Advances in pressure ulcer prevention and treatment made easy

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Introduction

Statistically significant advancements in clinical practice and technology with regard to pressure ulcer prevention and treatment have been made over the past 20 years. This has been driven by clinicians, researchers, educators, administrators and, more recently, governments, with clinical practice guidelines that underpin these activities. This Made Easy highlights the latest national and international guidance on prevention and treatment strategies for pressure ulcer care, with a focus on the role of silicone-foam wound dressings.

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Why are pressure ulcers a care priority?

Because of the increased emphasis on patient safety and quality of care, prevention of pressure ulcers (PUs) is a major concern in hospitals and other healthcare facilities — as well as entire health systems — worldwide. In the United States, it is estimated that 2.5 million patients are treated for PUs in acute care settings each year, and that 60,000 of these die from related complications[1]. Depending on the setting, PU incidence can range from 0.4–38% in hospitals, from 2.2–23.9% in skilled nursing facilities, and from 0–17% for care within the home[2].

Cost of pressure ulcers

Management of PUs comes at a high financial cost to healthcare facilities and systems globally. The US Agency for Healthcare Research and Quality (AHRQ) reported in 2008 that treatment related to PUs cost $11 billion each year[3]; studies have put individual treatment costs over a wide range, often between $37,800 and $70,000 per case[4–6]. The high cost of PUs has also been identified in Australia, with associated costs for a period of 12 months estimated to be US$1.65 billion[7]; the associated opportunity-cost related to increased lengths of stay from PUs is estimated to be a mean of $285 million (AUD)[8].

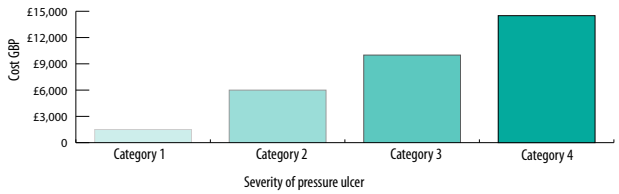
Box 1: Terminology around PUs

A pressure ulcer is a localised injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear. In the Pan-Pacific region, the term 'pressure injury' is used[9]. For the purposes of this document, 'pressure ulcer' will be used throughout, with the understanding that 'pressure injury' could equally be substituted.

There are no European-wide estimates of the total cost of PU prevention and treatment. Literature within individual countries reveals:

- **In the UK, PUs cost up to 4% of the annual health care budget, with estimated cost of care up to £30,000 per individual PU[6]. The Department of Health[11] further reports that the typical range for each stage rises with severity (Figure 1).**
- **The cost of PUs in the Netherlands ranges 'from a low estimate of $362 million to a high of $2.8 billion. The most conservative estimate is approximately 1% of the total Dutch healthcare budget' [11].**
- **In Spain, the cost of treating PUs is estimated to be approximately 461 million euros, or 5% of the total annual healthcare expenditure[12].**

Figure 1 | Average cost of PU treatment per patient[10]



A recent systematic review[13] of the cost of PU care found that the costs of prevention per patient per day varied between 2.65 and 87.57 euros across all care settings, while the cost of treatment ranged from 1.71 to 470.49 euros across different settings. This confirms that the cost of prevention is far less than the cost of treatment[13].

In addition to the steep financial costs, treatment of PUs takes up valuable nursing time[13] and can have a significant impact on a hospital's performance ranking. Many countries and payers are developing — or have already instituted — quality-reporting measures that include incidence of PU development. Rates above the thresholds set by these institutions can result in lower or rescinded reimbursement.

Furthermore, patient satisfaction and quality of life are deeply affected[14]. Patients who have developed a PU report profound, negative emotional, physical, mental and social effects on their quality of life[15]. In particular, patients are affected by pain experienced, appearance of the ulcer, odour and exudate.

Preventing hospital-acquired pressure ulcers

Research shows that 20–25% of beds in healthcare facilities are occupied by patients who have a PU, and that about 60–80% of those ulcers were acquired after admission to the facility[16]. PUs tend to develop relatively early after admission, often within the first 2 weeks[17]. One study found that 15% of elderly patients develop a PU in hospital within the first week[18], and another that elderly patients in long-term care are most likely to develop a PU within the first 4 weeks of admission[19]. Within the acute setting, the intensive care unit (ICU) has the highest prevalence[20].

Given that the cost of treating a PU is approximately 2.5 times the cost of preventing one[21,22], it is critical that prevention efforts — undertaken as soon as possible after admission — be the focus of any PU management programme.

Identifying at-risk patients

All patients are potentially at risk of developing a PU[23] . National and international recommendations for prevention include methods for screening and risk assessment, followed by the use of preventive PU strategies[6,23].

Risk assessment tools/scales and their use

International recommendations state that a risk assessment should be completed within 8 hours of admission[6]. Because risk assessment tools identify known multiple risk factors and are not exact predictors of PU development, it is important to understand their limitations and use them to provide corroboration for clinical judgement[24]. Box 2 outlines the three most commonly used validated tools.

Box 2: Commonly used validated risk assessment tools

- **Braden Scale for Predicting Pressure Ulcer Risk.** The scale consists of six factors: sensation, moisture, activity, mobility, nutrition and friction/shear. Each factor is rated on a scale of 1–4, excluding friction/shear, which is rated on a 1–3 scale. The numerical scale goes from 6–23, with the lower number being the higher risk for developing a PU. There is also a Braden Q scale in use for paediatric patients, which comprises seven subscales. Each subscale is rated 1–4 (1 = high risk). Total scores range from 7–28, with lowest scores putting a child at the highest risk for breakdown.
- **Norton Scale.** Developed in the UK, this scale consists of five factors: physical condition, mental condition, activity, mobility and incontinence, and scores range from 5 (lowest risk) to 20 (highest risk); the arbitrary cut-off score of 14 (or above) designates the patient as at-risk.
- **Waterlow Score (or Waterlow Scale).** This scale estimates the risk for PU development in a given patient, based on nine factors: build (weight + height), visual inspection of skin in at-risk anatomical areas, sex, age, continence, mobility and nutrition. There are three special risk factors: tissue malnutrition, neurologic deficits, and major surgery or trauma. Potential scores range from 1 (lowest risk) to 64 (highest risk). A total Waterlow score ≥10 indicates risk for a PU; a high risk score is ≥15; and a very high risk exists at scores ≥20. The score has received criticism owing to its large number of scored items.

Different risk assessment tools have different score-to-risk ratios so it is important to clarify which tool is being used and for this to be documented in the patient's notes. For example a Waterlow score of 9 would not indicate risk, but a Braden score of 9 indicates severe risk. A risk assessment should be repeated when a patient's condition changes.

A comprehensive skin assessment should be included as part of every risk assessment to check for colour changes, discolouration and variations in heat, firmness and moisture. This should include inspection of skin under and around medical devices[6].

Many healthcare facilities choose to complete a skin assessment at least once a day. This may be performed at each change of caregiver or shift, and after surgery or each procedure. This ensures the continued appropriateness of interventions used, as a patient's condition can change rapidly.

Implementing a pressure ulcer prevention protocol

All patients at risk should be offered a PU-prevention protocol. This requires the involvement of the multidisciplinary team and the development and implementation of standardised approaches that can be tailored to the specific risk factors involved[25], with particular attention focused on immediate pressure redistribution.

Building blocks of prevention: care bundles

Patients will require an appropriate care plan to minimise/eliminate pressure, shear and friction, manage moisture and maintain adequate nutrition/hydration. This will most often include selection of an appropriate high-specification support surface and implementation of a structured skin care regimen.

Immobile patients are at greatest risk of developing a PU and should be encouraged to change their position frequently (at least every 4–6 hours)[23]. For those unable to change position independently, a repositioning schedule should be initiated, with time allowed in a bedside chair where possible and a strategy to offload heel pressure in non-ambulatory at-risk patients.

Promoting skin health is key to prevention. While maintaining a certain level of skin hydration is vital for skin integrity (through adequate nutrition and fluids), too much moisture can reduce skin function and resistance to damage. For those patients who

have faecal or urinary incontinence, a suitable barrier product should be used to reduce the risk of skin breakdown[26].

Often these actions are bundled together to simplify monitoring of patients for signs of skin damage and implementing suitable equipment[27] (see Box 3 for the SSKIN care bundle). It is important that nurses communicate the need for interventions to patients and staff, as this will help ensure the recommended interventions are used appropriately.

Education and training for staff on identifying PU risk, prevention and treatment, needs to be done routinely to overcome staff turnover, varying levels of knowledge and motivational issues. Where staff have prioritised PU prevention in a busy critical care environment, this has led to substantial improvements in adherence to protocols for repositioning and product use with reductions in the numbers and severity of PUs[28].

Box 3: SSKIN care bundle for prevention and treatment of PUs

- ✔ **S**upport surface Use an appropriate pressure redistribution support surface and reassess as the patient's needs change
- ✔ **S**kin inspection Check entire skin regularly, with particular emphasis over bony prominences, and document in patient's healthcare records
- ✔ **K**eep moving Implement a turn/reposition schedule and optimise/encourage independent movement. Refer to occupational therapist/physiotherapist when appropriate
- ✔ **I**ncontinence and moisture Ensure appropriate management of incontinence (urinary and faecal), perspiration or exudate in conjunction with a structured skin care programme to maintain skin integrity
- ✔ **N**utrition and hydration Encourage individuals to eat and drink regularly and assist patients when necessary. Refer to dietitian when appropriate

Role of dressings in pressure ulcer prevention

Dressings that may be used prophylactically differ in their qualities and it is important to select a dressing that is appropriate to the individual and clinical need (Figure 2, page 4)[6].

A transparent film dressing or hydrocolloid dressing may be thinner and more suited for using under a medical device[29]. Foam dressings are highly absorptive and some can manage moisture at the skin surface more effectively than others[30]. Where there is increased risk of damage to fragile skin, dressings with a soft silicone border may be removed more easily for regular skin assessment[31]. Dressings that comprise more than one layer have been shown to have a clear benefit over a single-layer dressing in terms of redistributing tissue load when used to prevent heel PU[32].

Multilayer silicone-foam dressings

Although multilayer silicone-foam dressings will never be capable of reducing pressure to the level of redistribution found in a specialist support mattress, they can be used as an additional preventive measure in high-risk patients. This includes critically-ill individuals cared for in the high-dependency (HDU) or intensive care unit (ICU), patients admitted for surgery and orthopaedic and trauma patients.

A systematic review on the use of multilayer soft-silicone foam dressings, applied to bony prominences, has demonstrated a reduction in PU incidence in high-risk patient groups[33]. This has led to the adoption of standard protocols for PU prevention in patients admitted to hospital whereby dressings are applied over bony prominences pre-operatively and continued post-surgery to minimise the risk of PU development. There is also experience of using adhesive and non-adhesive foam dressings, especially on the heels, which has shown a reduction in the incidence of PUs compared to controls[34,35].

Regular skin inspection with removal/peeling back of the dressing should be continued throughout the patient's hospital stay to ensure daily visualisation of the bony prominence (Brindle, 2009).

Patients with medical devices

Pressure damage can occur on the skin or mucosal membrane in the absence of a bony prominence due to sustained, unrelieved pressure or moisture under or around the device (e.g. nasogastric tube, tracheostomy and oxygen-delivering mask). These PUs often conform to the pattern or shape of the device and most frequently occur on the head, neck, face and ear. It is important to ensure correct positioning, fit and care of equipment, as well as frequent skin inspection to minimise the risk of further damage and to protect the skin[29].

The guidance from the National Advisory Pressure Ulcer Panel, European Pressure Ulcer Advisory Panel and the Pan-Pacific Pressure Injury Alliance (NPUAP/EPUAP/PPPIA) now refers to

Multilayer foam dressings can be placed over bony prominences and under medical devices to prevent PU formation in at-risk patients, including the very young, critically ill and frail elderly. Acknowledgement: Pablo López and José Verdú

Figure 2 | Optimal properties of dressings used for pressure ulcer prevention

Redistribute pressure

When pressure is applied to skin, particularly over a bony prominence, it distorts the skin and underlying soft tissues[37]. The dressing construction must be capable of mitigating and redistributing load as this subsequently impacts shear forces on the skin.

Reduce shear and friction

Superficial skin changes are predominantly caused by frictional forces on the skin. Dressings have been shown to decrease friction and reduce localised shear forces on skin and subcutaneous tissues[38]. This may be dependent on the number of dressing layers and their construction, the size of the dressing and type of adhesion (e.g. silicone) as well as its ability to protect the skin.

Manage temperature/moisture

Changes in skin moisture levels (e.g. due to trapped perspiration at the skin-surface interface may increase the risk of superficial pressure ulceration[38]. Dressing construction may influence moisture trapping and humidity close to the skin. The ability to handle transdermal water vapour loss (TEWL) under a dressing is thought to play a key role in managing the optimum level of moisture at the skin surface for prevention[39].

medical device-related PUs and suggests a role for the use of prophylactic dressings to manage moisture around a device and redistribute pressure.

Choice of dressing is dependent on the type of device and patient needs as well as:

- **Ease of application and removal**
- **Ability to regularly inspect skin**
- **Thickness of dressing, especially under tightly-fitting devices**
- **Anatomical location of the device.**

Regular repositioning of the medical device, as the patient's condition allows, is key to avoiding device-related PUs. This should be performed once per shift as a minimum[40], although this will be dependent on the device itself and ability to remove or reposition the device.

Treatment of pressure ulcers

For patients who develop a PU, it is important to document the surface area (length, width) and depth, noting any areas of undermining and condition of the periwound skin. Recommendations support the use of a validated classification tool, such as the International NPUAP-EPUAP Pressure Ulcer Classification System[6], to classify each PU. This should be performed and documented each time the PU is assessed.

There is a high level of evidence to support the recommendation that all patients at risk of a PU should be placed on a high-specification foam mattress with the option to step up to an active support surface where additional pressure redistribution is required[6]. Standard hospital mattresses are not suitable for patients with an existing ulcer.

An integrated care plan that takes in all key components of pressure care (e.g. SSKIN bundle, see Box 3, page 3) should be implemented and tailored to individual needs. Involvement of the patient and their family is central to ensuring that individual problems and concerns are addressed.

Local wound treatment needs to incorporate the principles of wound bed preparation, including an evaluation of the best method of debridement to remove any dead or devitalised tissues. Wound dressings that maintain a moist wound environment and promote re-epithelialisation play a central role in PU care[23].

Dressing choice should take into account:

- **Size, depth and location**
- **Condition of wound bed**
- **Exudate level**
- **Condition of periwound skin**
- **Presence of tunnelling/undermining**
- **Frequency of dressing change**
- **Pain and comfort level.**

If there are signs and symptoms of local infection, consider a dressing containing a topical antimicrobial (e.g. silver) to manage the bioburden and/or suspected biofilm[41].

If exudate leakage is a problem from one side of the dressing (e.g. due to gravity) consider applying a dressing that allows greater overlap and conformability to maintain an adequate seal. In addition, the dressing should be gentle on the periwound skin (e.g. silicone border) to minimise pain and discomfort on application, removal and repositioning[6].

Dressings should be left in place for as long as possible to avoid disturbance to the wound bed[42]. Some newer dressings incorporate a change indicator to show when optimal dressing saturation is reached. This may reduce unnecessary dressing changes and frequency of nursing visits[43]. At each dressing change, check the PU for signs that indicate a change in treatment and re-evaluate the treatment plan if the PU does not show signs of healing in 2 weeks[6].

Importance of documentation

Communication and documentation of PU prevention and treatment interventions are very important. Discussion between the nursing unit and procedure areas should result in continuity of interventions. In addition, involve the patient and any carers in decisions being made about care to encourage greater patient satisfaction and improved concordance[44]. Documentation contributes to communication and also prevention of legal initiatives in the case of a hospital-acquired PU[45]. When legal teams perform a chart review and see that all necessary PU prevention interventions were undertaken, complete with clinical rationale, the only conclusion could be that the PU was unavoidable. Electronic health records need to facilitate documentation of risk and skin assessments, photography, PU prevention and PU interventions.

The essentials for documentation include:

- **Risk assessment and factors including comprehensive skin and tissue assessment**
- **Identification of whether PU is facility-acquired or not facility-acquired**
- **Classification of the PU**
- **Location of the PU**
- **Evidence-based preventative plan, detailing resources including skin care and equipment, offloading devices, mobilisation/repositioning schedules and intra-professional referrals**
- **Evidence-based wound management plan developed in partnership with patients and carers**
- **Reporting mechanism specific to the healthcare facility.**

Meeting these reporting parameters will further help healthcare facilities to measure outcomes.

Cost-benefits of implementing PU recommendations

Reducing the incidence of PUs will reduce nursing time and release hospital beds, improving the efficiency of the healthcare facility. Treatment of a PU will always involve a longer and more costly hospital admission[23]. Although prevention measures may initially increase costs (e.g. through the provision of high-specification foam mattress where these are not provided as part of standard care), overall cost-savings will be gained from a reduction in worsening of PUs and avoidance of complications[23]. Additional costs may also be saved through litigation avoidance[46].

While dressings have traditionally been used to provide the optimal environment for wound healing, there is an increasing expectation that they will assist in pain management, offer minimal dressing changes and be clinically and cost-effective[34].

Emerging use of dressings for prevention may also impact on cost of PU care[47]. Swafford et al report on a 12-month prevention programme in adults admitted to ICU where a range of prevention strategies were used, including the application of a silicone adhesive hydrocellular foam dressing[48]. Over the study period, there was a 69% reduction in the incidence of hospital-acquired PUs. This was despite a 22% increase in the number of ICU patients. There was also a decrease in the number of device-related PUs (from 2%-0.4% of admissions), due in part to the use of dressings underneath C-collars[48]. Overall there was an estimated cost saving of about $1 million dollars, which was largely attributed to the adoption of these preventive measures; this has led to a hospital-wide roll out of the programme[48]. Further large-scale studies are required to investigate outcomes in different patient populations[49] with the adoption of multilayer silicone-foam dressings as part of a wider PU prevention programme.

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Summary

Advances in PU prevention and treatment are contributing to reductions in PU numbers. New guidelines provide a benchmark for implementing appropriate strategies for PU management. Recommendations include the use of prophylactic dressings to protect bony prominences and skin under medical devices. Increased understanding of mode of action, evidence for dressing use and potential cost-savings is growing.

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