	
Trauma		✓	✓	✓
Reduced peripheral sensation	✓			✓
Reduced mobility	✓		✓	✓
Incontinence	✓	✓	✓	✓
Mental health issues and dementia	✓		✓	✓
Polypharmacy		✓	✓	✓
Diabetes and vascular changes	✓		✓	✓
Poor nutrition	✓		✓	
Oedema/lymphoedema	✓		✓	✓
Inflammation	✓	✓	✓	✓
Location of the wound/skin contour	✓			✓
Mechanical skin injury (skin stripping, tension injury, skin tears, shear, friction, pressure)		✓	✓	✓
Adhesion of dressing/bandages/devices to the periwound (includes dressings without adhesive properties)		✓	✓	

Table 1. Factors associated with periwound complications (Beeckman et al, 2020; Cowdell et al, 2020) *(Continued)*

Factor	Intrinsic	Extrinsic	Modifiable	Non-modifiable
Frequent dressing changes		✓	✓	✓
Dressing/bandages/devices that do not adequately address local wound conditions (fluid handling capacity)		✓	✓	
Type/amount of wound exudate	✓		✓	
Wound care treatment that can increase exudate (e.g. compression or oxygen therapy)		✓	✓	
Microclimate/moisture (see Box 1)		✓	✓	
Allergens/irritants		✓	✓	
Skin frailty	✓		✓	✓
Concordance/adherence to treatment	✓	✓	✓	✓
Social factors and access to healthcare		✓	✓	✓

Box 1. Overview of microclimate *(adapted from Dunk, 2015)*

Microclimate comprises temperature, humidity, and airflow next to the skin surface.

With any increase in humidity or over normal temperature range, the skin becomes weaker and more vulnerable (Clarke et al, 2011; Yoshimura et al, 2015).

Management of moisture and consideration of microclimate may encompass:

- Identifying the cause and systemic management of type/amount of wound exudate plus underlying causes: increased with venous disease due to venous pooling, infection, fluid overload (heart failure, liver, or kidney disease); decreased in individuals with circulation problems
- Considering humidity: increase airflow, consider occlusiveness of dressings, clothing, fabric types, and incontinence management
- Considering temperature (relating to the individual and the environment): positioning, comorbidities/medications
- Considering airflow: may be affected by the location of the wound, mattress type (high air loss versus low air, or standard mattress or foam; mattress covers may be used), or type of footwear in patients with a diabetic foot ulcer (DFU)
- Selecting dressings/bandages/devices that adequately address local wound conditions (fluid-handling capacity); materials that lock fluid or minimise lateral movement, amount of compression, dressing moisture vapour transmission rate.

Changing and improving practices for microclimate management requires a multipronged approach. Newer technologies need to be explored to improve traditional practices and reduce potential risk factors around skin damage due to microclimate. An evidence-based approach combined with education will lead to improved skin integrity in at-risk individuals.

Assessing risk

A holistic approach to assessment of individuals presenting with a wound is essential. This should consider the wound, its location, the periwound, the type and amount of exudate, the individual's overall health, a detailed medical and surgical history and environmental factors. Clinicians should be alert to the key factors that may exacerbate the vulnerability of the periwound and how to prevent or reduce the risk of further damage (Bianchi, 2012; Beeckman et al, 2020). These may include:

- History of skin damage and cause, including skin conditions (e.g. psoriasis/eczema/skin frailty)
- History of medical adhesive use and how it affected the skin (e.g. allergy/sensitivity)
- Hygiene practices.

The skin should be reassessed at every dressing change, clearly documenting results and planning management according to the risk factors identified. Assessment plays a key role in preventing periwound problems and in identifying individuals who may be at risk.

CONSENSUS STATEMENT

When caring for an individual with a disruption in skin integrity, those providing care should take a detailed history of the individual's health status (including a head-to-toe skin assessment), with a particular focus on the periwound.

CONSENSUS STATEMENT

A structured wound assessment should include the integrity of the periwound.

Wound assessment with a focus on the periwound

All wounds should be examined and documented as part of a formal wound assessment that includes the following factors (adapted from Stephen-Haynes and Carville, 2011):

- Aetiology
- Anatomical location
- Duration
- Dimensions (length, width, depth)
- Presence of undermining or tunnels (usually expect higher volume of fluid)
- Characteristics of wound edges (macerated or hyperkeratotic)
- Wound bed characteristics and percentage of viable/non-viable tissue
- Type and amount of exudate
- Presence of bleeding or haematoma
- Signs and symptoms of infection
- Pain
- Integrity of the periwound skin.

Periwound-specific assessment should also include (adapted from WUWHS, 2019):

- Skin integrity
- General condition of skin – e.g. dry/moist, thinned/thickened, discoloured
- Size of periwound area – i.e. relating to wound edges
- Temperature – cool/warm/hot
- Colour (e.g. lipodermatosclerosis/venous insufficiency)
- Erythema/cellulitis/lymphangitis/folliculitis
- Maceration/erosion/skin stripping
- Callus/hyperkeratosis/atopic eczema/xerosis
- Swelling/oedema/induration
- Sensation (e.g. for foot wounds, spinal cord injury or other conditions reducing sensation)
- Cause of damage, including scratching and self-harm.

There are a number of tools that have been developed to include the periwound area – for example, the TIMES (Tissue, Infection/Inflammation, Moisture imbalance, Edge of wound, Surrounding skin; Wounds UK, 2016), Triangle of Wound Assessment (Dowsett and von Hallern, 2017) and Bates-Jensen Assessment (Bates-Jensen et al, 2019) tools make specific mention of the importance of the periwound. Most recently, a periwound skin classification system has been proposed by Nair et al (2020). This is currently in the process of being validated.

Prevention of periwound complications

In all wounds, steps should be taken to prevent complications, including careful management of the periwound. Wherever possible, the focus should be on prevention, taking steps to protect the skin before complications develop. Care should be structured and evidence-based, implementing best available current evidence (WUWHS, 2020).

CONSENSUS STATEMENT

Healthcare professionals and caregivers/individuals should implement best available evidence for the prevention and treatment of periwound complications.

Wound and periwound skin cleansing

Wound cleansing is defined as the 'removal of surface contaminants, bacteria and remnants of previous dressings/treatments from the wound surface and its surrounding skin' (Rodeheaver and Ratliff, 2018). Wound cleansing has additional benefits, such as improved visualisation of the wound bed and edges, removal of organic and non-organic material, and removal of excess exudate (Weir and Swanson, 2019). In any wound cleansing routine, the sequence of cleansing – the wound, the periwound and, for example, the limb – is important. Cleanse the surrounding skin thoroughly but gently, without causing undue trauma, avoiding a vigorous rubbing technique. Once the dressing is removed, a pack (a sterile gauze moistened with a cleansing solution to prepare for the wound cleansing) can be placed on the wound while the periwound and/or limb is cleansed. The limb and periwound can be cleansed with a skin-friendly cleanser (pH v4–6), using disposable moistened cloths or commercial cleansing pads. A cloth that has touched the body should never be put back into the cleansing solution, as this causes contamination; therefore, several cloths are required. Spatulas can also be used to prevent contamination. Once adequate cleansing of the periwound and limb has occurred and all dried skin and debris has been removed, the wound is cleansed (Weir and Swanson, 2019).

Wound dressing selection and usage

Prevention strategies should encompass dressing selection and correct usage, in order to optimise healing and minimise further damage.

Potential properties of the ideal dressing include (adapted from WUWHS, 2019):

- Available in a range of shapes and sizes across care settings
- Easy to apply
- Easy, intuitive and safe to remove from its protective packaging
- Comfortable/reduces pain/does not cause pain on application
- Conformable to the wound bed/anatomical location
- Extensible, as stretch has been found to reduce risk of tension damage
- Prevents leakage and strikethrough
- Stays intact and remains in place during wear
- Suitable for extended wear if undisturbed wound healing is a priority
- Suitable fluid-handling capacity as per level of exudate, absorbent material for highly exudative wounds and lateral movement of fluid
- Retains fluid-handling capacity under compression therapy, body weight, or offloading device
- Atraumatic and retains integrity on removal
- Non-stick dressing for fragile periwound skin, use the minimum adhesive required, depending on the individual and their wound/skin condition
- Consider use of silicone adhesive in place of acrylic adhesive in at-risk or fragile skin

FIGURE 8 | Incorrect dressing removal technique (courtesy of Heidi Hevia Campos)

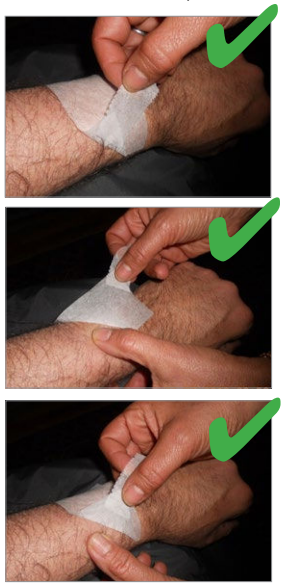

FIGURE 9 | Correct dressing removal technique (courtesy of Heidi Hevia Campos)

- Unlikely to cause sensitisation or to provoke an allergic reaction
- Anti-inflammatory agent for inflamed wounds
- Does not impede normal function
- Shower-proof
- Inactivates factors that enhance inflammation (i.e. MMPs)
- Cost-effective – considering factors such as the unit cost of dressing versus time taken to change, potential impact on healing
- Absorbs odour where appropriate
- Cosmetically acceptable and available in a range of colours to match the individual's preferences.

Dressing application and removal

Dressing application and removal techniques are also important. When applying a wound dressing:

- Select the correct size to ensure the central padded area covers the whole wound
- Use gentle warming hand pressure to initiate the adhesion process
- Apply from the centre to the edges, without stretching the dressing, to avoid shear
- Press adhesive dressings in place without stretching the edges to avoid breaking the adhesive bond, and avoid folds on the edges that allow leaks
- Ensure that any film-forming skin protectant is fully dry so that the adhesive bond is not exacerbated.

When removing a wound dressing:

- Remove dressings as soon as possible if saturated with exudate or contaminated by stool or urine
- Wet the wound contact surface of the dressing if it is 'stuck'
- Don't pick or scratch at the edge of the dressing/skin to lift the dressing edge
- Consider use of alcohol-free adhesive removers to minimise trauma; rinse off skin after application to avoid irritation to skin
- Take time to remove dressings slowly ('low and slow' technique)
- Using two hands, pull adhesive dressings at a low angle parallel to the skin, slowly while supporting the skin with the other hand/fingers at the adhesive–dressing interface (see Figures 8 and 9).

It is important to educate the individual/caregiver regarding use of a liquid barrier film prior to dressing application, and the removal technique, to minimise the risk of MARSI when the dressing is removed at the required frequency. This should include correct use of alcohol-free adhesive remover, when indicated, to aid in skin barrier protection. See Boxes 2–5 for information on protecting the periwound from damage from adhesives, moisture and non-adhesive dressings. At dressing changes, the wound and periwound

Box 2. Protecting the periwound from adhesive damage

- Select skin barrier with absorptive properties
- Apply liquid barrier film (e.g. protective barrier film, cyanoacrylate)
- Avoid products (e.g. creams, ointments) that interfere with dressing adhesion, or use a larger dressing with at least 5/6cm of intact skin surface for adhesion; avoid excess barrier products
- Use antimicrobial cleansing for skin with folliculitis and avoid frequent dressing removal
- Consider topical steroid for hypersensitivity responses (e.g. allergy/secondary inflammation) for short duration of time until inflammation has subsided
- Consider use of non-adhesive dressing (e.g. non-border dressings) with tubular retention bandage
- Consider use of low-trauma adhesive products (e.g. silicone adhesive dressings, fixation tape)
- Rotate sites where tape is applied and avoid applying with tension.

Box 3. Adhesive types and their risk

- Rubber-based: High adhesion, use in practice declining
- Acrylic-based: Very common in dressings, can be traumatic to vulnerable skin
- Silicone adhesive: minimal risk of trauma.

Box 4. Protecting the periwound from damage from moisture (adapted from Colwell et al, 2017)

- Select dressing with wound-appropriate absorptive properties, or use secondary pad
- Consider the size of the wound when choosing the size of the absorbent dressing
- Apply liquid barrier film (e.g. protective barrier film, cyanoacrylate) to cover the area under the dressing
- Plan dressing change frequency according to amount and type of wound exudate
- Remove dressings slowly; sterile water/saline soaks or a medical adhesive remover may be required if non-adhesive dressing is adhered to wound edge and/or periwound skin
- Use 'picture frame' method, as used for peristomal irritation
- Apply stoma powder to absorb excess moisture, or use 'crusting technique', according to local guidance where appropriate.

Box 5. Protecting the periwound from adhesion of non-adhesive dressings

- Select dressing with wound-appropriate absorptive properties, or use secondary pad
- Apply liquid barrier film (e.g. protective barrier film, cyanoacrylate)
- Avoid products (e.g. creams, ointments) that interfere with dressing adhesion
- Base dressing change frequency on amount and type of wound exudate
- Remove dressing in direction of hair growth if possible
- If removing hair, clip rather than doing a close shave (according to local guidance), and shave the periwound skin following the direction of hair growth.

should be monitored and any changes or new risk factors recorded and incorporated into the ongoing management plan, including all interventions and specific evaluation dates.

A recent scoping review (Perez Jaimes et al, 2020) found that there is currently low evidence for the use of topical skin protection products. A total of 1229 studies were identified, with only 12 meeting the inclusion criteria; 12 products were identified for wounds of different aetiologies, with the most frequent being alcohol-free barrier film and zinc oxide.

CONSENSUS STATEMENT

When caring for an individual with a wound, healthcare professionals should assess the periwound at dressing changes, planning management according to the changing risk factors identified.

It is important to note that, in some low-resource areas or healthcare settings, not all dressings and preventative products will be available, and best practice should be carried out as far as possible in the circumstances, with a focus on patient safety and skin protection. Skin dyes (e.g. gentian violet or mercurochrome) should not be used.

Managing infection risk

Any skin infection affecting the peri-wound – bacterial or fungal – must be managed in a timely fashion in addition to managing the risk of potential wound infection. According to an international survey (Dowsett et al, 2020), the three biggest challenges faced by clinicians

related to managing infected wounds are:

- Distinguishing between local infection and biofilm
- Selecting the right treatment according to diagnosis
- Fear of rapid deterioration due to spreading and systemic infection.

In response to these challenges, an international infection management pathway was developed using published guidelines and clinical evidence to guide differential diagnosis of biofilm and local infection and appropriate early treatment intervention, thereby reducing unnecessary or incorrect antimicrobial use and delays in treatment (Dowsett et al, 2020). This has been found in practice to lead to better outcomes, appropriate use of antimicrobials and reduced costs through prompt management of wound complications before they progress, resulting in faster wound healing overall and reduced risk to the periwound skin (Dowsett et al, 2020; Woo, 2020).

While wound bed colonisation increases the risk of infection, the periwound may also be at increased risk of infections due to wound exudate or factors attributable to the treatments used to manage the wound: for example, the use of emollients and compression bandages or hosiery both occlude and 'pull' the hair follicles, thus increasing the risk of *Staphylococcus aureus* folliculitis (Patel, 2011), so careful observation and monitoring is required. Damaged periwound skin is at greater risk of getting infected, so should be protected. Equally, the periwound should not be neglected during cleansing to reduce microbial bioburden, particularly in those with decreased host barrier function; a study found that periwound cleansing only (without directly cleansing the wound bed) was effective at reducing the microbial counts in the wound bed for up to 24 hours (Konya et al, 2005).

Misdiagnosis of infection can be an issue in the periwound, leading to treatment failure and further complications; for example, fungal infection may be mistaken for maceration or eczema (Lawton and Langøen, 2009). Accurate assessment and targeted treatment are essential. It is important that fungal infection, including *Candida*, is not neglected as potential diagnoses.

While early identification and management of infection is essential, the emergence of antimicrobial resistance (AMR) makes it necessary to avoid the use of antimicrobials when they are not necessary (Dohmen, 2006); although, in some cases, prophylaxis may be considered (e.g. in high-risk surgical wounds). Skin protection measures and, for example, preoperative skin care in the case of surgical wounds, have been found to reduce the risk of infection and further complications (Dohmen, 2006). All infection management should be conducted with antimicrobial stewardship principles in mind (see Box 6). The United Nations and other international agencies estimate that, if no action is taken, AMR-related diseases could cause 10 million deaths each year by 2050, costing £66 trillion (Interagency Coordinating Group on Antimicrobial Resistance, 2019). AMR is associated with the widespread use and misuse of antibiotics. Therefore, it is essential that topical antimicrobials are appropriately used in wound care, especially for infected or open wounds healing by secondary intention. It is imperative that clinical practices minimise the possibility of micro-organisms developing resistance to these therapies as well.

An approach focusing on antimicrobial stewardship should be used by all practitioners, thereby optimising and conserving all antimicrobial interventions. The interdisciplinary team approach is essential to ensure strong antimicrobial stewardship.

Box 6. Antimicrobial stewardship
(adapted from Fletcher et al, 2020b)

Antimicrobials are a group of agents that either kill or inhibit the growth and division of micro-organisms. They include antibiotics (which act on specific cellular target sites), antiseptics, disinfectants, and other agents, such as antiviral, antifungal, antibacterial and antiparasitic medicines (which act on multiple cellular target sites or function by bacteria-binding mechanisms). Antimicrobial resistance (AMR) describes when micro-organisms evolve over time and no longer respond to any antimicrobial therapy.

CONSENSUS STATEMENT

All interventions to manage infection/infection risk should take an approach that follows antimicrobial stewardship principles.

Infection versus inflammation

Differentiating infection from inflammation can be a challenge in clinical practice, as erythema is the body's response to any trauma. Inflammation can be overlooked, due to a focus on infection. It is important to use consistent assessment tools for determining infection versus inflammation, and to remember that early intervention is critical. If a wound has not decreased by approximately 30% in size by week 4 (or according to local guidance), then reassess the care plan and consult with a wound specialist (Laforet and Schultz, 2012).

Interdisciplinary team approach

Maintaining periwound health requires a collaborative approach with an interdisciplinary team. In order to optimise outcomes, it is necessary to engage and support the individual and their circle of care in the prevention and management of periwound damage. Depending on the type of wound, the team will vary; for example, an individual with a DFU may require input from podiatry and diabetes teams. The circle of care should be identified according to the individual's needs. If periwound damage is beyond the knowledge, skill and judgement of the healthcare professional/caregiver/individual, or persists despite best practice interventions, a specialist referral should be made. This may be to a specialist such as a tissue viability nurse, dermatologist, or nurse specialised in wound, ostomy and continence, for example.

CONSENSUS STATEMENT

The healthcare professional/caregiver/individual should collaborate with a specialist if periwound damage is complex, beyond their knowledge and skill, or persists despite best practice interventions.

Implementation in practice

Clinicians play an important part in supporting their organisations to ensure safe practice standards are observed and that care delivered is evidence-based. Clinical specialists should use their enhanced knowledge and skills to influence cost-effective, patient-centred care (Royal College of Nursing, 2010).

All staff should be educated in best practice, and care pathways introduced that reflect the evidence, such as making sure that checklists and assessments include the periwound skin as a part of routine wound care.

The effect on outcomes should be measured according to relevant parameters, such as:

- Reduced incidence of periwound skin damage
- Effect on time to healing and cost
- Complete number of periwounds assessed per month
- Number of staff trained per month.

Education and the future

Increased awareness and education focusing on the periwound is needed. It is important to educate professionals to accurately assess and document the periwound, in order to reduce practice variation and have a common language. Patients and relatives/carers also require education. It is also important that individuals are educated about the importance of skin integrity, continuing to ensure that the periwound skin is protected and moisturised once the wound has closed, as part of an ongoing maintenance regimen.

Healthcare organisations should establish policies, raise awareness, prioritise, provide necessary resources, and support the integration of periwound health into existing wound care programmes and healthcare quality improvement strategies.

CONSENSUS STATEMENT

Education on the periwound should be developed and/or integrated into existing wound educational programmes and bundles of care.

In addition to formal education (e.g. teaching, documents and resources, best practice guidelines), more 'informal' education is also needed through mentorship and implementation of best practice by senior members of staff.

The future

Research is needed to address gaps in the literature and produce high-quality evidence to inform practice, focusing on areas such as:

- Epidemiology of periwound damage
- Efficacy and effectiveness of prevention and management strategies for periwound complications
- Impact of periwound damage (quality of life and wellbeing, wound complications, cost to healthcare systems)
- Knowledge, attitudes and practices of periwound management
- Public awareness and ability for self-care or shared care of the periwound.

CONSENSUS STATEMENT

Research is needed to address gaps in the literature and inform evidence-based practice.

Attention on the periwound skin as part of wound bed preparation paradigms is in its infancy. Further research is required to fully understand the impact periwound skin health has on wound healing and infection control.

See Appendix 1 for a full list of the consensus statements, and Appendix 2 for literature search results based on the key areas of focus listed and relating to the periwound.

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Appendix 1: Full list of consensus statements

- The periwound is the area around a wound that may be affected by wound-related factors and/or underlying pathology.
- Periwound damage is a risk factor for delayed wound healing and may increase the risk of wound infection.
- Healthcare professionals and caregivers/individuals should manage modifiable intrinsic and extrinsic factors to promote and maintain skin integrity in the periwound, minimise damage and support healing.
- Not all periwound damage is avoidable.
- Exudate management is key to avoiding periwound damage.
- When caring for an individual with a disruption in skin integrity, those providing care should take a detailed history of the individual's health status (including a head-to-toe skin assessment), with a particular focus on the periwound.
- A structured wound assessment should include the integrity of the periwound.
- Healthcare professionals and caregivers/individuals should implement best available evidence for the prevention of periwound complications.
- When caring for an individual with a wound, healthcare professionals should assess the periwound at dressing changes, planning management according to the changing risk factors identified.
- All interventions to manage infection/infection risk should take an approach that follows antimicrobial stewardship principles.
- The healthcare professional/caregiver/individual should collaborate with a specialist if periwound damage is complex, beyond their knowledge and skill, or persists despite best practice interventions.
- Education on the periwound should be developed and/or integrated into existing wound educational programs and bundles of care.
- Research is needed to address gaps in the literature and inform evidence-based practice.

Appendix 2: Literature search

Literature summary				
Area of focus	**Author/journal details**	**Type**	**Purpose**	**Outcomes**
Periwound	Perez Jaimes et al (2020) Topical Products for the Protection of Periwound Skin: A Scoping Review. *Wounds* WNDS20200607-1	Scoping review	To map out topical products that have been implemented and evaluated for either the protection or treatment of injuries caused by exudate or the use of adhesives or therapeutic dressings on the periwound skin of acute or chronic wounds.	A total of 1229 studies were identified, 12 of which met the inclusion criteria. 12 products were identified for wounds of different etiologies, with the most frequent being the alcohol-free barrier film and zinc oxide. To date, the level of evidence is low. It is necessary to develop more robust research.
	Dini et al (2020) Surrounding skin management in venous leg ulcers: A systematic review. *J Tissue Viability* 29(3): 169-75	Systematic review	Key to venous leg ulcer care is the maintenance of healthy skin surrounding the ulcer, as failure to maintain skin integrity may influence the healing outcome. We thus reviewed the scientific literature looking for assessment and management instruments regarding this common but often neglected issue.	Management of moisture-balance with the selection of appropriate dressings is the most important target in surrounding-wound skin care. Moreover, contact dermatitis related to products and the dressings themselves is a neglected problem in patients with chronic leg ulcers which clinicians increasingly have to manage. The integrity of the surrounding skin is necessary for wound healing, and appropriate management is needed to address this aspect which is part of an overall approach to treating wounds.
	Aljghami et al (2019) Examining the contribution of surrounding intact skin during cutaneous healing. *J Anat* 234(4): 523-31	Murine model	To test the contribution of intact skin on wound healing.	Severe cutaneous wounds expose the body to the external environment, which may lead to impairments in bodily functions and increased risk of infection. There is a need to develop skin substitutes which could effectively promote complete skin regeneration following an injury. The intact skin enhances wound healing by increasing the number of myofibroblasts and neovascularization.
MASD	Gray and Weir (2007) Prevention and treatment of moisture-associated skin damage (maceration) in the periwound skin. *J Wound Ostomy Continence Nurs* 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.

Appendix 2: Literature search (Continued)

Literature summary (Continued)				
Area of focus	**Author/journal details**	**Type**	**Purpose**	**Outcomes**
MASD	Woo et al (2017) Management of moisture-associated skin damage: A scoping review. *Adv Skin Wound Care* 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.	15 studies involved periwound skin damage. Periwound skin damage is not well documented, and the exact prevalence of periwound skin damage remains elusive. Nevertheless, the impact of periwound skin damage is substantial. One large-scale international survey involving 2018 patients with chronic wounds found that 25% of respondents experienced pain around the wound, likely from periwound skin damage and local inflammatory responses. Increased periwound maceration, a vestige of skin damage from excess moisture, is correlated with higher pain levels prior to and during foam dressing changes. Periwound skin damage may affect keratinocyte migration from wound edges to the wound base, delaying overall wound healing.
	Brown (2017) Managing exudate and maceration in venous leg ulceration within the acute health setting. *Br J Nurs* S18-S24	Article	To guide management of exudate and prevent maceration.	Practitioners need to identify and treat its cause, and manage the exudate and prevent it from damaging periwound skin. Management involves dressings of the most appropriate absorbency and other products, and avoiding maceration of periwound skin; compression therapy is the gold standard treatment for treating oedema and venous leg ulceration. Nurses in acute settings may not have the skills to implement or maintain compression therapy.
Microclimate	Dunk (2015) Importance of the microclimate in maintaining skin integrity. *ANMJ* 23(3)	Article	To explore the link between microclimate and skin integrity.	Changing and improving practices for microclimate management requires a multipronged approach. Newer technologies need to be explored to improve traditional practices. Health organisations need to support an evidence-based approach.
	Yusuf et al (2015) Microclimate and development of pressure ulcers and superficial skin changes. *Int Wound J* 12(1): 40-6	Prospective cohort study	To evaluate the microclimate and development of pressure ulcers and superficial skin changes.	Pressure ulcers and superficial skin changes were developed in 20 of the 71 participants. Total mean difference in skin temperature was higher for patients with pressure ulcers and superficial skin changes (0·9 4 0·6°C) compared with controls (0·6 4 0·8°C) (p=0·071). Binary logistic regression predictor values for pressure ulcers and superficial skin changes were 0·111 for type of sheet and 0·347 for Braden Scale results. Difference in skin temperature seems to be a predictor for pressure ulcer development and superficial skin changes, while synthetic fibre sheets are able to maintain a beneficial microclimate.

Literature summary (Continued)				
Area of focus	**Author/journal details**	**Type**	**Purpose**	**Outcomes**
Microclimate	Yoshimura et al (2015) Microclimate is an independent risk factor for the development of intraoperatively acquired pressure ulcers in the park-bench position: A prospective observational study. *Wound Repair Regen* 23(6): 939-47	Prospective observational study	To assess factors of the microclimate in terms of skin temperature and perspiration as well as the interface pressure in order to determine whether the microclimate is an independent risk factor for the development of park-bench position-related pressure ulcers.	The change in skin temperature from baseline to the end of surgery (2.7 4 0.3°C vs. 1.9 4 0.8°C) and the average peak pressure (119.1 4 36.8 mmHg vs. 94.5 4 23.1mmHg) were significantly higher in the patients with PBP-PUs than in those without PBP-PUs. There were no significant differences in the amount of perspiration between the two groups. A hierarchical logistic regression analysis showed that the change in skin temperature was significantly related to the development of PBP-PUs. Our results suggest that a change in skin temperature toward a higher value is an independent risk factor for the development of PBP-PUs. Proper intraoperative management of skin temperature may therefore be a promising candidate as a preventive method against PBP-PU development.
	Zeevi et al (2018) Effects of ambient conditions on the risk of pressure injuries in bedridden patients-multi-physics modelling of microclimate. *Int Wound J* 15(3): 402-16	3-dimensional multi-physics coupled model	To determine the biothermal and biomechanical behaviours of the buttocks in supine lying on different support surfaces.	The percentage tissue volume at risk within the volume of interest was found to grow exponentially as the average tissue temperature increased. The resultant average sacral skin temperature was concluded to be a good predictor for an increased risk of PU/injuries. Each 1°C increase contributes approximately 14 times as much to the risk with respect to an increase of 1 mmHg of pressure. These findings highlight the advantages of using thermally controlled support surfaces as well as the need to further assess the potential damage that may be caused by uncontrolled microclimate conditions on inadequate support surfaces in at-risk patients.

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