

Innovations in the reduction of pressure ulceration and pain in critical care

KEY WORDS

- ▶ Critical care
- ▶ Pain
- ▶ Pressure ulcer

With pressure ulcers costing the NHS an estimated £4 billion per year (Whitlock et al, 2011), an increasing emphasis has been placed on reducing their incidence. The authors initiated a review of pressure ulcer incidence. Following this, it was decided that a product evaluation should be conducted within two critical care units in order to determine whether a prophylactic five-layer silicone foam would aid ulcer incidence reduction. The evaluation lasted for 3 months and the aims were to prevent incidences of ulceration caused by moisture, friction, and shear; reduce the incidence of pain associated with skin damage; and promote cost-effectiveness in the prevention of sacral lesions. The results of the evaluation highlighted the effectiveness of introducing a prophylactic dressing within critical care as a prevention strategy.

The UK National Health Service (NHS) has been seeking to improve specific aspects of health care, particularly since the early 1980s when the Griffiths Report (1983) placed emphasis on quality as an agenda item. At present, there is still increasing emphasis on quality and cost-effectiveness, as the NHS is faced with rising demands, but with limited resources. One area of concern is the growing incidence of pressure ulcers and the costs associated with them, which are estimated at over £4 billion per year (Whitlock et al, 2011).

Pressure ulcers have long been a notable burden for individuals and healthcare providers, and despite a rapid growth in the use of pressure-reducing support surfaces and the availability of national guidelines to support and guide patient care, statistics relating to pressure ulcer development indicate that targets set 20 years ago (Clark, 2003) have still not been achieved. The limited data that exist (Wighton, 2012) infer that pressure ulcers are now more commonplace despite rapid changes in clinical practice and they remain a serious healthcare problem in terms of patient discomfort, pain, quality of life, and financial burden. Older people are particularly at risk because they tend to have reduced circulation and less mobility (Wighton, 2012). Without a concerted effort, this cost is likely to inflate in the future as the population continues to increase in age.

Pressure ulcers are caused by sustained pressure being placed on a specific part of the body. Although wounds on the sacrum are often classified as pressure ulcers, little thought can sometimes be given to whether pressure is the underlying cause. Other reasons why wounds occur in this area may be related to shear, friction, moisture or the microclimate (Defloor et al, 2005; Brindle, 2010).

▶ Shear/friction: although shear and friction are separate phenomena, often their combined effects lead to tissue ischemia and ulcer development. Shear is one of the contributing factors in the development of pressure ulcers when mechanical loads act to stretch or twist soft tissue (Clark, 2013). It is the result of gravity pushing down on the body, causing resistance between the individual and the support surface. Shear occurs at the deeper fascial level of the tissues overlying the bony prominence and important structures that lie within the dermis become stretched in different directions (Bryant, 2000). In contrast, friction damage is confined to the epidermis and upper dermal layers and can present as mild-to-moderate abrasions. Friction between the skin and support surface can cause deterioration of the cornified layers of the skin, thus exposing underlying structures, and can cause separation between the layers of the epidermis (Butcher and Thompson, 2009).

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“The tissue viability nurse specialist decided to carry out a product evaluation in two critical care units to determine if the prophylactic use of a five-layer silicone foam as part of the prevention strategy would result in a reduction in the incidence of ulcers caused by moisture, shear, and friction.”

» Microclimate: according to Clark and Black (2011) and Young (2012), the microclimate is a term used to describe three aspects of the interface between the skin and a support surface: skin temperature, humidity and air movement. The microclimate is responsible for the regulation of the humidity and temperature of the skin, which, according to Young (2012), is an important factor in protecting the skin against external damage. This hypothesis was also supported by Brindle and Wegelin (2012) who claim that an imbalance in the microclimate may have a negative effect on normal tissue functions. Although it has been claimed that modern support surfaces can influence the microclimate through the movement of air over the individual's skin, or by mechanically moving the surface of the support away from the skin, the primary function of these devices is pressure redistribution, not microclimate control (Clark and Black, 2011).

BACKGROUND

Pressure ulcers present a significant healthcare threat to people who have been sedated or are unconscious, or those with restricted mobility, extreme age, or a medical condition with a lack of response to discomfort caused by prolonged mechanical loading (Clark, 2013). In particular, individuals in intensive care or high dependency units are at a high risk of developing pressure ulcers.

All critical care units in the Greater Glasgow and Clyde areas have proactive pressure ulcer prevention strategies in place, with all newly acquired pressure ulcers being recorded in a database and investigated by senior management and the tissue viability specialist. At one of the acute hospital sites, a review of the pressure ulcer data raised the awareness of an increased incidence of sacral ulceration within critical care unit. This initiated a review of incidence data by the tissue viability nurse specialist (TVNS). Despite intensive nursing care, and the use of dynamic therapy surfaces and proactive pressure ulcer prevention strategies, the rate of recorded sacral cleft ulcers over a 3-month period was found to be 20/60 (33%; *Figure 1*). Data collected over the 3-month period prior to the study was via retrospective reporting by nursing staff so unable to identify why December's figure was lower.

Although these ulcers were recorded as pressure ulcer development, the TVNS reviewed these data

with caution and believed that the skin damage in all cases was related to a combination of shear, friction, and an imbalance of the microclimate. It has been well documented that a dynamic mattress can redistribute pressure, however, there is no clear evidence that it can reduce shear and friction.

A previous study by Ohura et al (2005) investigated whether the application of dressing materials may reduce pressure shear and friction, however, we need to view this research with caution as this was an in vitro study and in vitro tests do not mimic the complex environment found in the clinical setting. Recently, there have been studies published recommending the use of a prophylactic foam dressing to reduce shear force and friction. However, according to Call et al (2010) and Brindle and Wegelin (2012), to be effective at reducing friction and shear, the ideal dressing should have the following characteristics:

- » The adhesive layer should not be too strong and should cover the foam layer on the dressing or it may cause mechanical trauma to the skin if the individual moves down the support surface.
- » It should be able to manage the microclimate and absorb excess moisture, but also have a high moisture vapour transmission rate to allow for evaporation
- » It should have adequate thickness to allow for bulk displacement in response to shearing forces and help to redistribute pressure.
- » It should be made up of multiple layers of foam that are capable of moving independently when the individual moves in order to dispel shear or friction.
- » It should come in different sizes and be larger than the bony prominence.

On review of the evidence, the TVNS decided to carry out a product evaluation in two critical care units to determine if the prophylactic use of a five-layer silicone foam (Mepilex® Border Sacrum; Mölnlycke Health Care) as part of the prevention strategy would result in a reduction in the incidence of ulcers caused by moisture, shear, and friction.

Traditionally, critical care units have very high-risk patients and if a reduction could be seen within the two units participating in this study, it was thought that this could then be replicated throughout critical care units across the Greater Glasgow and Clyde areas.

AIMS OF THE EVALUATION

Maurer (2010) identified staff resistance as being one of the main factors in preventing change. To ensure the evaluation was implemented effectively, the TVNS and critical care management agreed on aims and objectives, and agreed that the evaluation would be implemented for a period of 3 months.

The agreed aims were to determine whether the application of a prophylactic five-layer foam dressing would:

- ▶ Prevent the incidence of ulceration caused by moisture, friction, and shear.
- ▶ Reduce the incidence of pain associated with skin damage.
- ▶ Be cost-effective in the prevention of sacral lesions.

METHODS

All patients admitted to the critical care units in two large teaching hospitals between 1 January 2012 and 1 April 2012 were screened according to the patient selection criteria used for this evaluation (*Box 1*). Patients who met the inclusion criteria were assigned a prophylactic five-layer foam dressing with soft silicone wound contact surface (Mepilex Border Sacrum) as part of the pressure ulcer prevention strategy.

The prophylactic dressing regimen was discontinued on discharge and patients continued to be followed up by the TVNS for a further period of 7 days to monitor skin integrity. All patients continued to receive standard pressure ulcer prevention during the evaluation and the sacral area was checked every 24 hours.

Clinical information was recorded daily on OpenVista® CareVue (Medsphere®) – an electronic patient recording system – and a questionnaire was completed daily by the clinician on the clinical performance of the prophylactic dressing. The questionnaire collected data on:

- ▶ Patient identifier number.
- ▶ Quantity of dressings used for each patient until discharge from unit.
- ▶ Condition of the skin.
- ▶ Ability of the dressing to stay in place and conform to the sacrum.

RESULTS

A total of 82 patients were reviewed during the course of the evaluation. Seven individuals were excluded because of existing pressure ulceration or severe faecal incontinence, as this would have affected the results due to frequent dressing applications. Therefore, 75 participants who met the patient selection criteria were evaluated in the final analysis. At the end of the study, the incidence of ulceration development was 0%. The mean treatment duration was 9 days per patient and a mean of four dressings were used per patient. The cost-benefit analysis showed cost savings of £29.56 per patient per day with the use of the prophylactic dressing (*Tables 1–2*). Feedback from the questionnaires revealed no reports of pain.

DISCUSSION

Over the 3-month evaluation period, the incidence of pressure ulceration development in the sacral cleft was 0%. This is clearly an improvement on the incidence reported for a previous 3-month period (*Figure 1*). A cost-benefit analysis was carried out to determine the cost savings for prevention. If the five-layer silicone foam dressing were to be included as a prophylactic dressing into a package of care there would be cost savings of £29.56 per patient per day. Based on the mean treatment duration

Box 1. Inclusion criteria for the prophylactic dressing.

- ▶ All high-risk patients (i.e. Waterlow score >15).
- ▶ Bariatric surgery.
- ▶ Immobility, spinal cord injury (i.e. paralysis).
- ▶ Liver failure.
- ▶ Cardiac instability.
- ▶ Diabetes.
- ▶ Sedation.
- ▶ Malnutrition.
- ▶ Mechanical ventilation.
- ▶ Age >65 years.
- ▶ Surgical procedure >8 hours.
- ▶ Heart disease.
- ▶ Vasopressors >48 hours.
- ▶ Peripheral vascular disease.
- ▶ Past history of pressure ulcers.
- ▶ Major trauma.
- ▶ Traction.
- ▶ Haemodynamically unstable.

Table 1. Cost analysis of standard pressure ulcer treatment.

Product	Quantity	Cost per day (£)
Incontinence cleanser	40mL	0.20
Wipes	60	0.40
Gloves	20	0.66
Aprons	10	0.31
Pads	6	2.71
Barrier cream	5 g	0.90
Dressings	Primary/secondary	10.00
Nursing time per change	2 registered nurses	15.88 (7.94 each, Band 5 nurse)
Total		31.06

Table 2. Cost savings per day of pressure ulcer prevention.

Parameter	Cost per day (£)
Costs of standard care per patient	31.06
Mepilex® Border Sacrum five-layer silicone foam dressing	1.50
Cost savings of introducing a prophylactic dressing	29.56

*£4.50/dressing; average wear time, 3 days

Box 2. Recommendations for clinical practice regarding pressure ulcer prevention.

- ▶▶ Mepilex® Border Sacrum five-layer silicone foam to be introduced to all critical care units as a prophylactic dressing.
- ▶▶ Tissue viability champions to be identified to ensure good practice in critical care.
- ▶▶ Monthly group meetings to promote best practice.
- ▶▶ Update pressure ulcer policy and guideline to include change in clinical practice
- ▶▶ Further research to be carried out to investigate how effective these dressings are on aging skin.

of 9 days per patient, this equates to an average cost saving of £266.04 per patient.

The majority of staff found the dressing easy to apply and that it also enabled daily skin inspection without full removal and replacement of the product. Patients reported no pain during the evaluation and that the dressing was comfortable to wear. Staff reported that it easily conformed to the sacral cleft and was available in different sizes. Although the overall reduction in ulceration to the sacrum within these critical care units may have been influenced by the implementation of a five-layer soft silicone foam dressing, the study was limited to a small sample size, a short duration, and limited to a specialised area. Further research would be needed to support this hypothesis in a wider sample of patients.

CONCLUSION

Introducing a prophylactic dressing within critical care as a prevention strategy was demonstrated to be effective in reducing the incidence of ulceration to the sacrum. Auditing and comparing data collected over the 6 months in both units has been useful to demonstrate how practice can be changed and patient's outcomes improved. This evaluation highlights that nurses have embraced the challenge of improving quality and outcomes for their group of patients in critical care.

This evaluation highlighted that prevention of skin damage is essential and small changes in clinical practice can have a significant impact on clinical and financial outcomes. Recommendations of the evaluation are detailed

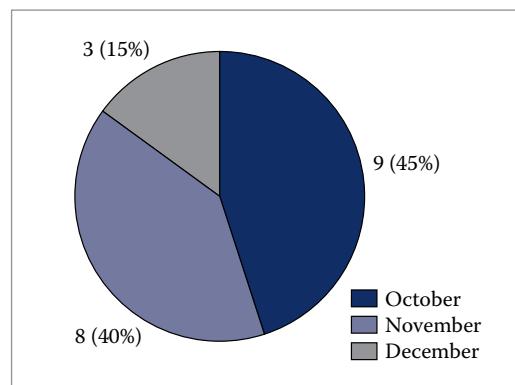


Figure 1. Incidence of ulceration over a 3-month period prior to study in a 20-bed critical care unit

in *Box 2*. Clinicians need to influence change in practice to improve patient care and reduce harm, and to maintain a healthcare system of the highest possible quality, they must strive for constant improvements. WUK

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