Are our mattresses too short for our beds?

The occurrence of heel pressure ulcers appear to not be reducing at the same rate as those in other anatomical locations. May this in some part be due to the standard hospital equipment (i.e. profiling bed frame and standard foam replacement mattress), in daily use in most clinical settings? In an environment where harm-free care is a major focus, it may be time to revisit the equipment that a large number of patients are cared for on.

KEY WORDS
- Foam replacement mattress
- Heel pressure ulcer
- Profiling bed

Recent publications suggest that while pressure ulcers (PUs) are reducing in number, the profile of their anatomical location appears to be changing. With the almost standard use of specialist mattresses, the damage occurring in the sacral area appears to be reducing, however, the number occurring on heels does not. Indeed, it appears to be increasing (Junkin and Grey, 2009; Leijon et al, 2013) — although this may be simply a percentage rather than numerical increase as the number of sacral ulcers reduces. In some sub-groups of patients — the critically ill, older people and those with diabetes — the heel is frequently the most common site of pressure damage. PUs to the heel have been addressed as an individual component within the most recent National Institute for Health and Care Excellence (NICE) guidelines (NICE, 2014) with the importance of offloading the heel being particularly stressed.

RISK FACTORS FOR HEEL ULCERATION

This increase in heel ulcer prevalence can be attributed to many things, including the increasing age of hospitalised patients with concomitant reduction in arterial blood supply to the peripheries (*Box 1*). However, a more preventable issue may also be playing a key role in the development of heel ulceration. Many areas are now switching their bed stock to electronic profiling bed frames. These bed frames have many advantages for patient handling and patient independence. They may also reduce friction and shear forces over the sacrum as elevation of the lower leg (or introducing the knee break) reduces the likelihood of the patient sliding down the bed.

However, widespread adoption of these frames has introduced an additional and, so far, unresolved complication. Articulating the bed frame with the patient *in situ* causes the patient's heels to move across the mattress — causing friction and shear forces. Furthermore, while it may seem strange, the articulation of the bed frame makes the bed (and mattress) shorter in proportion to the patient. This frequently results in a mattress that is so short, the patient's heels are not supported and, of even more concern, the feet are being pressed up against the rigid bed end, thus causing pressure damage (*Figures 1* and *2*).

Box 1. Factors which may increase the risk of heel ulceration.

- Poor blood supply (peripheral arterial disease, poor cardiac function, peripheral oedema)
- Lack of sensation (neuropathy, diabetes, cerebrovascular accident)
- Reduced mobility
- Increased pressure
- Lack of examination (failure to remove anti embolic stockings or compression bandages/hosiery)
- Limb size and shape
- Poor skin condition
- Poor positioning
- Poor moving and handling techniques
- Dehydration
- Certain medications, e.g. inotropes.

JACQUI FLETCHER
Clinical Strategy Director, Welsh Wound Innovation Centre, Cardiff, UK

Figure 1. Patient's feet pressed firmly against the bed frame.

Figure 2. Indentation in the foot caused by pressing against the holder of an alternating mattress pump.

Figure 3. Mattress measured when flat = 195 cm.

Figure 4. Mattress measured contoured = 186 cm.

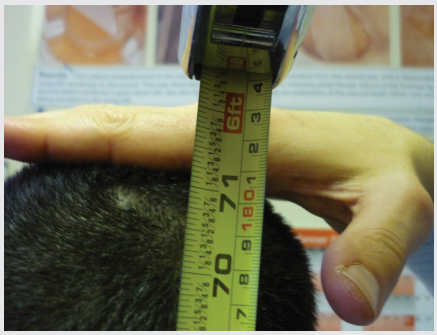

Figure 5. Man measured when standing = 181 cm.

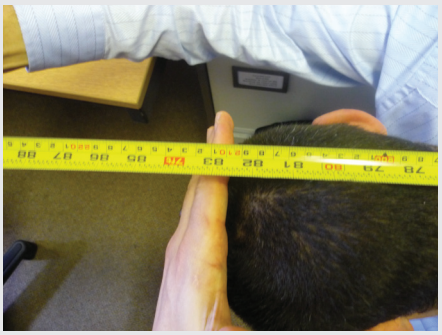

Figure 6. Man measured when reclined = 210 cm.

Current advice from the bed/mattress manufacturers is to extend the end of the bed (if necessary removing the foot of the bed) and to use a foam insert to support the heels. However, in practice this very rarely occurs. What tends to happen is that a pillow is stuffed into the gap between the end of the mattress and the foot of the bed and the vulnerable heel is deprived of any pressure redistribution properties of the mattress, whether the mattress be a good quality foam replacement or a more sophisticated system.

Despite this issue already having been raised (Fletcher, 2011), it appears manufacturers have done little to address this issue and heel damage is becoming increasingly prevalent.

Some simple observations have been recorded that may contribute to these issues. A standard hospital mattress is approximately 195 cm long when flat (see *Figure 3*). However, many are now

Figure 10. Equipment hung on the bed end potentially causing pressure damage.

used on profiling beds, which means they have to conform to the contours of the bed frame and so are no longer flat. Profiling the mattress across the curves reduces the length of the mattress (see *Figure 4*). In addition, when the bed is profiled with the patient *in situ*, because the mattress moves across the frame, the patient's heels move between 15–20cm across the surface.

Conversely, as the body profiles to the mattress it appears to become taller (see *Figures 5* and *6*). Therefore, the body may now be longer than the mattress. This means that the heels have been forced over the surface of the mattress causing both friction and shear — on average travelling 15 cm (Fletcher 2014). The patient's heels now may be over the end of the mattress and, therefore, not benefiting from any pressure-reducing properties of the equipment. The toes, midfoot or heel may also be firmly pressed against the bed end, causing additional high pressure (see *Figure 2*).

HARM-FREE CARE

With the increasing acceptance that PUs are an 'avoidable harm', it is imperative this apparently simple issue be addressed. However, this is a difficult issue to resolve; manufacturers are reluctant to make longer beds/mattresses (as they often then will not fit in hospital lifts). A separate foam section could, and is, supplied to fit in the end, but these frequently get lost.

Furthermore, as can be seen in *Figures 1* and *2*, there is not a huge gap between the end of the mattress and the foot of the bed, so staff are relied on to extend the end of the bed, which they frequently forget to do and which may compromise space in already tight bed areas. In addition, the issue of using the bed end to hang a whole variety of things on, including mattress boxes and plastic folders that hold the patients' notes, also increases the risk (see *Figure 10*). Staff can seem oblivious to this perhaps because it occurs so commonly.

The author's personal experience with patients suggests that they do not like being repositioned back up the bed as they know they will continue to slide down; whereas once their foot is secure on the bed end — they are not going anywhere! This also draws into question how effective the knee break is at reducing movement, or how effectively correct positioning is used.

CONCLUSION

This is an ideal opportunity for collaborative working between the NHS and industry, the benefits of which have been recognised both by the Department of Health (2008) and the commercial sector (Association of the British Pharmaceutical Industry, 2012). Equipment should be produced that maintains patients within a safe environment; its routine use should not compromise their care or add to their level of risk. Tissue Viability Nurses and equipment manufacturers have fought long and hard to ensure that the beds and associated equipment used by specialists is viewed exactly as that — specialist equipment — rather than furniture that serves a purely 'for sleeping on' function. Clinicians must also ensure that it causes no further harm to patients. WUK

REFERENCES

Association of the British Pharmaceutical Industry (2102) *Joint Working – A Quick Start Reference Guide for NHS and Pharmaceutical Industry Partners*. Available at: http://bit.ly/1Cmqijb (accessed 19.06.2014)

Department of Health (2008) *Best Practice Guidance for Joint Working between the NHS and the Pharmaceutical Industry*. Available at: http://bit.ly/V4BKhp (accessed 19.06.2014)

Fletcher J (2011) Do Your Mattresses Fit Your Beds? Poster presentation, *Wounds UK Conference*, Harrogate

Fletcher J (2014) Do Articulated Bed Frames Increase the Prevalence of Heel Ulcers? Poster presentation, *Wounds UK Conference*, Harrogate

Junkin J, Gray M (2009) Are pressure redistribution surfaces or heel protection devices effective for preventing heel pressure ulcers? *J Wound Ostomy Continence Nurs* 36(6): 602–8

Leijon S, Bergh I, Terstappen K (2013) Pressure ulcer prevalence, use of preventive measures, and mortality risk in an acute care population: a quality improvement project. *J Wound Ostomy Continence Nurs* 40(5):469–74

NICE (2014) *Pressure Ulcers: Prevention and Management of Pressure Ulcers. NICE Clinical Guideline 179*. Available at: http://www.nice.org.uk/guidance/cg179 (accessed 19.06.2014)