

WHAM Evidence summary: Pressure injuries: Preventing heel pressure injuries with positioning

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CLINICAL QUESTION

What is the best available evidence on positioning strategies to prevent pressure injuries (PIs) of the heel?

SUMMARY

Heel are a common anatomical location in which PIs occur. Due to their small surface area and minimal tissue protection over the bony prominence, interface pressure at the heel is high when an individual is lying in bed, particularly when that individual has reduced mobility¹ (*Level 3*). There is evidence to indicate that suspending the heels using a foam cushion block² or heel suspension boots²⁻⁴ reduces the incidence of heel PIs (*Level 1*).

CLINICAL PRACTICE RECOMMENDATIONS

All recommendations should be applied with consideration to the wound, the person, the health professional and the clinical context.

Offload the heels completely by distributing weight along the leg and positioning the knee in slight flexion (Grade A).

Offload the heels using a device specifically designed for heel elevation (Grade B).

SOURCES OF EVIDENCE

This evidence summary is based on a structured database search combining search terms that describe heel PIs with search terms related to positioning and suspension devices. Searches were conducted in EMBASE, PubMed, Medline, Scopus and the Cochrane Library. Evidence published up to June 2017 in English was considered for inclusion. The evidence in this summary and levels of evidence for intervention studies are reported in Table 1.

BACKGROUND

The heel is an anatomical location that experiences a high incidence of PIs due to its small surface area and low amount of subcutaneous tissue over the bony prominence.^{5, 6} The heel is afforded minimal protection from tissue while sustaining high levels of interface pressure,¹ particularly when the individual is in supine position. During both intended and unintended movement in a bed, the heel is susceptible to friction and shear, further increasing the risk of PI development.

Table 1: Sources of evidence and the level

Level 1 Evidence	Level 2 Evidence	Level 3 Evidence	Level 4 Evidence	Level 5 Evidence
Experimental Designs	Quasi-experimental Designs	Observational – Analytic Designs	Observational – Descriptive Studies	Expert Opinion/ Bench Research
1.b Systematic review of RCTs and other study designs ⁵ 1.c RCT ^{2,4,8,11,13,15}	2.c Quasi-experimental prospectively controlled study ¹²	3.c Cohort study with control group ^{1,6,9,10} 3.e Observational study without a control group ^{3,16,17}	4.b Cross-sectional study ⁷ 4.c Case series ¹⁴	5.b Expert consensus ⁵

Large prevalence studies have identified that the heels closely follow the sacrum as the second most common anatomical location for PIs.^{7, 8} Individuals with reduced mobility, particularly individuals who are sedated, are at the highest risk of heel PIs.^{5, 9}

CLINICAL EVIDENCE

Suspending, or “floating” the heels clear of the support surface by elevating the lower leg/calf is demonstrated to be an effective strategy to relieve pressure, shear and friction forces, thereby reducing the risk of heel PIs. There is evidence that heel interface pressures can be reduced with elastic gel mats, leg elevation devices and gel heel blocks,¹⁰ but translation to a reduction in heel PIs is not reported (*Level 3*). Evidence for effective repositioning interventions is reported below.

Heel suspension boots

Heel suspension boots designed from egg-crate foam to suspend the foot on an elevated pad within a protected boot space that extended up the lower leg were found to be effective in reducing the incidence of heel PIs. In this trial, older adults aged above 65 years who had undergone hip fracture surgery were randomised to the intervention (heel suspension boot, $n = 120$) or no heel elevation device ($n = 119$). All participants were cared for on a pressure redistribution support surface. There were no new heel PIs in the intervention group compared with 29 heel PIs (category 1 or greater) in the control group ($p < 0.001$)⁴ (*Level 1*).

Heel suspension boots designed from polyurethane foam have been trialled in older adults. The suspension boots were applied in the ambulance and worn throughout the stay in hospital. All individuals received ongoing skin and risk assessments. Heel PIs occurred less often in individuals wearing suspension boots compared to those with no heel elevation (14.6% versus 30%, $p = 0.017$)¹¹ (*Level 1*).

The results from a study¹² that compared heel suspension boots to intravenous fluid bags concurred that specially designed suspension boots are more effective (0% versus 40%, $p = 0.006$) in preventing heel PIs (*Level 2*).

An observational study found zero incidence of pressure ulcers and a 50% reduction in plantar flexion contractures in sedated individuals who wore a heel elevation boot³

(*Level 3*). A quality improvement report demonstrated that use of heel suspension boots for individuals at high risk of heel PI was associated with a 44% reduction in any heel PI and a 67% reduction in full thickness PIs over 12 months⁹ (*Level 3*).

It appears that there is no significant difference between different models of heel suspension boot for efficacy in preventing heel PIs¹³ (*Level 1*).

Foam cushions

A foam block cushion that supported the entire lower leg, thereby floating the heels, used with a second foam block that supported the feet to prevent foot drop was shown to be more effective in reducing incidence of heel PI than no heel elevation.² The participants, who were all assessed as having high risk of PI, were cared for on a water mattress. There was a significant reduction in rate of any heel PI associated with heel elevation on a foam cushion (8.6% versus 55.4%, $p < 0.0001$)² (*Level 1*).

Use of an ‘eggshell’ foam pressure redistribution mat under the feet of 50 individuals at high risk of heel and/or malleoli PIs or other types of foot ulcer was reported to have positive outcomes. Individuals with impaired skin integrity at commencement of the trial showed improvements, and no individuals developed heel PIs¹⁴ (*Level 4*).

Standard pillows

Standard pillows were found to be as effective as a heel suspension boot in preventing PIs in one small study, but the results were unreliable due to the small sample size and method of applying the heel suspension device¹⁵ (*Level 1*).

There is some evidence that a standard pillow may be unreliable in maintaining the heels in an elevated position for extended periods of time, especially in more mobile individuals, or those with dementia or agitation/leg spasms.^{3, 4} Because pillows can be easily relocated from the heels for other positioning purposes, they may also be inappropriate for use in immobile, sedated individuals¹³ (*Level 5*).

CONSIDERATIONS FOR USE

The following recommended practices should be considered when using heel suspension devices:

- Inspect skin underneath the device at regular intervals⁵ (*Level 5*).
- Ensure that a heel suspension device is not applied too tightly, or there is a risk of PIs developing as a result of device application⁵ (*Level 5*).
- Avoid using water filled gloves or intravenous fluid bags to elevate the heels as they place undue pressure on the Achilles tendon³ (*Level 5*).
- Avoid pressure damage to the Achilles tendon by elevating the entire calf⁵ (*Level 5*).
- Avoid popliteal vein compression and risk of deep vein thrombosis by positioning the knees in 5° to 10° flexion¹⁶ (*Level 3*).
- Consider the effect of the device on the skin microclimate. If the device significantly increases moisture and skin temperature it may not be appropriate¹⁵ (*Level 5*).
- Use a pressure redistribution support surface in conjunction with heel elevation⁵ (*Level 5*).

CONFLICTS OF INTEREST

The author declares no conflicts of interest in accordance with International Committee of Medical Journal Editors (ICMJE) standards.

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ABOUT WHAM EVIDENCE SUMMARIES

WHAM evidence summaries are consistent with methodology published in

Munn Z, Lockwood C, Moola S. The development and use of evidence summaries for point of care information systems: A streamlined rapid review approach, *Worldviews Evid Based Nurs*. 2015;12(3):131-8.

Methods are provided in detail in resources published by the Joanna Briggs Institute as cited in this evidence summary. WHAM evidence summaries undergo peer-review by an international review panel. More information is available on the WHAM website: <https://www.whamwounds.com/>.

WHAM evidence summaries provide a summary of the best available evidence on specific topics and make

suggestions that can be used to inform clinical practice. Evidence contained within this summary should be evaluated by appropriately trained professionals with expertise in wound prevention and management, and the evidence should be considered in the context of the individual, the professional, the clinical setting and other relevant clinical information.

PUBLICATION

This evidence summary has been published in *Wound Practice and Research*:

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