

Heel pressure ulceration: the perennial clinical and financial problem?

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Abstract

The heel of the foot is particularly susceptible to pressure, friction and shear forces. In consequence, heel pressure ulcers account for approximately 18% of all hospital-acquired pressure ulcers in England. To ameliorate the effects of friction and shear forces, the use of heel protectors made from silk-like fabric is recommended. This article outlines how one such product, the Parafricta bootee (APA Parafricta), has facilitated a reduction in heel pressure ulcer development, resulting in both time and cost savings in an acute NHS trust over the course of 8 years and thousands of patients. A cost-analysis will also be detailed to show that if the products and processes pioneered by this trust were used throughout NHS England, over £300 million in resource savings could be achieved each year.

Key words: Cost reduction; Friction; Heel pressure ulcer; Incident reduction; Shear

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Background

Unfortunately, human feet were not designed to effectively redistribute pressures exerted during activities of daily life, such as from walking, dancing (particularly in pointed-heeled shoes), or even simply lying in bed on one's back. The heel of the foot is especially unsuited to these activities and, as a result, heels are particularly susceptible to friction and shear forces. Consequently, heel pressure ulcers are the second most common pressure injury in both the UK and the United States (Vanderwee et al, 2007; Clark et al, 2017; Rivolo et al, 2020).

Shear is defined as the 'mechanical force that acts on an area of skin in a direction parallel to the body's surface' (Bergstrom, 1994). The subsequent injury—known as ischaemia, which can lead to cell death—is seen in the deeper tissues, rather than at skin level. Shear force is affected by various factors, such as the amount of pressure exerted, the extent to which the body makes contact with the surface and the coefficient of friction between the materials contacting each other (Bergstrom, 1994). In feet, shear force is created by the friction between the heel's skin and the support surface (Gleeson, 2015).

Friction, on the other hand, is the mechanical force exerted when skin is dragged across a coarse surface, such as bed linen (Bergstrom, 1994). Antekol et al (2012), suggested that friction is not a single entity, but rather can be both static and dynamic:

- Static friction (stiction): the force that resists motion between two surfaces
- Dynamic friction: the force resisting, and thus slowing down, movement between two surfaces when they are moving relative to one another, for example, by sliding.

Shear and friction are critical contributors to pressure ulceration, of which there are several categories:

- Category I: non-blanchable erythema
- Category II: partial thickness skin loss
- Category III: full thickness skin loss
- Category IV: full thickness tissue loss
- Deep tissue injury: unstageable ulcer (Fletcher and Hall, 2018; NHS Improvement, 2018a).

Evidence suggests that the combination of pressure forces and shear can cause deep tissue injuries, leading to category III or IV pressure ulcers. Meanwhile, superficial friction can cause skin lesions that resemble category II pressure ulcers (Lahmann and Kottner, 2011). To ameliorate the effects of friction and shear, the National Pressure Ulcer Advisory

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Panel et al (2014) recommend the use of silk-like fabrics for clothes and bed linen, rather than cotton or cotton blend.

Simple solutions

A number of interventions designed to prevent heel pressure ulcers are available, most of which aim to reduce or redistribute pressure. Low-pressure interventions spread the pressure over a large area, thereby reducing the effects of friction, shear or both (Greenwood et al, 2017). Off-loading devices can remove the pressure completely, while low-friction interventions, such as prophylactic dressings or booties, reduce friction and shear forces (Greenwood et al, 2017).

One such low-friction product, the Parafricta bootie (APA Parafricta), is recommended for research by the National Institute for Health and Care Excellence (NICE) (2014) to both prevent and reduce the progression of pressure ulcers. These booties have been demonstrated to be highly effective (Smith and Ingram, 2010; Stephen-Haynes and Callaghan, 2011; Schofield, 2018). Parafricta booties differ from those comprised of other materials, such as sheepskin, as they minimise the force needed to overcome the skin sticking to a surface before sliding, thereby reducing the risk of shear force (Gleeson, 2015, 2016). Other benefits of the Parafricta booties are that they are easy to don and doff, and they are designed to be washed (60°C in a domestic washing machine, 70°C for 10 minutes in a hospital laundry) and reused (NICE, 2014).

These features mean that the booties can potentially be used by patients in the community, allowing earlier discharge from hospital for patients who are at risk of pressure ulcers, but are otherwise clinically well. Early discharge has been shown to facilitate improvement in quality of life, while reducing inpatient care costs and the risk of complications (NHS Improvement, 2018b; Coffey et al, 2019). In addition, using effective pressure ulcer-reducing garments in a community setting could potentially reduce the number of patients admitted to the acute setting with an existing pressure ulcer, resulting in lower costs of nursing care, dressings and rehabilitation in both settings.

Using locally derived cost data, Smith and Ingram's (2010) study of 204 patients calculated that the savings associated with pressure ulcer prevention was approximately £63 000 per 100 at-risk patients, outweighing the cost of purchasing low-friction booties. This would be to the benefit of the patient, and could reduce both treatment- and hospital stay-associated costs to healthcare services.

Case study: St Helens and Knowsley Hospitals NHS Trust

The St Helens and Knowsley Hospitals NHS Trust, located in Lancashire, UK, has been using Parafricta booties for heel pressure ulcer prevention since 2012. Between 2012 and 2015, the trust evaluated the efficacy of the low-friction booties in patients considered at risk of heel pressure ulceration as part of an initiative to reduce friction- and shear-related hospital-acquired heel pressure ulcers. In the year before the introduction of the low-friction booties, 50 hospital-acquired heel pressure ulcers were recorded. All patients identified by the trust's protocol as at risk of heel pressure ulcers were fitted with low-friction booties. Staff were given education and training on general and heel pressure ulcer prevention and management, with a focus on the prevention of shear and friction.

The prevalence of pressure ulcers and the related costs at St Helens and Knowsley after the Parafricta bootie intervention were compared with figures from other trusts in NHS England using data extracted from the NHS (2013) Safety Thermometer and the NHS (2010) Pressure Ulcer Productivity Calculator (Department of Health, 2012; Fletcher and Hall, 2018).

The data showed that, across the NHS England acute sector over the 8-year period between 2012 (when St Helens and Knowsley adopted the Parafricta booties) and 2020, a mean average of 0.8% of all patients experienced hospital-acquired pressure ulcers classified as category II or higher. Meanwhile, the prevalence of hospital-acquired pressure ulcers at St Helens and Knowsley was 0.2%, around 75% lower than the NHS England acute sector average (Figure 1).

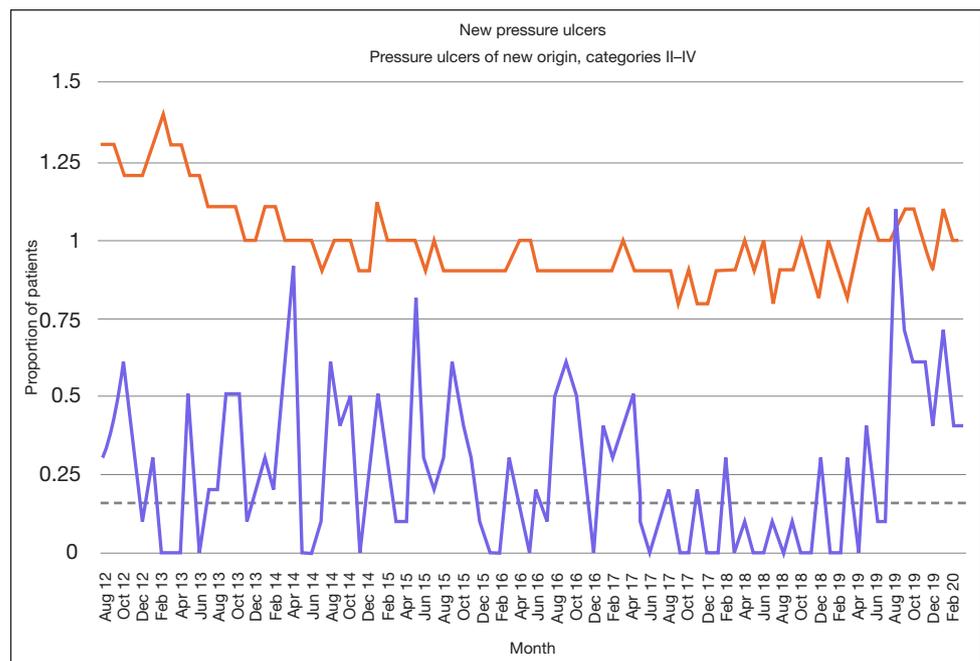


Figure 1. Total (purple line) and mean average (grey line) prevalence of hospital-acquired pressure ulcers (categories II-IV) at St Helens and Knowsley Hospitals NHS Trust, compared to the NHS England acute sector average (orange line) between August 2012 and February 2019.

Trusts belonging to NHS England receive 6 million inpatient admissions per year. Therefore, this pressure ulcer data means that 48 000 inpatients per year acquire a pressure ulcer after admission (NHS Digital, 2020). If the NHS England acute sector as a whole were to achieve the prevalence rates of St Helens and Knowsley, this figure could decline to just 12 000 patients per year, representing a reduction of 36 000 patients with hospital-acquired pressure ulcers.

Potential cost savings

The NHS (2010) Pressure Ulcer Productivity Calculator outlines the treatment cost of each category of pressure ulcer (Box 1). This enables the calculation of treatment cost savings if pressure ulcer prevalence was reduced. The weighted average cost of treating a pressure ulcer is £8835, assuming the prevalence of category II, III and IV pressure ulcers is in the ratio 65:25:10 respectively (NHS Digital, 2020).

Using this data, Table 1 shows the average NHS England acute sector annual treatment costs for hospital-acquired pressure ulcers classified as category II or higher, compared to those accrued at St Helens and Knowsley. If the average treatment costs for hospital-acquired pressure ulcers across NHS England was as low as those at St Helens and Knowsley, savings of around £318 million per year could be achieved. It should be noted that this figure does not include saved bed days, only treatment costs. However, as patients with pressure ulcers typically stay in hospital longer than those without (NHS Digital, 2020), the total savings of reducing the prevalence of hospital-acquired pressure ulcers would likely be even higher.

Box 1. Treatment costs of pressure ulcers.

- Category* II pressure ulcer: £6768
- Category III pressure ulcer: £11 231
- Category IV pressure ulcer: £16 277 (NHS, 2010).

*It should be noted that, before 2018, 'stage' was used in terminology rather than 'category'.

Table 1. Potential annual cost savings if the cost reductions achieved at St Helen’s and Knowsley Hospitals NHS Trust was achieved across the NHS England acute sector.

Category II and above annual pressure ulcer treatment costs (£ millions)		
NHS England average	St Helens and Knowsley	Annual saving
424.08	106.02	318.06

The only subjective element of the £318 million potential annual savings figure cited above is the assumed mix of category II, III and IV pressure ulcers, taken from NHS Digital (2020) data, used for the purpose of calculating their annual treatment costs. However, if the savings achieved at St Helens and Knowsley for only category II pressure ulcers were achieved across NHS England trusts, the total annual saving would still be high, at £244 million. This was calculated by multiplying the annual 75% reduction in inpatients acquiring a pressure ulcer post-admission (36000) by the £6768 average category II treatment cost.

Conclusions

After using the Parafricta booties for over 8 years, with thousands of patients, St Helens and Knowsley NHS Trust has demonstrated that effectively addressing the prevalence of heel pressure ulcers can significantly reduce the overall prevalence and cost of general hospital-acquired pressure ulcers. This, coupled with other evidence, also suggests that the Parafricta low-friction booties are both clinically and economically effective in reducing the prevalence of heel pressure ulcers. They are simple to use for clinicians, patients and carers, preventing the friction and shear forces that contribute to heel pressure ulcer development. Therefore, adopting the St Helens and Knowsley prevention and management regimen across England could potentially lead to significant patient benefits and NHS cost savings.

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Conflicts of interest

Trevor Jones and Henning von Spreckelsen are employed by APA Parafricta Limited and Parafricta International Limited (respectively), who make and distribute Parafricta low-friction booties.

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Key points

- Using low-friction fabrics to prevent and treat hospital-acquired pressure ulcers can have considerable cost-saving implications for the NHS.
- Parafricta low-friction booties have been successfully implemented in an NHS trust and resulted in a 75% lower prevalence of hospital-acquired pressure ulcers over 8 years compared to the average for NHS England.
- Using low-friction fabrics for clothes and bed linen is a cost-effective and efficacious method of reducing the burden of hospital-acquired pressure ulcers.

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