

# Utilising a foam positioning device for preventing pressure ulcers on the feet

KEY WORDS

- ▶ Feet
- ▶ Pressure ulcers
- ▶ Redistribution

This product review explores the complex challenges involved in managing the seated patient with, or at risk, of pressure-related tissue damage on the foot. The proposed benefits of Devon™ pressure redistribution foam were examined, taking into consideration the care regimen. The evaluation suggests improvement where tissue damage was present on initial assessment, and increased patient comfort when their feet were on hard surfaces. A simple questionnaire found positive patient and staff experience of the product.

One of the key elements identified to reduce the financial burden on the NHS is a reduction in avoidable pressure ulcers. The estimated costs of patients with pressure ulcers in the UK range from £1.9 billion to £2.8 billion, with individual hospitals spending up to £3 million. The Department of Health (DH) states that individual costs per patient are £2838 in the acute sector and £2286 in the community setting for pressure ulcer management alone (DH, 2010).

In the quest to reduce patient harm and the financial burden of pressure ulcers, there are currently several key national programmes directing organisational change, ensuring an open and honest approach to providing and sharing robust data across all healthcare settings (Health and Social Care Information Centre, 2013).

Reduced skin integrity has a significant detrimental effect upon the patient and carer and is an increasing financial burden to healthcare organisations. It is, therefore, essential that healthcare professionals explore new avenues, therapy processes and adjuncts if an attempt at resolving these challenges is to occur.

The heel is the second most common bony prominence for the acquisition of pressure damage and ulceration (Fowler et al, 2008). There are multiple contributing and confounding factors that affect the skin integrity of the foot, including comorbidities, disease processes and lifestyle choices (Bateman, 2013a; Vowden and Vowden, 2013).

When the tissue of the foot is compressed between a bony prominence and a hard surface

– such as the floor or a footstool – reduced skin integrity and the formation of pressure, friction and shear damage can occur, particularly when the normal capillary pressure of 32mmHg is exceeded, which increases the risk of impaired tissue perfusion (Walton-Geer, 2009). In clinical practice, patients are often seen seated with their heels resting on hard surfaces, such as non-pressure dispersing footstools, chair edges and bedside table bars, increasing the risk of pressure ulcer formation or deterioration (Bateman, 2013b).

A large-scale study undertaken by Jordan and Clark in 1977 demonstrated that seated patients had a much higher incidence of heel and ankle tissue damage from pressure, shear and friction compared to bedbound patients. Huber (2013) advocated the use of pressure redistributing devices in the operating theatre environment as a means to reduce avoidable harm to the heel and malleolus.

**AIM**

A decision was made to evaluate the impact of introducing a redistribution foam to use on hard surfaces for the feet of patients at risk of lower-limb ulceration within a large teaching NHS Foundation Trust.

The Devon™ Disposable Foam mat (Covidien; *Box 1*) was selected due to the range of supporting evidence available for the product's redistribution properties, tissue protection and comfort, alongside the fact that it is used within several theatre departments nationally for a range of applications (Shelanski and Holley, 2009; Huber, 2013).

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**METHOD**

The 2-month evaluation took place in the hospital's elderly care, respiratory and orthopaedic wards, due to the increase in incidence of lower-limb pressure damage, and generally low Braden score in these settings.

Patients able to sit out of bed who met one or more of the following criteria were recruited via referral to the Trust's acute wound care service:

- ▶▶ Presence of blanching erythema to the foot.
- ▶▶ Presence of category I–IV pressure damage to the foot.
- ▶▶ Diagnosis of diabetes or vascular insufficiency (with or without skin damage).
- ▶▶ Presence of any other foot/ankle tissue damage of any aetiology (e.g. trauma, burns).
- ▶▶ A Braden score of ≤18 (Bergstrom et al, 1987).

Patients with intact skin to the foot, or who had no diagnosis of diabetes or vascular insufficiency, or a Braden score >18 were excluded.

Verbal explanation of the rationale for the evaluation was provided to all participants and consent was received and documented in the medical notes. Ward staff were also informed and educated about the device and the purpose of the evaluation. As this device is used within the Trust for redistribution of pressure areas as normal practice, patients were informed in depth as to its benefits, and consent was gained as with any device, dressing or intervention in any care package. The evaluation was agreed by procurement and senior nurses, which includes ethical approval, results dissemination and publication.

**Box 1. Clinical properties of the Devon™ foam redistribution device (Covidien, 2012).**

- ▶▶ Reduce interface pressure, friction and shear.
- ▶▶ Reduce the risk of pressure sores and nerve damage while maintaining proper circulation.
- ▶▶ Comprehensive positioning products range provides protection and support for all recognised pressure points, including the sacrum and heels.
- ▶▶ Provide the ideal combination of exceptional stability and cushioning.
- ▶▶ Non-toxic, firm density foam.
- ▶▶ Non movement on wipe clean surfaces, such as the floor and footstool.
- ▶▶ Easily transported, adaptable and cost effective as single patient use.

In accordance with local Trust policy, and in order to minimise harm from infection and falls, appropriate information was provided in regards to correct use and disposal of the single patient device. Two foam pads were provided to each participant so that if one needed to be disposed of, the other could be used to continue pressure redistribution uninterrupted. Patients were also provided with a copy of the risk alert form (*Box 2*).

The patients were advised to have bare feet or fabric coverings to their feet while using the device (dressings, bandages, socks or tights). Hard footwear was not advised.

Patients' existing care packages (e.g. dressing regimen, physiotherapy, etc) were not changed, except for the addition of the redistribution device. The following aspects of patients' foot status were recorded by the lead wound care nurse for the duration of the evaluation period:

1. Surface being used by the patient (i.e. floor, footstool, or both).
2. Continuous daily monitoring of Braden risk score, pressure ulcer category and tissue status.
3. Patient experience in regards to comfort and ease of use.
4. Patient mobility status.
5. Ability to undertake usual physiotherapy with the foam pad in position.
6. At the end of the evaluation, both patients and physiotherapists were asked if they would chose to use the device in future care settings or not.

Assessment was for a period of 2 months, or until discharge, whichever came first.

**RESULTS**

The patient demographics at baseline are summarised in *Table 1*.

The 50 patients evaluated were the first 50 who were referred to the wound care service by the respective clinical areas that met the criteria, and all 50 patients agreed to participate. There were no patient refusals and no patients stopped using the device. One woman said it made her feet warm but that was the only comment and she chose to continue with the device.

All 50 patients continued to use the redistribution device as part of their care package. The device was replace when soiled.

**Box 2. Risk alert form.**

**DEVON (PINK FOAM) PRESSURE REDISTRIBUTION DEVICE**

From 1 January 2014, the Devon Redistribution foam device (pink foam pad) will be made available for ordering via Cardea. This is for patients who have:

- ▶▶ Risk of ulceration (Braden score of ≤18).
- ▶▶ Chair bound/reduced mobility status.
- ▶▶ Pressure ulcer to the foot.
- ▶▶ Diabetic lesion to the foot.
- ▶▶ Vascular lesion to the foot.
- ▶▶ Diabetic/vascular skin intact, but at risk.

**Staff must follow the following:**

- ▶▶ Devices to be used on floor/footstool only.
- ▶▶ Devices must be disposed of immediately when soiled/wet/damaged.
- ▶▶ Single patient use only and to be labelled for each patient with a permanent marker on the device base.

**Contact: Lead Nurse, Wound Care**

*“There was no deterioration to those with category IV pressure ulcers, diabetic and vascular lesions.”*

Table 1. Patient characteristics (n=50).

Male: female (n)	31: 19	
Age (years)	34–93	mean 72
<b>Foot status</b>		
Braden score	7–21	mean 14
Intact foot tissue	n=10 (20%)	
Blanching erythema	n=10 (posterior 7, malleoli 3)	
Pressure ulcer category and location:		
1	n=12 (24%; posterior 7, malleoli 5)	
2	n=5 (10%; posterior 5)	
3	n=4 (8%; posterior 2, malleoli 1, elbows 1)	
4	n=3 (6%; posterior 2, malleoli 1)	
Diabetic ulcer	n=3 (6%; plantar 3)	
Vascular ulcer	n=3 (6%; malleoli 3)	
<b>Foot contact surface</b>		
Floor only	n=34 (68)	
Bed and footstool only	n=1 (2%)	
Floor and footstool only	n=14 (28%)	
Table (elbows) only	n=1 (2%)	
<b>Other interventions</b>		
Physiotherapy	n=42 (84%)	

A total of 40 patients had some form of foot skin integrity impairment at the beginning of the study.

One female patient wished to use the product under her elbows when resting upright on a table, as well as for her feet. She had bilateral category III pressure ulcers to her elbows from propelling herself upright on hard surfaces to aid breathing as a result of chronic obstructive airways disease.

Many of the patients automatically gripped the foam with their toes and felt using the foam encouraged them to move their feet (Figure 1). Evaluation data at the end of the 2-month period are summarised in Table 2 and Box 3.



Figure 1. Many patients automatically gripped the foam with their toes.

The results of the evaluation were positive with a large majority of the patients' pressure ulcers either reaching full epithelisation or were healing with evidence of wound bed depth, width and length reduction, at the end of the 2-month period.

Data in Table 2 suggest that those patients who healed or did not deteriorate were those with category I or II pressure ulcers or blanching erythema at baseline. In addition, there was no deterioration to those with category IV pressure ulcers, diabetic and vascular lesions, despite a Braden score below 10 which indicates they were at high risk. These results suggest that by implementing a device such as the Devon redistribution foam, both prevention and protection mechanisms may be promoted within the holistic care package.

There were no interruptions to the 42 patients undertaking physiotherapy, with the foam remaining *in situ* throughout interventions; both patient and physiotherapist comments suggested that they would use the device in future.

The allied healthcare professionals' positive comments related to the ease of physiotherapy standing exercises while on the foam, for those who it was deemed appropriate, with little disruption to the patient and that they witnessed independent regular foot and toe movement while the patient was sitting with no prompt from staff.

Positive themes that emerged from the evaluations related to comfort of the product, stability when on floor and stool surfaces, ease of transferability from surfaces due to its lightweight and the tactile surface it provided which appeared to encourage patients to mobilise toes and heels whilst placed upon it. One young male patient suggested that the colour could be varied as the pink hue was not to his taste, however. This has been fed back to the company provider as a patient directing future product manufacture.

Although the evaluation was extremely positive, there was an incident where when removing the product too early may have resulted in a pressure ulcer that was deemed to be healing, deteriorating from a low category to a high category.

**Poor outcome**

One male patient who presented with a category II pressure ulcer used the foam within the care setting for a total of 14 days when his ulcer was

deemed to have epithelialised and, therefore, required no further dressings. At this time, the redistribution foam was also discontinued as part of the whole package of care. Four days after the discontinuation of the dressing regimen and foam, the patient was assessed as having a sloughy 4mm deep cavity to the calcaneus and diagnosed with a category III pressure ulcer.

Due to the patient having a sudden medical deterioration, his risk had increased, with a reduction of Braden score from 14 to 8 as a result of dehydration and his acutely confused state, and his independent mobility status had reduced with increased dependence upon clinical staff. Although the clinical status of the patient may have contributed to the increased risk of heel deterioration, pressure redistribution devices should not suddenly be removed and a downgrading of equipment must be put in place to reduce the risk of further pressure damage occurring (Rycroft-Malone, 2001). Within the evaluation, those patients whose risk increased while on the redistribution device, particularly

**Table 2. Skin integrity results.**

	Baseline (n)	Evaluation end (n)	Improvement
Braden score (range)	7–21	9–21	No change
Foot tissue intact	10	10	No change
Blanching erythema	10	0	100%
Pressure ulcer category			
1	12	0	100%
2	5	1	80%
3	4	4 epithelialising	100%
4	3	2 epithelialising	66%
Diabetic ulcer	3	3	No change
Vascular ulcer	3	3	No change
Physiotherapy	42	42	100% compliant

those with diabetes and vascular insufficiency did not deteriorate further.

From a clinician perspective, this incident was alarming, but from a patient and carer perspective this was absolutely catastrophic and added to his already critical status. For those patients who are ill and already compromised, the additional pain and suffering associated with heel ulceration should never be underestimated (Harding, 2013).

From an organisational perspective, the acquisition of a high-category ulcer resulted in a serious untoward incident being generated, resulting in a full root cause analysis and lessons to be learned action plan. The mean cost of the incident was £10000 (DH, 2010). It is clear that education and continuing staff support within any implementation process is absolutely key to maintaining patient care packages and promoting the understanding of prevention, as well as cure within the management of skin integrity.

**CASE STUDY**

A male patient, 43 years old with a Braden assessment of 16, presented with deroofed bilateral category II pressure ulcers to the heels. Cause of ulceration was attributed to friction and shear from footwear. Although the patient did not complain of pain, soiled footwear, there were concerns about infection, wound deterioration and general lower limb aching. The patient was admitted via A&E to control unstable diabetes. He had been diagnosed with associated peripheral neuropathy 18 months previously and had a

**Box 3. Feedback results.**

When asked “Would you use this device in future care?”, 50 (100%) patients and 32 (100%) physiotherapists answered “yes”.

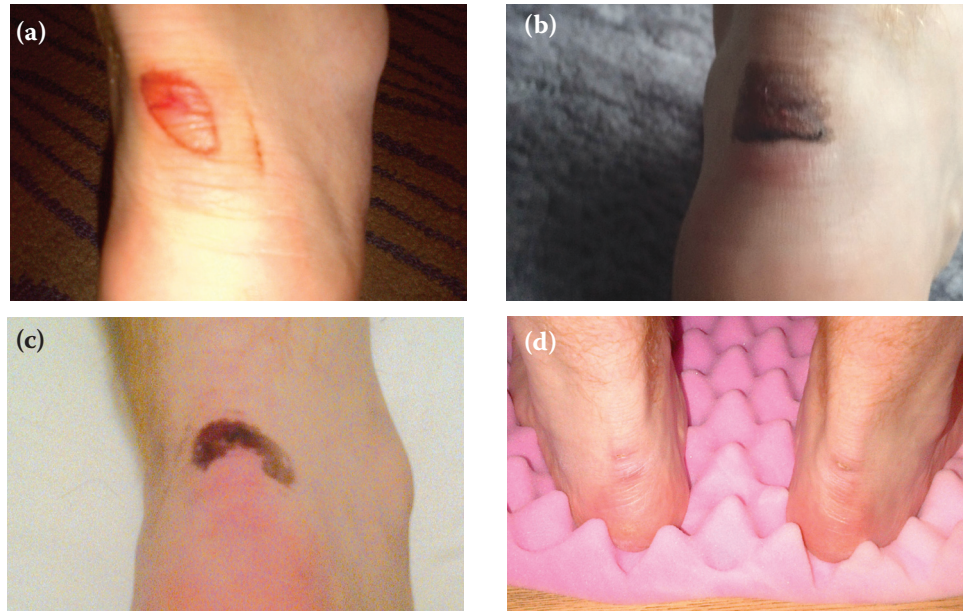
Patient comments included:

- ▶▶ “Comfortable.”
- ▶▶ “Soft.”
- ▶▶ “Can rest feet easier on footstool – no slipping off.”
- ▶▶ “Keeps my feet warm.”
- ▶▶ “Not heavy to move from floor to stool.”
- ▶▶ “Reminds me to put my feet flat on the floor.”
- ▶▶ “I think they need to do blue for a man – it’s a bit of a girly colour.”

Physiotherapist comments included:

- ▶▶ “We really like this foam, it stays put on the floor and patients find it easy to stand directly upon it so there is no break in their foot protection.”
- ▶▶ “When can we have these regularly? I have several patients who would benefit from the foam.”
- ▶▶ “The foam appears to act as a reminder to the patient to keep moving their feet which can only be a good thing. Independent pressure relief (of the patient moving and lifting their feet) is something we all strive for in our patients’ management regimen.”

*“The cost benefit of the device was agreeable from a procurement perspective.”*



**Figure 2. Case study. a) Presentation with deroofed category 2 ulcers. b) All signs of erythema resolved by day 3. c) By day 7, ulcers had reduced in size. d) Both pressure ulcers had reached the epithelialisation stage at day 14.**

history of low grade pressure ulcers over the previous 10 years. Written consent was obtained for photograph publication.

On initial presentation (*Figure 2a*), the patient's heels demonstrated deroofed category II pressure ulcers with a granular base, minimal maceration, moderate haemoserous exudate and no malodour. The dressing regimen consisted of saline cleansing, and application of a soft silicone adherent border, which was renewed every 48 hours while in the evaluation process. The Devon™ foam device was introduced immediately following assessment and was used on the floor when seated and the foot stool.

By day 3 (*Figure 2b*), there was minimal haemoserous exudate and all signs of erythema had resolved. As the granular base had become less moist a basic silicone adhesive film was utilised which allowed the wound bed to be viewed.

On day 7 (*Figure 2c*), both pressure ulcers had reduced in overall size by 60% with signs of epithelialisation and a dry intact wound bed, thus no further dressings were required.

By day 14 (*Figure 2d*), both pressure ulcers had reached the epithelialisation stage and the patient was discharged from the evaluation, although

the patient chose to continue to utilise the foam redistribution device while seated even within the home environment.

Although the product is not recommended for mechanical cleansing, and soiled products are normally disposed of in accordance with local clinical waste policy, the patient washed the foam at 60 degrees with a mild detergent in a washing machine with no change to the product or its density. The product was still in use 4 weeks following discharge with a weekly wash.

#### **COST ANALYSIS OF IMPLEMENTATION**

There were no initial financial costs as all evaluation products were provided at no charge. The cost of the redistribution device agreed via supply chain is approximately £3 per unit. The Trust's alternative product is a non-disposable gel foot rest, costing upwards of £60 and requiring decontamination after each use. The cost benefit of the device was agreeable from a procurement perspective.

Using the productivity calculator (DH, 2010) to analyse mean costing of pre- and post-evaluation pressure ulcers, the financial burden difference was significant in regards to the relevant 24 patients within this group. The one patient who

deteriorated added unnecessary costs to the overall expenditure (Table 3).

Additionally, at baseline a total of 10 patients who presented with blanching erythema who did not go on to develop any pressure ulcers despite their high Braden risk which is a welcome change, as in clinical practice it is commonly these patients who do deteriorate if pressure is not redistributed appropriately (Kozier et al, 2008). If these 10 patients went on to develop non-blanching erythema, the cost to the organisation would have immediately been approximately £10000, rising to £60000 if category I or II pressure ulcers had developed.

### RECOMMENDATIONS FOR PRACTICE

Due to the success of the evaluation, the organisation has implemented a change in practice which follows the route of alerting risk (Box 2) alongside both Trust and manufacturer’s short training across all clinical areas where the foam would be utilised. It was considered absolutely vital to ensure that all healthcare workers utilised the product safely and continued to use the product as a preventative measure. A cost-effective bulk buy ensured that the product was always available in ward areas to ensure timely deployment. The wound care service skin integrity task team will continue to evaluate the product in clinical areas to ensure that complications are kept to a minimum and to collect and analyse further data to enable sharing of this change in practice.

### CONCLUSION

Prevention and appropriate, timely management is essential in reducing patient harm and unnecessary costs. Individual clinicians need to make sensible and informed choices about intervention and management, utilising guidelines and adhering to policy (Harding, 2013). Working closely with procurement and industry colleagues will promote the best care and products for patient care. Sharing changes in practice is essential to achieve consistency locally and nationally.

The implementation and evaluation of a traditional theatre only device such as the Devon redistributing foam within the wider clinical environment described here suggests a role for the product in enhancing patient comfort and protection, and offers an alternative pressure

**Table 3. Pressure ulcers cost analysis.**

Pressure ulcer category	Baseline		Evaluation end			
	(n)	Cost (DH, 2010)	Healing (n)	Static (n)	Deteriorated (n)	Cost (DH, 2010)
1	12	£18 000	12	0	0	0
2	5	£30 000	4	0	1	£10 000
3	4	£40 000	4	0	0	0
4	3	£43 000	2	1	0	0
Total	24	£131 000	22	1	1	£10 000

redistribution surface with a prevention element to the seated patient – a much needed innovation in the quest to reduce pressure ulcer incidence and tissue deterioration, safeguarding those patients within our care. WUK

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