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How to...
Ten top questions and answers on the use of dressings for pressure ulcer prevention

Pressure ulcer (PU) prevention remains a struggle for clinicians around the globe and across all transitions of care. In most situations, the use of evidence-based practice and established PU prevention guidelines provide the necessary interventions to protect patients from these devastating injuries. However, these same standards of practice are not always enough for high-risk patients, leaving clinicians to investigate adjunctive therapies to add to their PU prevention protocols. The recent rise in evidence supporting the use of prophylactic dressings for PU prevention has been supported by two randomised controlled trials (RCTs) demonstrating efficacy of a particular dressing in preventing PUs[1,2]. This article serves as a brief recap of the use of these dressings for PU prevention by answering the top ten questions regarding the evidence and their use.

1 Why should dressings in PU prevention be considered?

The first thing that must be understood when considering the use of dressings as part of a comprehensive PU prevention strategy is that dressings do not replace existing prevention protocols. A foam dressing is not a specialty bed; a foam dressing does not replace routine turning and repositioning.

Guidelines for the prevention and treatment of PUs have long been described in the literature and are the focus of both existing[3] and soon to be released updated guidelines from the European Pressure Ulcer Advisory Panel and National Pressure Ulcer Advisory Panel. These guidelines discuss well-known standards in prevention, such as risk, skin and nutrition assessments and interventions including turning, repositioning, heel floating, pressure redistribution surface selection, moisture management, incontinence prevention strategies and progressive mobility practices. For most patients, attention to proper determination of risk, implementation of these interventions and escalation of interventions based upon a change in patient status will prevent PU development. However, PUs continue to plague patients and the clinicians that care for them globally, and experts agree that not all PUs are avoidable[4,5].

In high-risk patients, implementing standards of practice may either not be possible or not sufficient to adequately protect the patient. For example, how do the standard recommendations for turning patients at least every 2 or 4 hours depending upon the surface used[6] apply to the patient who is undergoing a long operating theatre procedure without the possibility of repositioning, or to the severely haemodynamically unstable patient who does not tolerate turning despite techniques to turn the sickest individuals[7]? Moreover, what of the patient in severe respiratory distress who requires head-of-bed elevation close to 45 degrees, and therefore is unable to be repositioned to appropriately reduce the impact of friction, shear and pressure? Could a dressing be used to decrease patients' risk when their mobility is severely compromised or when excessive shear is involved?

Additionally, extremity immobility related to rigid casts, splints or traction may prevent the use of effective interventions such as bilateral heel floating using pillows or the application of heel offloading devices. In this case, a recent RCT demonstrating the efficacy of heel dressings for PU prevention[1] suggests that certain dressings may provide protection for the calcaneous from the inside of the splint or cast until the device may be removed. The inability to float the heel also arises secondary to morbid obesity or even related to agitation where compliance with standards of practice is the primary deficit. A dressing capable of reducing friction, shear, microclimate and pressure may now be seen as an additional option, after the use of pillows or a heel offloading boot, when standard interventions are not feasible or effective.

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2 Is there any evidence for the use of dressings in PU prevention?

Initial studies looking at the prophylactic use of dressings for PU prevention lacked statistical significance[8,9,10,11]. Recently, Santamaria et al[1] conducted a prospective, open–label, RCT of 440 trauma and critically ill patients who were admitted to the emergency department (ED) and ultimately into the intensive care unit (ICU) of a university medical centre in Australia. The control group (*n*=221) received standard PU prevention practices; the intervention group (*n*=219) differed only in the application of a prophylactic sacral dressing (Mepilex® Border Sacrum; Mölnlycke Health Care) and heel dressings (Mepilex® Heel; Mölnlycke Health Care). The patients were assessed and randomly assigned in the ED; this occurred specifically because of emerging evidence that suggests the triage time carries a high prevalence and incidence of PU development[12,13].

After 1 year, the researchers reported less PUs in both the sacral and heel regions for the intervention group when using dressings as an adjunct to prevention (sacral — two PUs in the dressing group versus eight in the standard of care group, *P*=0.05; heel — five PUs in the dressing group versus 19 in the standard of care group, *P*=0.002). The use of dressings resulted in a 10% reduction in incidence for the intervention group with a hazard ratio of 0.19 (*P*=0.002), indicating that the application of a dressing to high-risk patients in the ED/ICU was superior to standard PU practices alone.

A second study by Kalowes[2] evaluated whether the use of a sacral soft silicone foam dressing (Meplex Border Sacrum, Mölnlycke Health Care) would significantly lower PU incidence. In this prospective, experimental study, 367 medical-surgical/surgical trauma and cardiac care ICU patients were randomised into: a control group (*n*=184) receiving a standard care intervention bundle, including a pressure redistribution surface, turning protocol, incontinence prevention and nutrition management; and an intervention group (*n*=183) receiving the same standard of care interventions, but with the addition of the sacral dressing.

Over the 11-month study, seven PUs (unstageable, deep tissue injury and stage II) developed in the control group (4.21%) versus one PU (deep tissue injury) in the intervention group (0.6%); these results were found to be statistically significant (*P*=0.001). The researchers subsequently implemented the use of a prophylactic sacral dressing to their standard of care bundle for high-risk ICU patients.

The emerging clinical and *in-vitro* evidence supporting the use of prophylactic dressings or PU prevention has led reviewers of the soon to be published 2014 *International Pressure Ulcer Prevention and Treatment Guidelines* (European Pressure Ulcer Advisory Panel and National Pressure Ulcer Advisory Panel) to consider the need to address this topic.

3 How does dressing composition protect from pressure, shear, friction and microclimate?

Clinicians may struggle to fully grasp how a wound care dressing has the capability of truly protecting the tissue from the forces of pressure, shear, friction and microclimate. Researchers showed *in-vitro* evidence that the physical deformation of tissue secondary to the forces applied during a loading event were likely more damaging than the resulting ischaemia or hypoxia that occurred[14]. Therefore, if repetitive insults to the tissues could be potentially avoided by diverting the forces applied to the tissues away from the bony prominence or through dissipation of the intensity, the skin may be protected from injury.

Nakagami et al[15,16] looked at this possibility when they compared the use of a transparent film versus a hydrocolloid-ceramide wound dressing to decrease PUs on the heel. The authors concluded that while they showed the dressings did in fact reduce shear and friction, the dressings did not have an impact on pressure, and therefore could not substitute for heel floating. In this case it could be suggested that the physical properties of the dressings allowed for mitigation of two forces, but did not encompass pressure or microclimate.

Further studies looking at the role of foam dressing in decreasing pressure in patients with diabetic foot ulcers during walking provide more insight[17,18,19]. Four commercially available dressings were tested and all showed minor reductions in impact pressures. The studies indicated that each dressing performed differently and some dressings were less efficient when wet. A dressing will never be capable of reducing pressure to the level of redistribution found in a specialist mattress; but in order for a dressing to be an additional preventive measure, the dressing construction must be capable of mitigating and redistributing load as this subsequently impacts shear.

As a result of the success of using the five-layer silicone sacral dressing, as reported by Santamaria et al[1] and Kalowes[2], *in-vitro* studies were completed to assess how the dressing's construction provided benefit, and importantly

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how similar dressings compared based upon their unique construction. Call et al[20] describe an *in-vitro* comparison of nine competitor sacral dressings currently on the market. They assessed how well the dressings reduced the coefficient of friction, reduced shear transmission through the dressing to the skin surface, and how much load could be deflected over the area of the dressing. In these studies, they determined that dressing materials and structure changed the impact of shear and loading forces, and that dependent on structure and function the dressings may or may not be well suited for prevention.

Further, the management or maintenance of an appropriate microclimate (relative heat and humidity) is an important measure to assess. Especially in critically ill patients and those with obesity, cardiac conditions or on certain medications, perspiration and insensible fluid loss is a known contributor to altered skin integrity via the impact of moisture-associated skin damage[21]. Thus if a dressing is to be used for prevention, it must be known how the dressing manages moisture vapour transmission and responds to heat retention.

Call et al[22] evaluated eight commercially available sacral dressings and looked at the amount of moisture held under the dressing, the amount that was capable to be transmitted out of the dressing and the amount of heat that was trapped at the skin surface. Clinicians should question the evidence of the chosen dressing's performance in these areas before using as an additional intervention for PU prevention.

4 How should appropriate dressings be selected for the protection of different anatomical areas?

Based on both the *in-vitro* and *in-vivo* evidence, it is possible to determine that products such as the soft silicone foam dressing used in the aforementioned studies can be used for protecting the sacrum and heel; other options exist to protect from medical devices.

Black et al[23] recently provided a review of literature and consensus panel recommendations for the prevention of medical device-related PUs. The authors described several studies that highlighted the benefit of various dressings (films, hydrocolloids and thin foams) in the prevention of device-related PUs. The differences in construction of these one-, two- and three-layer dressings again support the findings that the construction of the dressing and the type of forces applied to the area matters. While a film, hydrocolloid or thin foam would have minimal impact on the high levels of shear, pressure, friction and microclimate on the sacrum, these forces are dramatically less under medical devices such as tracheostomies or noninvasive positive-pressure ventilation (NIPPV) masks.

Medical device-related PU prevention is primarily rooted in skin assessment under the device, proper fitting and routine repositioning of the device. Fletcher[24] outlines new techniques to help reduce or prevent skin damage beneath medical devices. Additionally, device manufacturers are often unaware of the potential harm caused by their products, making clinician reporting of these events back to the manufacturers vital.

5 Who is at risk and when should dressings be considered as part of the prevention strategy?

ICU

Intensive care patients have long been identified for their increased risk of PU development secondary to the underlying comorbid conditions, decrease in tissue tolerance and the therapeutic interventions used by clinical staff[25–27]. In the author's facility, after using sacral silicone foam dressings for over 5 years and seeing the profound reduction in PUs, the decision was made by the critical care nursing council to begin applying the sacral dressing to all admitted, non-ambulatory adult ICU patients. This decision came in part because of the high acuity of the patients in an academic trauma centre, and because of the complexity of PU aetiology, where tissue insult may far precede cutaneous manifestation.

Operating room

The operating room (OR) has been linked to PU formation in numerous studies[28,29,30]. The use of a sacral foam silicone dressing has been studied in the operating theatre. Brindle and Wegelin[9] reported that in their cardiac surgery evaluation of the dressing, one of the limitations of the study were that both the intervention and the control group had a sacral dressing applied for their supine OR procedure, with the control group having the dressing removed on arrival to the ICU. This inherently affected the statistical significance of the findings. However, of interest was the fact that none of the PUs that developed during the time of the study in either group occurred until at least 6 days after their operative procedure. This left the authors considering that the dressing may have had a protective effect in the OR, especially considering the length of the overall procedures in their study.

Castelino et al[31] evaluated the use of both

the sacral dressing and the same dressing in different shapes on non-traditional sites during operative procedures. In prone neurosurgical patients they evaluated the preprocedural application of sacral soft silicone foam dressings to 104 patients and compared their outcomes with 114 standard of care patients undergoing the same surgery. They reported no PUs developing in the preprocedural dressing group, while 12/114 developed pressure injuries in the standard of care group.

Emergency department (ED)

The ED is an often overlooked area of hospital PU prevention measures, simply because of the complexity of providing consistent care, available equipment and merging prevention with initial triage assessment and stabilisation. Naccarrato and Kelechi[32] describe this dilemma well, and provide insight via a literature review and recommendations for developing emergency nurse PU prevention guidelines.

The use of dressings may be beneficial for prevention in high-risk patients who are waiting to be admitted via the ED and have known risk factors impacting tissue tolerance, such as patients with spinal cord injury or those patients who may be transported directly to the operating theatre from the ED. Cubit and colleagues[33] evaluated the application of Mepilex Border Sacrum to men and women >65 years who had a Waterlow Scale Risk Assessment score indicating a high risk or very high risk for pressure injury in an Australian ED. Subsequently, the authors reported that patients who were not allocated a dressing during their ED stay were 5.4 times more likely to develop PUs than those who had the dressing applied as part of their prevention protocol. They concluded that the application of a dressing in the ED seemed to be beneficial for elderly and 'at-risk' patients.

In the author's facility, patients entering the trauma bay have a dressing applied to their sacrum during primary assessment, as many of these patients inevitably are sent to the operating theatre or the ICU directly. The risk of PU development in the ED and the benefit of prophylactic dressing use was additionally highlighted in the RCT by Santamaria et al[1], as all patients were randomised and the intervention dressings applied in the ED.

6 Does the dressing size make a difference?

When selecting an appropriate dressing for PU prevention, it appears that size does matter. Call et al determined in both of their *in-vitro* evaluations[20,22] that the larger dressing sizes were more adept at load deflection over their increased surface area. The dressing needs to be larger than the bony prominence it means to protect.

7 Application and assessment: how do we implement?

The most difficult aspect of using a soft silicone foam dressing to protect the sacrum is the proper application of the dressing to the body, as well as the technique used for skin assessment. In the author's setting the Mepilex Border sacrum dressing is used, and the following advice relates to this product. The challenge for successful product application stems from the anatomical variability of each patient and the need to place the dressing so that it is fully protecting the bony prominence. For incontinent patients, proper application is key to prevent undermining. The dressing is occlusive and therefore, when applied appropriately, urine and stool can be wiped off of the top of the dressing without resulting strike through. Clinicians should be careful not to position the dressing too close to the anus and ensure the distal pole of the dressing is well sealed to the skin during application to further prevent undermining.

The clinician should remember that the primary area of protection is the sacrum, and this should be the first focus of dressing application; in some patients, a prominent coccyx or the proximal portion of the gluteal cleft may also be protected from intertriginous injury. The dressing orientation should also be considered when evaluating the width of the surrounding bordered edge of the dressing. If during application it is noted that the bordered edge alone is covering a portion of the bony prominence, the dressing may be flipped upside down, as the more narrow edge of the proximal portion of the dressing may allow for more coverage.

When applying the dressing, it is easiest to remove the centre backing layer, fold the dressing in half and focus on the application of the distal pole of the dressing to the area around the sacrococcyxgeal junction; this is the area of dressing application that is of the greatest importance to maintain a proper seal. The skin should be clean and dry and free from skin creams and barriers, as their use will interfere with the dressing's adhesive technology and negate the preventive benefit. Thus clinicians are encouraged to cleanse and dry the skin with a pH-balanced cleanser, apply the dressing to the dry skin and then use protective barrier creams or moisturisers to the skin surrounding the dressing after application.

When protecting the heel, the situation

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is generally more straightforward, as the clinician should consider a specially shaped heel version of the chosen dressing. The clinician must remember that the dressing must be large enough to not only protect the posterior calcaneous but also the medial and lateral aspects of this bony prominence as well.

After dressing application, it is possible to use a technique that allows for skin inspection and reapplication without changing the dressing. This requires at least two people, so that the clinician removing the dressing and assessing the skin can use both hands on the dressing without having to be concerned with moving the patient. The key is to perform the peel-and-peak technique slowly; if the dressing is grabbed and removed too quickly, the dressing edges will roll and decrease the ease and effectiveness of reapplication. The clinician should proceed, keeping the dressing taut to prevent rolling, by starting at the top left or right edge of the dressing and pulling the dressing diagonally down, while constantly pulling the dressing border out-and-away so as to not let it fold downwards. The distal seal of the dressing near the sacrococcyxgeal junction should never be removed, as this seal is the primary prevention against undermining of the dressing from incontinence. The dressing must be firmly adhered to the skin throughout its entire surface area to allow for proper loading and deflection of the forces applied to the dressing. Without this adherence, the dressing is ineffective.

8 How often should a dressing placed on intact skin be changed or the skin assessed?

The author recommends that clinicians should determine the best method for recommending skin assessments and dressing changes according to their organisational protocols. In the author's practice, nurses have been instructed to change the dressing every 72 hours and inspect the skin. However, one should never restrict the skill or practice of a registered nurse, and because of this the nurses are encouraged to perform a peel-and-peak technique if there is any concern over skin integrity following a change in patient condition or after a long OR procedure.

As reported by Brindle and Santamaria[34], dressing removal and reapplication in subsequent days did not result in significant changes in adhesion quality.

9 When should a prophylactic sacral dressing not be used?

Not all patients require the use of a prophylactic dressing; in most cases, a comprehensive PU prevention strategy is sufficient to manage risk. However, there are specific instances where dressings should not be used or be discontinued from the prevention protocol. While a properly applied dressing is resistant to undermining from incontinence, frequent faecal and urinary episodes of incontinence may overwhelm the dressing or create chemical denudation that impedes adherence. Specifically, patients with *Clostridium difficile*-induced diarrhoea are not candidates for prophylactic sacral dressings because of the frequency of soiling in these cases. If the dressing needs to be changed more than twice in a 24-hour period, it should be discontinued in favour of alternative skin protection, such as barrier creams in the case of incontinence.

In general, ambulatory patients and those capable of independent turning and repositioning without sensory perception deficits do not required preventive dressings.

Each organisation's prevalence and incidence data should be reviewed to identify populations who are at risk, and the locations of the PUs that are most common. For example, in the neonatal ICU, sacral dressings are not used for prevention.

Morbid obesity may prevent the proper application or benefit of a prophylactic dressing. In the author's facility, patients with a body mass index >70 are common. For these patients, changes in body shape, such as deep skin folds and creases, prevent the correct application of a sacral dressing for PU prevention.

It is important to understand that prophylactic dressings should *never* be positioned under the grounding pad in the OR; to be effective, the grounding pad must be 100% in contact with the skin to prevent arcing. For supine patients positioned in the OR, the author's facility uses the vastus lateralis as the preferred location for grounding pad application, which in no way interrupts the use of a preoperatively applied sacral dressing.

10 Is there any evidence on the cost-effectiveness of dressings for prevention?

A recent article by Santamaria and colleagues[35] provided a cost–benefit analysis of the previously published RCT by the same researchers[1] Based on a 10% reduction in PU incidence when a dressing was used, the

researchers determined their ICU could project an annual cost savings between $172 880–293 800 for the hospital.

Kalowes[2] similarly reported on the cost-effectiveness of the use of sacral soft silicone foam dressings; the author projected a $40 000 annual cost of dressings for use in PU prevention, with an overall savings of $325 000 for their hospital system via PUs prevented in comparison with the control group.

In clinical practice, it is necessary for facilities to determine how the product will be used to reduce costs. While both sacral and heel soft silicone foam dressings have been proven to be efficacious in the prevention of PUs, organisations need to ensure that staff know which patients should have this adjunctive therapy and, importantly, how to properly apply the dressings and assess the skin. Without proper in-service education and instruction, product misuse may occur, related to ineffective processes. ■

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