



Skin integrity update

Wounds International clinical updates present recent developments in the field of leg ulcers, pressure ulcers, skin integrity and diabetic foot, including the latest from associations, clinicians and industry. If you use an innovative technique in your practice that you would like us to feature in future issues, please email the editor at: scalne@woundsinternational.com

Innovations in callus and hyperkeratosis management



This short report describes an innovative method for managing callus and hyperkeratosis to maintain skin integrity in vulnerable patients.

All healthcare professionals have a duty to assess, maintain and restore skin integrity as part of their daily contact with patients. The skin is

one of the largest organs in the body, serving a vital role as a protective barrier, a thermal and hydration regulator, a sensory, excretory and metabolic organ and an emotional communication tool.

Skin structure varies markedly across anatomical regions of the body, the density of hair follicles, sweat and sebaceous glands, sensory organs and the thickness of the dermis and epidermis changing to reflect the specific function of an area of skin. Skin structure also changes with ageing, as a response to recurrent trauma and with exposure to environmental hazards such as sunlight^[1,2].

Maintaining adequate hydration

Levels of skin hydration affect the efficiency of the skin barrier function and its ability to resist trauma. For example, excessive moisture causes maceration while dehydration causes cracking and both can increase the risk of bacteria penetrating the skin, cellulitis and spreading sepsis^[3,4]. Maintenance of skin hydration and the prevention of moisture damage, whether from exudate exposure, urine and faecal contamination or prolonged exposure to liquid is, therefore, an essential element of care requiring the careful use of emollients, the application of barrier products such as Cavilon™ No Sting Barrier Film (3M™)^[5] and the selection of appropriate dressings to contain and remove excessive exudate from the wound and the peri-wound area.

Preventing build up of callus

Skin normally provides a supple, elastic and conformable surface. Accumulation of callus, the build-up of skin preparations such as emollients, keratosis (an excessive growth of the top layer of skin cells), or dried secretions on the skin surface decrease the ability of the skin to move freely, stretch and conform. This can result in dry cracks or fissures and the development of focal pressure damage under areas of callus, both of which can be a significant problem in the foot of a diabetic patient, especially in the presence of a peripheral autonomic neuropathy^[6].

Accumulations of callus and other materials should be managed by debridement in the case of callus formation, possibly combined with off-loading of the affected area. Where dry skin on the heel is a problem, careful removal of excessive heel callus by sharp debridement and the use of emollients and urea-based preparations is effective.

Where lower limb hyperkeratosis is a problem, careful skin cleansing using emollients as a soap substitute or Debrisoft® (Activa Healthcare) as a gentle mechanical debriding agent can be effective^[7]. Debrisoft comes in the form of a pad with a soft fleecy appearance and feel, bound edges and a knitted outer surface coated with polyacrylate. The contact layer consists of soft inert flexible polyester fibres with angled tops. The fibres loosen necrotic tissue, keratoses and adherent exudate from the wound and surrounding skin, absorbing and binding the debris within the pad. After an initial treatment, ongoing maintenance debridement may be required.

Pressure ulcer prevention is one of the key quality indicators of the care clinicians provide. At first contact, all patients should undergo a pressure ulcer risk assessment to ensure the provision of both appropriate care and the necessary equipment to



Figure 1: Bottom of foot demonstrating build-up of callus.



Figure 2: Hyperkeratosis on a lower limb.

facilitate that care. Part of that risk assessment is to undertake a skin inspection documenting skin status, recording areas of skin damage and vulnerability, and formulating a care plan that corrects and treats damage and reduces risk of pressure injury.

This process of regular skin assessment also forms part of the management strategy of the diabetic foot where neuropathy, structural abnormalities and ischaemia can result in

a reduced protective response, altered foot loading and an increased risk of skin damage^[8].

Peter Vowden is Professor of Wound Healing Research, Bradford Teaching Hospitals NHS Foundation Trust and the University of Bradford, UK.

1. Farage MA, Miller KW, Berardesca E, Maibach HI. Clinical implications of aging skin: cutaneous disorders in the elderly. *Am J Clin Dermatol* 2009; 10(2): 73–86.
2. Nakanishi M, Niida H, Murakami H, Shimada M. DNA damage responses in skin biology — implications in tumor prevention and aging acceleration. *J Dermatol Sci* 2009; 56(2): 76–81.
3. Cox NH. Oedema as a risk factor for multiple episodes of cellulitis/erysipelas of the lower leg: a series with community follow-up. *Br J Dermatol* 2006; 155(5): 947–50.
4. Koutkia P, Mylonakis E, Boyce J. Cellulitis: evaluation of possible predisposing factors in hospitalized patients. *Diagn Microbiol Infect Dis* 1999; 34(4): 325–7.
5. Guest JF, Greener MJ, Vowden K, Vowden P. Clinical and economic evidence supporting a transparent barrier film dressing in incontinence-associated dermatitis and peri-wound skin protection. *J Wound Care* 2011; 20(2): 76–84.
6. Aye M, Masson EA. Dermatological care of the diabetic foot. *Am J Clin Dermatol* 2002; 3(7): 463–74.
7. Bahr S, Mustafi N, Hattig P, et al. Clinical efficacy of a new monofilament fibre-containing wound debridement product. *J Wound Care*. 2011; 20(5): 242–8.
8. National Institute for Health and Clinical Excellence (NICE). Clinical Guidelines CG10: Type 2 diabetes – footcare. 2004; Available at: <http://guidance.nice.org.uk/CG10/NICEGuidance/pdf/English> (accessed December 6, 2011)

Preventing pressure injury in Australia



This paper describes how the introduction of skin care protocols such as the use of skin wipes instead of soap and water, protective silicone sacral dressings and tackling malnutrition, have improved the management of skin integrity in an Australian hospital.

Skin is an organ that is often overlooked by clinicians as long as it remains intact. The skin has seven main functions:

- Protection
- Sensation

- Fat storage
- Sebum secretion
- Sweat secretion
- Vitamin D formation
- Pigment production.

All of these functions are vital for a healthy functioning body. However, the skin is vulnerable to two main types of threat — natural or induced. Natural threats include the aging process and drying out, whereas induced threats include soaps, conventional bathing, pressure injuries, incontinence-associated dermatitis and skin tears.

Pressure injuries are now identified in the top three causes of global preventable harm and are recognised as being harmful, preventable, painful and costly. There are many costs involved in pressure injury prevention and management, such as equipment and maintenance, wound treatment and length of hospital stay. Investing in pressure injury prevention not only saves money, but also minimises hidden costs through reduction of patient pain, reduced readmission rates and cancellations, and reduced litigation. In 1997, Young estimated the cost of managing a stage 4 pressure injury at \$61,230AUD^[1], whereas a Queensland University of Technology study indicated that a pressure injury increased the length of stay in hospital by four days per patient^[2].

Prevention in Australia

Many strategies have been implemented to reduce the development of pressure injuries. However, they continue to be a significant problem, consuming a large percentage of healthcare resources. Most facilities throughout Australia perform annual pressure injury prevalence studies, which measure the percentage of patients in hospital against those who have a pressure injury (hospital-acquired and present on admission).

Although most healthcare facilities attempt to educate staff and provide the right equipment, wound treatment and risk assessment, nonetheless there is an acceptance that in certain circumstances a pressure injury is inevitable.

However, the author's team at the Prince Charles Hospital in Brisbane (a 640-bed referral hospital specialising in cardiac and thoracic medicine) were frustrated by the attitude that skin damage could not be avoided and felt it was time to go beyond simply placing patients on pressure-relieving devices and checking for broken areas of skin. It was decided that there was a definite need to move out of crisis management and into prevention.

After many years of implementing risk assessments, using pressure redistribution equipment and providing copious staff education, the team's pressure injury prevalence studies still indicated that moderate numbers of stage 1 pressure injuries were developing at the hospital. The team felt it was time to look broadly at causative influences and focus more attention on nutrition and continence management.

Research indicates a strong correlation between malnutrition and pressure injury. If the patient is malnourished, the risk of a pressure injury is doubled — if he or she is severely malnourished this risk is increased

five-fold^[3]. The team embarked on a programme of ensuring that clinicians understood how to refer patients to the dieticians, how to use the Malnutrition Screen Tool (MST) on the Waterlow Pressure Ulcer Risk Assessment tool and preparing patients for mealtimes. If patients score more than 2 on the MST, they are referred to the dietician^[4].

Equally, the team felt that continence had been neglected in the hospital and was not generally recognised by nurses as a high-risk factor. Upon investigation of staff attitudes and knowledge, it became evident that there was an *ad hoc* approach to skin care and continence management. Staff were using their favourite creams or simply applying what was available, rather than drawing on evidence-based practice to make decisions.

As a result, an audit was performed on the hospital's stocks of skin care products and staff knowledge. Results indicated that 80% of staff said they were confident in managing continence. However, 50% had a problem with leaking pads and, therefore, were not actually managing patients' continence effectively.

Evidence-based research recommends replacing standard bed baths with pH neutral cleansing wipes, which incorporate a built-in moisturiser, as well as built-in water-based barrier for perineal hygiene^[5]. The wipes are more like a coating than a cream, which goes on as the clinician wipes the skin.

It is important to check the manufacturer's guidelines to ensure any wipes are in the neutral pH range (5–5.5pH) to match the skin's neutral pH value. This will maintain the skin's flora and prevent unwanted microorganisms from gaining a foothold. The team decided to introduce a product called Comfort Shield® Barrier Cloths (Sage Products) as it met all the criteria of a barrier wipe and the company provided educational support. This change of practice ensured that skin hygiene was standardised throughout the hospital and that patients' skin was automatically moisturised and protected with a barrier cream. It is important to recognise that a water-based barrier cream will avoid the problem of expensive continence aids leaking because they are clogged by oil-based barrier creams^[6]. The team also recognised the principle of covering and protecting damaged skin as outlined in local pressure ulcer prevention guidelines^[7].

Covering and protecting the skin can also reduce the damage caused by the forces of pressure, shear, friction and moisture.

The team developed a protocol to ensure that patients who were at risk of developing a sacral pressure injury would be protected by the application of a silicone sacral dressing (such as Mepilex® Border Sacrum [Mölnlycke]). The protective dressing helps to reduce the shear and friction on the sacral skin, protects the area from contamination with faeces and urine and also allows some extra padding to the sacral bony prominence. The criteria for the protocol include the following:

- Patient has been on bed rest for over 48 hours
- Patient has a body mass index (BMI) of less than 18 or greater than 35
- Patient has recently undergone surgery that lasted for

over eight hours

- The patient is malnourished as defined by the Malnutrition Screen Tool (MST) on the Waterlow Pressure Ulcer Risk Assessment Tool^[4]
- There is evidence of a stage 1 pressure injury or a past history of a sacral pressure injury.

Overall, staff seem to have embraced the principles of prevention and those patients who have been bedridden long-term have benefited from the dressing application. Feedback from staff includes reports of reddened areas resolving within 24 hours and not progressing to a stage 1 pressure injury. The team's first pressure injury prevalence audit post-implementation of the protocol indicated a 50% reduction in sacral pressure injury. It should be noted, however, that this was not the only contributing factor to this decrease in prevalence. Other factors include:

- Nutrition
- Repositioning
- Patient compliance
- Evaluation
- Providing appropriate support surfaces
- Keeping pressure off bony prominences
- Reducing shear and friction.

Conclusion

Pressure injury prevention remains complex and challenging. It is important not to fall into traditional clinical habits, but rather to continue moving forward in exploring evidence-based practice. It is no longer acceptable to expect that another member of the team will implement these practices and staff in all areas should remember that pressure injuries are painful, preventable and potentially fatal. As Florence Nightingale once observed^[8]:

'Poisoning by the skin is no less certain than poisoning by the mouth — only slower in its operation.'

Tracy Nowicki is a clinical nurse consultant working at the Prince Charles Hospital, Brisbane, Australia.

1. Young C. What cost is a pressure ulcer? *Primary Intention* 1997; 5(4) 24–31.
2. Graves N, Birrell F, Whitby M. Modeling the economic losses from pressure ulcers among hospitalised Australians. *Wound Repair Regen* 2005; 13(5): 462–67.
3. Banks MD, Graves N, Bauer JD, Ash S. The costs arising from pressure ulcers attributable to malnutrition. *Clin Nutr* 2009; 29(2): 180–6.
4. Queensland Health. Waterlow Pressure Ulcer Risk Assessment Tool. 2012; Available at: <http://www.health.qld.gov.au/psq/pip/docs/waterlow.pdf> (accessed 18 January, 2012)
5. Dibsie LG. Implementing evidence-based practice to prevent skin breakdown. *Crit Care Nurs Q* 2008; 31(2): 140–9.
6. Cohen E. *Skin and Oral Hygiene, Aged Care Nursing: A Guide To Practice*. 2003; Ausmed Publications, Melbourne/San Francisco
7. Queensland Health. Pressure Ulcer Prevention and Management Resource Guidelines. 2009; Available at: http://www.health.qld.gov.au/psq/pip/docs/pup_guidelines.pdf (accessed 18 January, 2012)
8. Nightingale F. *Notes on Nursing: What it is and what it is not*. 1970; Dover Publications, New York

Beating blistering through dressing choice



This short report looks at developments in blister prevention through careful attention to wound management and dressing choice, particularly in postoperative wounds.

The importance of choosing a dressing that not only maintains a warm moist healing

environment at the wound bed, but also protects the periwound area from possible blister formation should not be underestimated.

Postoperative periwound blistering is a well-recognised phenomenon in orthopaedic surgery and, to a lesser extent, gynaecological surgery^[1], occurring when the epidermis is separated from the dermis due to continued friction to the skin^[2]. In orthopaedic surgery, postoperative wound blistering has been reported as being caused by the dressing application itself or the type of tape used to hold the dressing in place^[3]. Indeed, Tustanowski^[4] agrees that inappropriate dressing choice and excessive tape use can cause wound blistering and includes the following as other potential causes:

- Movement at the wound site
- Age
- Gender
- Type of incision
- Medications
- Co-morbidities.

Sanusi^[1] states that the development of wound blistering may increase the risk of surgical site infection, require further dressings and increase discomfort, in addition to increasing costs due to delayed discharge and outpatient appointments.

Dressing selection

When choosing a dressing, attention needs to be paid to protecting the periwound area and ensuring that the dressing does not adhere to surrounding skin, that it is easy to apply and remove, and flexible. Flexibility is essential, especially for orthopaedic wounds that are prone to swelling and have an increased risk of friction between the wound and dressing^[5]. Using a more permeable dressing can reduce friction, helping to maintain an optimal moist wound healing environment that will reduce pain at dressing changes^[4].

Other studies outline^[6] how traditional dressing pads secured with tape and newer 'central' pads with an adhesive border can cause wounds to become macerated, whereas vapour-permeable films transmit excess wound fluid as moisture vapour, thus preventing maceration.

Flexibility is an important component of a dressing as it

permits movement at the wound site and periwound area. Waring and Butcher^[7] discuss the importance of dressing conformability and state that the dressing should behave like a second skin, while recognising that there are factors that influence how a dressing conforms to a patient:

- Level of adhesion
- Isometric elasticity of the dressing
- Dressing thickness
- Shape of wound site
- Quantity of exudate held within the dressing.

Prevention of friction has been discussed extensively by Dillon et al^[8] who concluded that hydrocolloids (ie Duoderm®, ConvaTec), films (ie Tegaderm®, 3M Health Care) and films plus fabric (ie Opsite® Post-Op, Smith & Nephew) accommodated skin movement sufficiently to prevent excessive friction and contain postoperative swelling.

Dressings that incorporate soft silicone (eg Safetac® technology, Mölnlycke) have been shown to minimise the risk of trauma and pain associated with the use of adhesive dressings^[9]. Soft silicone adhesives are described as micro-adherent, forming a seal between intact skin and the dressing and preventing lateral movement of wound exudate onto the surrounding skin, which helps to prevent maceration of the periwound area^[9].

The author suggests that the use of skin barrier creams/lotions can be beneficial if applied to the periwound area before dressing application, helping to prevent potential skin damage from moisture and excess exudate.

Conclusion

Despite the amount of literature available on dressing choice, there does not appear to be international consensus on the prevention and treatment of wound blisters. There needs to be more research in this area to explore dressing and skin protection interventions that can help to reduce the incidence of blisters. Additionally, there needs to be clear education for all clinicians involved in wound care, including any member of the multidisciplinary team involved in the assessment, planning, treatment and evaluation of the wound and periwound area. Sanusi [1] concludes that incorrect application of wound dressings resulting in painful blistering is 100% preventable and should never be permitted to develop on patients.

Karen Ousey is Reader Advancing Clinical Practice, University of Huddersfield, UK.

1. Sanusi AL. Severe wound traction blisters after inadequate dressing application following laparoscopic cholecystectomy: case report of a preventable complication. *Patient Saf Surg* 2011; 5(1): 4.
2. Cuzzell J. Clues: bruised, torn skin. *Am J Nurs* 1990; 90(3): 16–18.
3. Gupta SK, Lee S, Moseley LG. Postoperative wound blistering: is there a link with dressing usage? *J Wound Care* 2002; 11(7): 271–73.
4. Tustanowski J. Effect of dressing choice on outcomes after hip and knee arthroplasty: a literature review. *J Wound Care* 2009; 18(1): 449–58.
5. Ousey K, Gillibrand W, Stephenson J. Understanding and preventing wound blistering. *Wounds UK* 2011; 7(4): 50–56.
6. Aindow D, Butcher M. Films or fabrics is it time to re-appraise postoperative dressings? *Br J Nurs* 2005; 14(19): S15–20.

7. Waring M, Butcher M. An investigation into the conformability of wound dressings. *Wounds UK* 2011; 7(3): 14–24.
8. Dillon JM, Clarke JV, Deakin AH, et al. Correlation of total knee replacement wound dynamic morphology and dressing material properties. *J Biomech* 2007; 40(Suppl 2): S61.
9. White R. Evidence for atraumatic soft silicone wound dressing use. *Wounds UK* 2005; 4(1): 14–22.

North American innovations in skin integrity



This short report looks at innovative developments in skin integrity in Canada and the US.

Skin integrity performs two crucial roles in the field of wound management. The first is optimising the quality of the skin so that it is well-hydrated, supple, and has the

best tensile strength possible — important in the prevention of pressure ulcers, skin tears and incontinence-associated dermatitis. The second role is preventing the extension of existing wounds due to maceration or dermatitis, or erosion of the periwound skin in any exuding lesion.

Education that focuses on both of these areas is important for all care providers, from the support worker who provides skin and continence care, to the nurse who supervises and carries out treatment, through to the wound care specialist.

Periwound skin

Sibbald et al^[1] mention the periwound skin briefly in their 2011 wound bed preparation update, stating that assessing clinicians should classify the wound edge as being hyperkeratotic, macerated or normal. No specific directives are given, however, other than achieving moisture balance through the careful selection of an appropriate dressing.

Dressing manufacturers need to continue to develop new products that manage large or copious amounts of exudate while preserving the integrity of the periwound skin.

Prevention

The choice of skin care products can have a major impact on preventing breakdown, as recently demonstrated by Beeckman et al^[1], who compared a three-in-one perineal washcloth, impregnated with 3% dimethicone formula with standard care using water and pH neutral soap. Researchers found the washcloth had a statistically significant effect in preventing incontinence-associated dermatitis ($P=0.003$) (although the severity between the two groups was not significant [$P=0.006$]).

Improving skin integrity through 'responsible bathing', as defined by LeBlanc et al^[3], and by the appropriate selection of dressing products, has been highlighted in a project based in Ontario, Canada. A toolkit developed by the project provides educational materials on prevention of pressure ulcers, skin tears, pre-tibial injuries and matching dressings

to wound characteristics that can be implemented in any healthcare setting and which are freely available (www.woundcare.thehealthline.ca).

Pressure ulcer prevention has been identified by Accreditation Canada as a Required Organisational Practice (ROP) — an essential area of practice requiring healthcare centres to have strategic plans in place to enhance patient safety and minimise risk. Compliance necessitates the use of validated risk assessment forms, integrated policies and procedures around interventions, education of staff and monitoring. An organisation's quality and services are examined against national standards of excellence

An update of the Registered Nurses of Ontario (RNAO) best practice guideline, *Risk Assessment and Prevention of Pressure Ulcers*, was published in 2011^[4] and includes several additional recommendations, which reflect current research findings such as the use of two hourly re-positioning when using a standardised mattress, emergency stretcher or operating table surface. These guidelines form the basis of many best practice initiatives across Canada.

Other North American initiatives include the ongoing consensus on skin tears. Started in 2010, and led by Kimberly LeBlanc from Ottawa, Canada, and co-chair Sharon Baranoski, from Chicago, USA, representatives from five countries have participated in a three-step Delphi procedure to develop 12 consensus statements around the definition of a skin tear. The next step is a new classification system consisting of three different types of skin tears that will comprise an international standard. A second Delphi will validate these classifications using photographs and will be used to test inter- and intra-rater reliability. Future goals include a validated international risk assessment tool and a care pathway.

All of this work should help to advance best practice in skin and periwound care to the point that they become standard practice. They need to become integral to the education of future clinicians and be supported in written policies for all health organisations. In the US and Canada these advances are proving that when it comes to skin integrity, Benjamin Franklin's maxim that an ounce of prevention is worth a pound of cure, has never been more apt.

Connie Harris is Senior Clinical Specialist Wound and Ostomy, CarePartners ET NOW; and Project Lead-South West Regional Wound Care Framework Initiative, London, Ontario, Canada

1. Sibbald RG, Goodman L, Woo KY et al. Special Considerations in Wound Bed Preparation 2011: An Update. *Adv Skin Wound Care* 2011; 24(9): 415–36.
2. Beeckman D, Verhaeghe S, Defloor T, Schoonhoven L, Vanderwee K. A 3-in-1 perineal case washcloth impregnated with dimethicone 3% versus water and pH neutral soap to prevent and treat incontinence-associated dermatitis. A randomized, controlled clinical trial. *J Wound Ostomy Cont* 2011; 38(6): 627–34.
3. LeBlanc K, Christensen D, Orsted HL, Keast DH. Best practice recommendations for the prevention and treatment of skin tears. *Wound Care Can* 2008; 6(1): 14–32.
4. RNAO. Risk Assessment & Prevention of Pressure Ulcers. RNAO, 2011. Available at: http://www.rnao.org/Storage/83/7749_PRESSURE-ULCERS_Supplement_2011.pdf (accessed 24 January, 2012)