Using heel protectors for the prevention of hospital-acquired pressure ulcers

ABSTRACT

Pressure ulcers are a frequent, but often preventable, occurrence among patients in acute care facilities, and the heel is one of the anatomical locations most commonly affected. Multiple clinical guidelines recommend the use of robust assessments to identify at-risk patients and the application of heel protection devices to reduce the likelihood of developing heel pressure ulcers. A quality improvement initiative involving robust skin-assessment practices, staff education, and the use of heel protection devices was analysed retrospectively to evaluate the efficacy of current practice interventions. These analyses revealed that the incidence of heel pressure ulcers was inversely correlated with the number of heel protectors used at two large acute NHS teaching hospitals in inner London, and that the consistent and early use of heel protectors improved patient outcomes and reduced costs of care.

Key words: Pressure ulcers ■ Healthcare costs ■ Retrospective studies ■ Prevalence ■ Quality improvement

The incidence of hospital-acquired pressure ulcers among patients in the UK and Europe is high, costly, and persistent, despite the fact that most hospital-acquired pressure ulcers are believed to be preventable (Guy et al, 2013).

In view of this, the authors conducted a retrospective analysis, looking at heel pressure ulcer incidence after quality improvement initiatives at two large acute NHS trusts. The initiative included the use of robust skin assessment, staff education and the use of a heel protection device.

Background

Scale of the problem

Skin breakdown occurs most often in regions of skin covering a bony prominence, and the heel is often affected (Fowler et al, 2008; National Pressure Ulcer Advisory Panel (NPUAP) et al, 2014). Heel pressure ulcers are associated with increased risk for pain, reduced mobility, local and systemic infections, renal and multi-organ failure, limb loss, and death (Tenenbaum et al, 2013). Heel pressure ulcers are also associated with increased healthcare costs. Published estimates of the mean costs for treating pressure ulcers in the UK range from £1214 for a category 1 pressure ulcer to £14 108 for a category 4 pressure ulcer (Dealey et al, 2012).Cost can increase with the pressure ulcer severity and the incidence of complications such as critical colonisation, cellulitis and osteomylitis (Dealey et al, 2012).

Understanding of the aetiology of heel pressure ulcers has improved in recent years, and equipment to prevent their occurrence is widely available. However, the prevalence of hospital-acquired pressure ulcers (greater than category I) in patients in acute hospital settings in Europe and the UK has been reported to be 10.5%, and it has been reported that only 9.7% of eligible patients receive adequate preventative care (Vanderwee et al, 2007). NPUAP et al (2014) highlighted that in the literature between 2000 and 2012, there was a pressure ulcer incidence ranging from 0% to 12% in acute care and from 3.3% to 53.4% in critical care.

Large-scale prevalence data have revealed that among patients with hospital-acquired pressure ulcers, the heel is affected in 23.7% of cases in acute care facilities and 22.9% of those are in long-term care (Vangilder et al, 2008). Furthermore, a study of hospital-acquired pressure ulcer incidence revealed that the heel was the most common anatomical location to acquire a pressure ulcer after admission to a care facility (Whittington and Briones, 2004).

Evidence-based strategies for preventing heel pressure ulcers have been published and multiple risk-stratified interventions are required. Of particular importance is the appropriate use of pressure offloading devices (Cuddigan et al, 2008; Institute for Healthcare Improvement, 2011; NPUAP et al, 2014). Devices designed specifically to redistribute pressure at the heel are preferable to pillows or air mattresses because incidental movement by the patient can quickly render pillow positioning ineffective, or even increase pressure on the heel. Heel protector boots, an example of which is shown in *Figure 1*, have key advantages over pillows because boots are more likely to stay in place, and can help prevent foot-drop by supporting the foot in a neutral position (Junkin and Gray, 2009).

Evidence-based heel pressure ulcer prevention

Evidence-based prevention of heel pressure ulcers requires an understanding of the pathophysiology of pressure-related breakdown and risk factors associated with development.

The development of pressure ulcers results from sustained pressure, including shear, that causes localised injury to the skin and underlying tissue (NPUAP et al, 2014). The risk of developing heel pressure ulcers is increased by the

Kumal Rajpaul, Consultant Nurse, Kings College Hospital NHS Foundation Trust

Claire Acton, Clinical Lead and Tissue Viability Nurse Manager, Guy's and St Thomas' NHS Foundation Trust

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Sage Prodcuts

Figure 1. An example of a heel protector

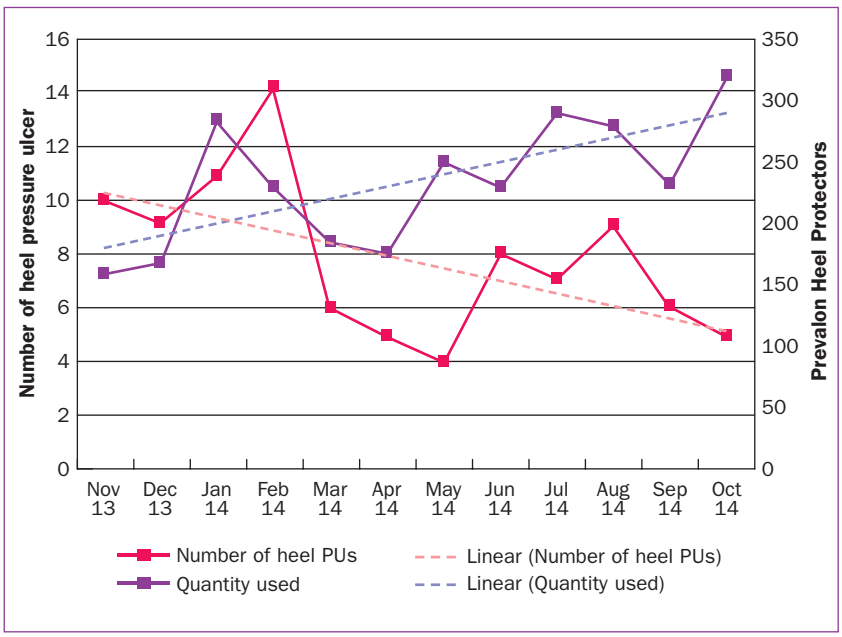

Figure 2. King's College Hospital—number of heel pressure ulcers and number of heel protectors used

pressure to the soft tissues of the posterior portion of the heel resulting from patients lying in a supine position for extended periods of time (Tenenbaum et al, 2013). A study published in 2011 that used computer modelling to demonstrate the vulnerability of the heel to pressure ulcers found pressure-related breakdown is also influenced by the stiffness of the support surface (Sopher et al, 2011).

Risk factors shown to be associated with the development of heel pressure ulcers include multiple comorbidities such as diabetes mellitus, vascular disease, stroke, and end-stage renal disease, as well as patient-specific factors such as advanced age, sensory deficit, spinal cord injury, immobility, obesity, and poor nutrition (Fowler et al, 2008; Delmore et al, 2015; Hanna-Bull, 2016).

Current guidelines suggest conducting a structured risk assessment at the time a patient is admitted to an acute hospital, or as soon as feasible, to identify patients at risk of pressure-related breakdown. Such risk assessments should assess multiple factors, including patient mobility, perfusion and oxygenation status, as well as skin health. Following risk assessment, risk specific interventions should be implemented for pressure ulcer prevention (NPUAP et al, 2014). Follow-up assessments should be repeated daily where clinically indicated (Cuddigan et al, 2008; Institute for Healthcare Improvement, 2011).

Methods

Two retrospective analyses were conducted in two acute care hospital settings in different trusts, with the aim of evaluating the efficacy of a heel protector device used as part of a quality improvement intervention for heel pressure ulcer prevention. In addition, the cost saving of heel protector devices was calculated.

Quality improvement interventions

The quality improvement intervention at both King's College Hospital NHS Foundation Trust and Guy's and St Thomas' NHS Foundation Trust included the use of heel protector boots as part of a risk-stratified intervention. Patients were selected for the intervention based on the clinician's judgement. At both facilities, clinicians were educated on the importance of heel pressure ulcer prevention and how to appropriately use and apply heel protector boots.

Clinical inclusion criteria differed by facility. At King's College Hospital NHS Foundation Trust, clinical inclusion criteria included: if they were heavily sedated or unconscious, were postoperative and met the other inclusion criteria or were immobile; diabetic, vascular, or renal disease; large, oedematous, contracted or cachexic limbs; any heel tissue breakdown, blistering, or ulceration; necrotic feet; risk of tissue damage to heels, ankles, or foot borders; stroke; or other high-risk conditions. At Guy's and St Thomas' NHS Foundation Trust, the goal was use of heel protectors when skin damage was first noted at an early stage. Clinician education was a large part of the quality improvement intervention with a focus on identifying tissue damage at an early stage.

Analysis

King's College Hospital NHS Foundation Trust

The retrospective analysis compared the use of heel protectors to the incidence of hospital-acquired heel pressure ulcers over a 12-month period from November 2013 to October 2014. Audit data for the analysis were obtained from an online reporting and monitoring system. The data were cross-referenced and verified against the monthly incidence data for hospital-acquired pressure ulcers. The analysis compared the number and severity of hospital-acquired heel pressure ulcers developed to the

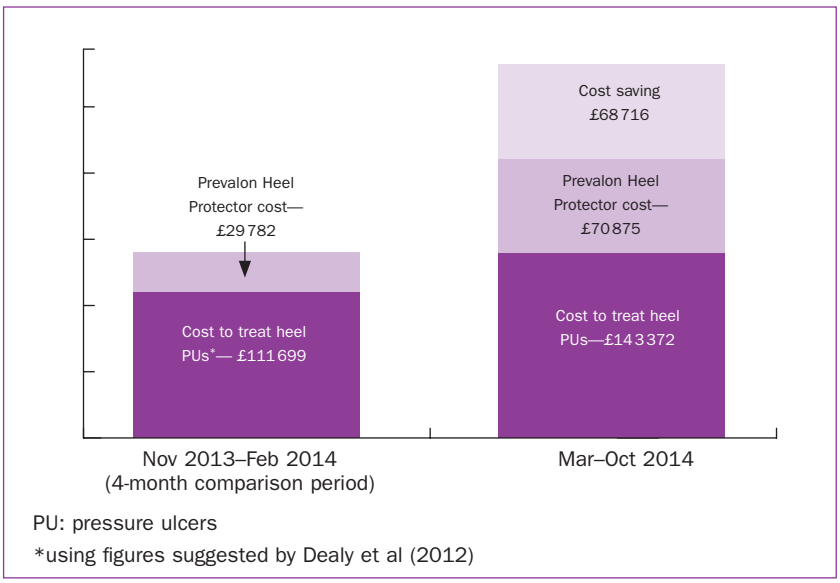

Figure 3. King's College Hospital cost saving comparing 4 months with 8 months

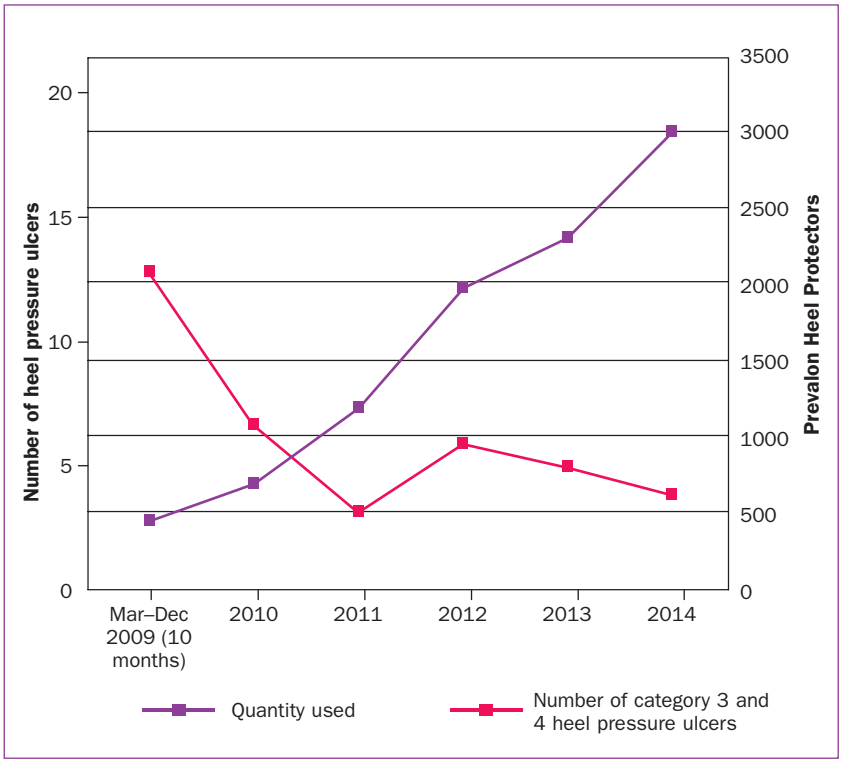

Figure 4. Guys and St Thomas' Hospital: Heel protector use and category 3 and 4 heel pressure ulcers

number of heel protectors being used in the trust. The analysis included heel pressure ulcers in categories 1 to 4.

The cost saving was calculated by using published estimates of the costs of treating pressure ulcers in the UK ranging from £1214 (category 1) to £14108 (category 4) (Dealey et al, 2012) and the cost of the Prevalon® Heel Protector manufactured by Sage Products LLC.

Guy's and St Thomas' NHS Foundation Trust

This retrospective review used audit data from an electronic reporting and monitoring system from 2009 to 2014. Pre-intervention (2009) and post-intervention (from January 2010 to December 2014) incidences of category 3 and 4 heel pressure ulcers were compared before and after the quality improvement interventions. The incidence of hospital-acquired heel pressure ulcers, the number of heel protectors, and the cost saving were calculated over a 5-year period.

Results

King's College Hospital NHS Foundation Trust

The review of data at King's College Hospital NHS Foundation Trust over a 12-month period from November 2013 to October 2014 revealed an inverse relationship between the numbers of heel protection devices used, which increased nearly twofold during the study period, and the number of heel pressure ulcers recorded, which decreased by an average of 43.18% over the same period of time (*Figure 2*). In addition to the observed decrease in hospital-acquired heel pressure ulcers, the increased use of heel protectors was associated with treatment cost savings of £68716 in the last 8 months (March to October 2014) of the quality improvement period examined. This was compared with the first 4 months (November 2013 to February 2014) of the evaluation being used as a baseline (*Figure 3*).

Guy's and St Thomas' NHS Foundation Trust

The analysis of audit data at Guy's and St Thomas' NHS Foundation Trust over the 5-year period from 2009 to 2014 revealed a similar inverse relationship between heel protector use and incidence of category 3 or 4 heel pressure ulcers (*Figure 4*). The number of serious heel pressure ulcers The number of stage 3 and 4 pressure ulcers fell from a high of 13 during the last 10 months of 2009 to no more than 6 per year over the final 3 years covered by the analysis, demonstrating a sustained 67% reduction. Over the same 5-year period, the number of heel protectors used rose from 448 to 3008. In addition to the reduction in total numbers of heel pressure ulcers reported over the study period, there was also a dramatic reduction in the most serious, category 4 heel pressure ulcers from 12 in the first 10 months, to three category 4 heel pressure ulcers over the last 4 years (*Table 1*). These reductions in the incidence and severity of heel pressure ulcers were concurrent with an increase in patient acuity within the Trust, according to skin assessments conducted on all patients on admission and throughout their hospital stay. This further supports a correlation between heel protector use and the prevention of hospital-acquired heel pressure ulcer in addition to relevant training and education for health professionals.

Using hospital treatment costs of £9041 per category 3 heel pressure ulcer and £14108 per category 4 pressure ulcer (Dealey et al, 2012), the cost saving for the quality improvement intervention was calculated to be £294964 over the 5-year period examined (*Figure 5*).

Discussion

These retrospective analyses indicate the quality improvement initiatives implemented at two separate facilities were successful in reducing the incidence of heel pressure ulcers. This reduction in heel pressure ulcer

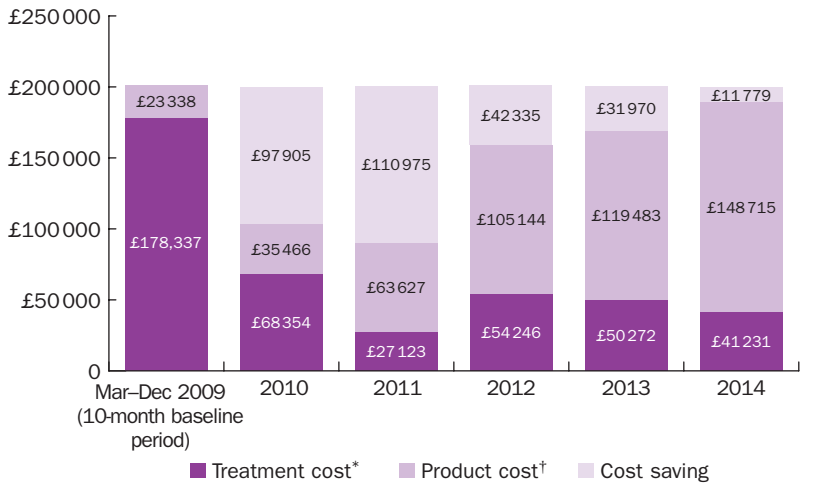

Figure 5. Guys and St Thomas' costs saving

incidence resulted in increased quality of care, improved patient outcomes, and greater cost efficiency.

Important factors in the success of this quality improvement initiative were robust assessments that allowed skin damage to be noted at an early stage, as well as the provision of suitable evidence-based education to staff. The initiatives also required changes in clinical practice to use the heel protectors in high-risk patients and at an earlier stage in the presence of non-blanching erythema (category 1) following individual patient assessments. Previously the practice had been ad hoc usage of heel protectors or pillows used for heel offloading.

The education and training of health professionals in the recognition, prevention, treatment and management of heel pressure ulcers is essential to reduce the risk of avoidable harm to patients. Investing funds into appropriate devices as part of a comprehensive strategy for risk-stratified prevention is important to ensure effective pressure ulcer prevention.

Several published guidelines for the prevention of pressure ulcers recommend the use of pressure-offloading devices, such as heel protectors (NPUAP et al, 2014). Characteristics desirable in heel protectors include the ability to elevate the heel off the support surface, decrease friction and shear on the skin of the heel, maintain visibility of the heel when the device is on, reduce pressure on the Achilles tendon, accommodate other tubing and other medical devices, and prevent hip and knee rotation (Junkin and Gray, 2009). Another important consideration when choosing a heel protector is its ability to maintain grip of the limb (Salcido et al, 2012).

Recovery from heel pressure ulcers is difficult and costly, with prolonged hospital length of stay, and inconsistent treatments between institutions (Stuart et al, 2008). At the prices in 2000, pressure ulcers were estimated to cost the NHS £1.4 billion to £2.1 billion a year to treat (Bennett et al, 2004), 4% of total NHS expenditure at that time. Updating the costs to 2011 prices, Dealey et al (2012) estimated that care of pressure ulcers could cost a single institution in the region of £3.36 million a year, making reduction of pressure ulcers a key financial as well as clinical consideration.

KEY POINTS

- A retrospective analysis was undertaken after the implementation of a quality improvement initiative for the prevention of heel pressure ulcers using risk and skin assessment at two NHS trusts
- A heel protector can be a useful tool in the prevention, management and treatment of heel pressure ulcers
- This quality improvement initiative required changes to clinical practice to utilise the heel protectors in high-risk patients at an earlier stage in the presence of non-blanching erythema
- Education and training of health care practitioner in the recognition, prevention, treatment and management of heel pressure ulcers is essential in the prevention of avoidable harm to patients

Conclusion

Evidence-based best practice for heel pressure ulcer prevention should be implemented as soon as initial risk assessment is undertaken to ensure patient safety and improved outcomes. These successful quality improvement outcomes were the result of in-depth education to heighten clinician awareness of the importance of implementing risk-stratified pressure ulcer interventions and how to identify patients who would most benefit from these interventions. In addition, clinical leadership supported investing in heel protector boots as part of an overall pressure ulcer prevention initiative. As a result of heel pressure ulcer avoidance, patient outcomes have improved and a cost saving has been realised, making this a sustainable quality improvement initiative. **BJN**

Declaration of interest: none

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