

ARTICULATED BED FRAMES AND HEEL ULCER PREVALENCE

Pressure ulcers to the heel are becoming of increasing concern; indeed, there is a section detailing specific guidance on the prevention and treatment of pressure ulcers to the heel in both the National Institute for Health and Care Excellence (2014) and National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel and Pan Pacific Pressure Injury Alliance (2014) guidelines. Although pressure damage occurs on many other areas of the body, with the sacrum being the most common, it appears that heel ulcers are becoming more prevalent and increasingly challenging to treat.

“Heels are a specifically high-risk area because of their shape and anatomy; the use of hospital equipment should not increase the risk of damage to this area.”

Heel ulcers are notoriously difficult to heal, which can make their treatment expensive. They also have a significant impact on the patient, particularly regarding mobility (Stuart et al, 2008). Therefore, there is an increasing focus on preventing heel damage, primarily by focusing on the use of add-on products, such as boots or wedges, to offload pressure to the heel, or silicone devices that redistribute the pressure. However, selection of the most appropriate device is not easy, and a systematic review of the literature by McGinness and Stubbs (2014) highlighted the need for further well-designed trials of support surfaces for pressure ulcer prevention and devices designed specifically for heel relief.

Articulating bed frames

It is the author's opinion that a crucial piece of equipment is frequently overlooked in the goal of preventing heel ulceration: the articulating bed frame. Articulating bed frames are routinely used in most acute — and some community — care settings. They were originally introduced to reduce the number of back injuries to nurses and

to help maintain patient independence (Call and Baker, 2008). Keogh and Dealey (2001), in a study on the early use of profiling bed frames, concluded that patients fared better in terms of in-bed ease of transfer and mobility independence during transfer than those nursed on an older static hospital bed frame. However, Call and Baker (2008) identified differences in the pressure profiles achieved when using different bed frames relevant to the frames' distinctive profiling mechanism — this relates both to the number of sections there are to the bed, and the direction and articulation that occurs within each section during profiling. Profiling is the movement of sections of the bed to let the patient sit upright, and/or to elevate the section behind the knees to reduce the likelihood of sliding down the bed.

The differences relating to how an articulated bed frame is constructed also affect both the friction and shear forces the patient is subjected to. This is particularly apparent in the older-style profiling beds, where a simple hinged backrest pushes the patient down into the bed. As the backrest rises, shear

JACQUI FLETCHER
Clinical Strategy Director,
Welsh Wounds Innovation Centre

increases to the pelvic region and pushes the patient's heels further down towards the foot of the bed, during which the heels are dragged across the surface and subjected to significant friction. Newer multi-section beds have a movement pattern that shifts the backrest backwards as it tilts, thus creating more space, while simultaneously moving the leg sections to reduce (though not completely eliminate) heel movement.

The bed frame and the mattress should be synergistic. To benefit the patient, the mattress must be designed to follow the action of the bed frame. Many standard foam mattresses are not able to contour, in order to follow the bed frame. Furthermore, a standard mattress is not a standard length — it is standard within a range — and neither are the bed frames. It is, therefore, important to have the correct mattress on the correct frame to ensure a good fit. Profiling of the bed frame magnifies any shortness in the mattress length, as contouring the bed frame appears to make the patient taller and the mattress shorter. This is regularly seen in practice and easily demonstrated. When beds are profiled, one of the two following situations occur:

- ▶▶ The bed platform moves away from the foot of the bed, leaving a gap that tends to get plugged with a pillow or a rolled-up blanket (*Figure 1*).
- ▶▶ The bed platform moves towards the foot of the bed, pushing the patient's feet and heels tight against the foot of the bed, along with any equipment, such as mattress pumps, that is hung from the end of the frame (*Figures 2 and 3*).

As a result, one of the most vulnerable areas of the body is either supported on an inappropriate surface (a rolled-up blanket or pillow) or is subjected to additional pressure by being pressed against the foot plate. In the author's experience, when offered repositioning up the bed, patients frequently make statements along the lines of "there is no point because, at least with my feet



Figure 1. The gap at the end of bed is filled with either a blanket or pillow.



Figure 2. As the mattress is pressed against the foot of the bed, so are the patient's feet.



Figure 3. The gap between the mattress and the foot of the bed is visible but the patient's feet are still pressed against the foot board.



Figures 4 and 5. The mattress is shown to measure 195cm in length when flat.



Figures 6 and 7. Profiling the mattress across the curves reduces its length. The contoured mattress is shown to measure 186 cm.



Figure 10. This man is shown to measure 203 cm when standing.

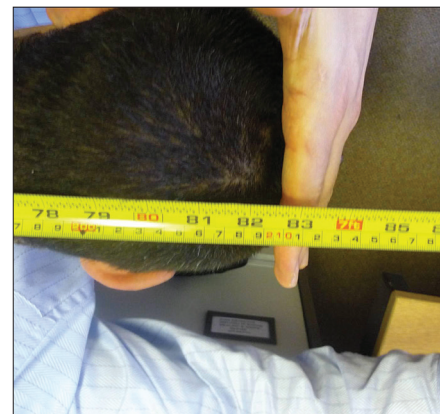


Figure 11. This man is shown to measure 210 cm when reclined.



Figures 8 and 9. The position of the tape in relation to the malleolus prior before and after contouring the bed frame illustrates how far the heels have travelled.



Figure 12. Potential damage caused by foot pressed against a mattress bracket on bed end.

against the end, I cannot slide down any further". The gap could be filled by laying the patient flat, repositioning them further up the mattress and then contouring, so at least the heels would then be on the mattress. But in this case, the head would be too high and over the mattress, which would not be comfortable. This all seems contrary because the mattress is usually significantly longer than the average patient; a standard European single mattress is approximately 200 cm in length (approximately 6.7 ft).

Although a standard hospital mattress is approximately 200 cm long when flat (Figures 4 and 5), many are used on profiling beds, which means that they have to conform to the contours of the bed frame, so they are no longer flat. Profiling the mattress across the curves reduces the length of the mattress (Figures 6 and 7).

In addition, when the bed is profiled with the patient *in situ*, as the mattress moves across the frame, the patient's heels move 15–20 cm across the surface (Figures 8 and 9). This can occur even if the knee break is used while profiling, as not all articulation beds are designed so that the centre moves apart to stop the patient's heels from sliding down.

As the body profiles to the mattress, it appears to become taller (Figures 10 and 11). 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 — and may end up over the end of the mattress. Therefore, the heels would not be benefiting from any pressure-reducing properties of the equipment being used. The toes, midfoot or heel may also be firmly pressed against the foot of the bed, causing additional high pressures (Figure 12).

Some companies are working to resolve the issue of the foam not contouring to the frame, introducing specific innovations to their designs that let the



Figure 13. Specifically placed and sized cuts in the U – Core (outside frame) of a foam mattress allow it to follow the contours of the bed frame.

Foot Inspection Guide
Check and document pressure areas at least once a day

Patient Name: _____ Date: _____

You may find it helpful to use a mirror to ensure you fully inspect the heels if the patient can not be suitably positioned.

Is there any pain or soreness? Yes No

Is there any change in the texture of the tissue e.g. boginess? Yes No

Is there thick callous present? Yes No

Have you identified a pressure ulcer? Yes No

Risk Factors: please tick those that apply

Peripheral Arterial Disease Diabetes Immobility Lack of sensation

Actions:

Mattress with heel zone Heel protection Float heels with pillows Skin care

Ipswich Touch Test Refer for further assessment e.g. ABPI Patient education

Name of clinician completing foot assessment: _____

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Figure 14. A heel assessment sheet.

mattress contour more closely to the frame (Fletcher, 2014) (Figure 13). This also seems to reduce the distance the heels travel and, therefore, the friction they are subjected to.

It is the author's opinion, therefore, that bed frames and, more specifically, their articulation or profiling may increase the risk of tissue damage to the heels. Clinicians can help to reduce this risk by following simple steps:

- ▶ Know your bed frame — actually look at the mechanism and see how it works
- ▶ Always articulate the frame by using the automatic setting if there is one — this moves the lower limb and the

back rest at the same time

- ▶ Do not use pillows or rolled-up blankets to fill the gap at the end of the bed; use appropriate fillers supplied by the mattress manufacturers. It is preferable to pull the mattress down to the foot of the bed (especially if it has a specific heel zone) and use the extra section to support the head so the heels benefit from the pressure-reducing properties in the mattress
- ▶ Always use a slide sheet under the heels when moving the patient up the bed or profiling the bed frame.

The patient's skin should be checked regularly (at least once a shift). This entails completely removing anti-embolic stockings and not simply rolling them up or down. Also remove the anti-fall socks and any specific heel device, and visually inspect the skin for signs of pressure damage. Be aware of the effects of using fitted sheets on mattresses with profiling bed frames. They can create a 'hammock' effect if pulled taut. Berry (2014) suggested that future research should focus on considering an assessment tool specific to the heel, for example the LATER framework created by Direct Healthcare Services (see <http://bit.ly/1DWpxvp>)

For some patients, the main area of risk is the heel, and they may not need a more sophisticated mattress — simply provision of appropriate heel support and good documentation of the condition of the heel and risk factors specific to it (Figure 14).

Conclusion

Heels are a specifically high-risk area because of their shape and anatomy; the use of hospital equipment should not increase the risk of damage to this area. Mattresses and bed frames should be considered as individual components but also as a composite, because they are used in conjunction in the daily care of patients. By assessing the two components together, risk can be fully assessed and appropriate actions instigated.

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