Evidence Search Service
Results of your search request

Reducing Pressure Ulcers on Heels

**ID of request:** 13393  
**Date of request:** 23rd May, 2018  
**Date of completion:** 27th June, 2018

If you would like to request any articles or any further help, please contact: Liz Wright at Elizabeth.wright@poole.nhs.uk / library@rbch.nhs.uk

Please acknowledge this work in any resulting paper or presentation as: Evidence search: Reducing Pressure Ulcers on Heels. Liz Wright. (27th June, 2018). BOURNEMOUTH, UK: East Dorset Library and Knowledge Service.

**Sources searched**
- CINAHL (16)  
- ClinicalKey (1)  
- EMBASE (2)  
- Google Scholar (2)  
- NICE Guidance (1)  
- PubMed (6)

**Date range used** (5 years, 10 years): 2012-2018  
**Limits used** (gender, article/study type, etc.): No Limits  
**Search terms and notes** (full search strategy for database searches below):

The search terms used were, Heel Ulcer, Heel, Ulcer, Reduction, Prevention, Skin Ulcer and Decubitus Ulcer. The Databases searched were, Cinahl, Embase, AMED, PubMed, Google Scholar, ClinicalKey and NICE Guidelines.

For more information about the resources please go to: [https://dorsetnhs.libguides.com](https://dorsetnhs.libguides.com).

**Summary of Results**

The results of the search show on the whole that using a protective dressing is an effective way to reduce heel pressure ulcers, as well as education and highlighting at risk patients. I have looked at articles form the last 5 years, though there are a couple from 2012. The NICE guidelines on Pressure ulcers: prevention and management (CG179) have also been included for reference.

Articles 1, 2, 12, 14, 17 and 18 advise on using prophylactic multi-layer dressings and article 18 also highlights that this results in cost saving due to the decrease in heel pressure ulcers. Article 25 is a clinical evaluation of the KerraPro Heel silicone heel pad, which advocates its use. Number
5 gives advice on the best way to apply the dressings and article 12 is a retrospective analysis of a quality improvement project on the use of heel protectors, which shows that the number of heel pressure ulcers and the cost of care within two London acute hospitals had reduced.

The next four articles 4, 9, 15 and 16, look at the use of boots and shoes. Article 4 advises the use of the Maxicare Pro evolution heel boot in rehabilitation settings for those with restricted movement. Article 9 demonstrates that focused rigid heel devices effectively reduce heel pressure in healthy individuals and could therefore be used when a reduction is pressure is required for bedbound or chair-bound patients. Article 15 states that using low-friction fabric bootee reduces heel pressure ulcers and saves money. The last of these articles, number 16 looks at the use of specialist shoes to reduce pressure in leprosy patients.

Articles 3, 7, 20 and 21 look at what the patients are laying on and how they are positioned. Number 3 highlights that custom contoured shapes are better at reducing heel pressure ulcers than planar support surfaces, 21 states that an alternating pressure mattress works well. Article 7 looks at the angle of the foot and what effect this has on the heel. The study finds that the foot being upright puts the most pressure on the heel, weight, age and BMI does not affect this, though dry skin does. 20 is a literature review regarding the use of elevation devices, it shows that there is little high quality evidence to support that the routine use of these help with the reduction of heel pressure ulcers, but advises that they do have a part to play in a multifaceted programme.

Numbers 6, 8 and 27 look at identifying at risk patients and having the correct tools to do this. Article 6 details an algorithm that has been designed to find at risk patients, article 8 states that skin assessment should start at the beginning of care and there should be appropriate tools at ward level, 27 highlights the use of mirrors and how this helps nursing staff to inspect the heel more thoroughly leading to a decrease in heel pressure ulcers.

The remaining articles are general articles on the reduction of heel pressure ulcers, with article 22 and 24 looking at the reduction in community settings. They all highlight the need for good education on pressure ulcer prevention, and multidisciplinary team approach and the need to start prevention techniques as early as possible.

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National Institute for Health and Care Excellence (NICE)
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C. Search History

A. National and International Guidance

*National Institute for Health and Care Excellence (NICE)*

**Pressure ulcers: prevention and management (CG179) (2014)**

[Available online at this link](#)

Next This guideline covers risk assessment, prevention and treatment in children, young people and adults at risk of, or who have, a pressure ulcer (also known as a bedsore or pressure sore). It aims to reduce the number of pressure ulcers in people admitted to secondary or tertiary care or receiving NHS care in other settings, such as primary and community care and emergency departments.

B. Original Research

1. **Do Prophylactic Foam Dressings Reduce Heel Pressure Injuries?**
PURPOSE: The purpose of this evidence-based report card is to examine the evidence and provide recommendations related to the effectiveness of prophylactic foam dressings in reducing heel pressure injuries. QUESTION: Do prophylactic foam dressings applied to the heel reduce heel pressure injuries for patients in the acute care setting? SEARCH STRATEGY: A search of the literature was performed by a trained university librarian that resulted in 56 articles that examined pressure injury, prevention, and prophylactic dressings. A systematic approach was used to review titles, abstracts, and text, yielding 13 studies that met inclusion criteria. Strength of the evidence was rated based on the methodology from Essential Evidence Plus: Levels of Evidence and Oxford Center for Evidence-Based Medicine. FINDINGS: Thirteen studies were identified that met inclusion criteria; 1 was a randomized controlled trial, 2 were systematic reviews, 3 quasi-experimental cohort studies, 1 quality improvement study, 1 case series, 1 scoping review, 1 consensus panel, and 3 bench studies. All of the studies identified suggest that the use of prophylactic foam dressings reduces the development of pressure injuries on the heel when used in conjunction with a pressure injury prevention program. The strength of the evidence for the identified studies was level 1 (4 level A, 4 level B, and 5 level C). CONCLUSION/RECOMMENDATION: The use of prophylactic multilayer foam dressings applied to the heels, in conjunction with an evidence-based pressure injury prevention program, is recommended for prevention of pressure injuries on the heel (SORT level 1).

2. Prophylactic dressing use to prevent heel ulceration in post-epidural orthopaedic patients. 

The absence of pressure injury remains a key indicator of care; as with many disease processes, prevention is better than management. In recent years, the concept of prophylactic pressure ulcer prevention using dressings has gained traction. This article reports a small quality assurance study undertaken on an orthopaedic ward, where dressings were used prophylactically on the heels of patients who had undergone surgery under spinal anaesthesia. Results showed that in the study group (n=87), no tissue damage occurred during the wear time or whilst in hospital, whereas in the comparator group, 12 patients (18.75%) went on to develop category 2 heel pressure ulcers during the same period.

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3. A pilot study comparing custom contoured and planar support surfaces for pressure ulcer risk over the heels for night time postural management using interface pressure mapping and discomfort scores.

Purpose Custom contouring techniques are effective for reducing pressure ulcer risk in wheelchair seating. These techniques may assist the management of pressure ulcer risk during sleep for night time postural management. Objectives To investigate the effectiveness of custom contoured night time postural management components against planar support surfaces for pressure ulcer risk measures over the heels. Method Supine posture was captured from five healthy participants using vacuum consolidation and 3-dimensional laser scanning. Custom contoured abduction wedges were carved from polyurethane and chipped foams. Pressure mapping and the visual analog scale were used to evaluate the effectiveness of the contoured foams in reducing pressure and discomfort under the posterior heel against standard planar support surfaces. Results Custom contoured shapes significantly reduced interface pressures (p < 0.05) and discomfort scores (p < 0.05) when compared to planar support surfaces. Polyurethane foam was the most effective material but it did not differ significantly from chipped foam. Linear regression revealed a significant relationship between the Peak Pressure Index and discomfort scores.
Conclusions The findings of this pilot study suggested that custom contoured shapes were more effective than planar surfaces at reducing pressure ulcer risk surrogate measures over the posterior heels with polyurethane foam being the most effective material investigated. It is recommended that Evazote foam should not be used as a support surface material for night time postural management.

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4. **An evaluation of the use of the Maxxcare Pro Evolution Heel Boot in a rehabilitation care setting.**
   JONES NIA J. Wounds UK 2017;13(4):100-105.

An evaluation was conducted across six rehabilitation wards in the South-East Wales area to observe the performance of the Maxxcare Pro Evolution Heel boot in this care setting and to review the acceptance of the boot among a cohort of patients with restricted mobility at risk of pressure damage. Seventeen patients were included in this evaluation and all were deemed to be either at risk of developing pressure damage or had existing pressure damage to the heel. The mean age of the cohort was 75 years. Patients were monitored for 14 days during which skin assessments were conducted. The Maxxcare Pro Evolution Heel boot has been designed to offload the heel during extensive periods of unrelieved pressure whilst in bed or in a sitting position. The findings from this evaluation suggest that the Maxxcare Pro Evolution Heel boot was effective in protecting the heels of patients at risk of developing pressure damage in a rehabilitation setting.

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5. **Evidence Summary: Pressure Injuries: Preventing heel pressure injuries with prophylactic dressings.**
   Haesler E. Wound Practice & Research 2017;25(4):210-212.

The article examines the use of prophylactic dressings to prevent pressure injuries (PIs) of the heel. It presents recommended practices for applying prophylactic dressings, including the inspection of skin underneath the dressing at least daily. The effect of a multi-layer polyurethane foam dressing with a silicone border is discussed, as well as the long-term effect of a multi-layer foam hydrocellular prophylactic dressing.

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6. **Use of a Diagnosis-Driven Heel Pressure Injury Algorithm.**

Heel pressure injury (HPI) prevention can be challenging without tools to identify at-risk patients. An HPI prevention algorithm was implemented to standardize practice and allowed nurses to use basic patient information to identify vulnerable persons, alleviating the need for extensive, time-consuming medical record reviews.

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7. **Effects of different heel angles in sleep mode on heel interface pressure in the elderly.**

**Background** The heels are one of the most common sites of pressure ulcers, and the incidence rate in the elderly aged 70 years or older is high. Although there is literature on heel interface pressure, the heel interface pressure of the elderly in different postures has not yet been explored, which will be investigated in this study, as well as the effects of different foot positions. Their skin conditions will also be examined. Methods Twenty-five females and twenty-six males, 70 years old or older, are evaluated while lying down, with only their naked foot in its natural position on a mattress, as well as placed on a standard or pressure-relieving mattress in different positions. The moisture, sebum content, and elasticity of the skin of the heel are tested. Findings The heel of most of the participants is positioned at a 60°–69° or 90°–99° angle to the support surface. The heel interface pressure is the greatest when the foot is upright. The age, weight, and body mass index have no significant impacts. The moisture and sebum content are extremely low while elasticity is normal. Interpretation The relaxed position of the foot is in neutral external rotation and upright positions. A greater amount of pressure is experienced when the foot is upright. The pressure-relieving mattress is more effective for reducing heel pressure but may not apply to all cases. Finally, the skin of the heel is dry and lacks sebum, which implies greater risk of developing heel sores.

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8. **Heel pressure ulcer, prevention and predictors during the care delivery chain - when and where to take action? A descriptive and explorative study**

Hazardous healthcare settings, for example acute care, need to focus more on preventing adverse events and preventive actions across the care delivery chain (i.e pre-hospital and emergency care, and further at the hospital ward) should be more studied. Pressure ulcer prevalence is still at unreasonably high levels, causing increased healthcare costs and suffering for patients. Recent biomedical research reveals that the first signs of cell damage could arise within minutes. However, few studies have investigated optimal pressure ulcer prevention in the initial stage of the care process, e.g. in the ambulance care or at the emergency department. The aim of the study was to describe heel pressure ulcer prevalence and nursing actions in relation to pressure ulcer prevention during the care delivery chain, for older patients with neurological symptoms or reduced general condition. Another aim was to investigate early predictors for the development of heel pressure ulcer during the care delivery chain. Existing data collected from a multi-centre randomized controlled trial investigating the effect of using a heel prevention boot to reduce the incidence of heel pressure ulcer across the care delivery chain was used. Totally 183 patients participated. The settings for the study were five ambulance stations, two emergency departments and 16 wards at two hospitals in Sweden. A total of 39 individual patients (21%) developed heel pressure ulcer at different stages across the care delivery chain. Findings revealed that 47-64 % of the patients were assessed as being at risk for developing heel pressure ulcer. Preventive action was taken. However, all patients who developed pressure ulcer during the care delivery chain did not receive adequate pressure ulcer prevention actions during their hospital stay. In the ambulance and at the emergency department, skin inspection seems to be appropriate for preventing pressure ulcer. However, carrying out risk assessment with a validated instrument is of significant importance at the ward level. This would also be an appropriate level of resource use. Context-specific actions for pressure ulcer prevention should be incorporated into the care of the patient from the very beginning of the care delivery chain.
9. **Heel pressures with generic and focused rigid heel cast devices while in a static supine and seated position**

**OBJECTIVE:** To identify if the choice of material used to make focused rigid cast (FRC) and generic heel cups has an effect on heel pressure in healthy individuals during a static supine and seated position.  

**METHOD:** A repeated measure design was used to compare the effect of two focused rigidity heel devices made from different materials (3M semi-rigid and Benecast FLEX) and a generic polymer gel heel cup device on barefoot heel pressures. Subjects had heel pressures taken while barefoot and with the three different heel devices while in a supine and seated position using the device.  

**RESULTS:** We recruited 32 healthy participants (21 females, and 11 males). When comparing Benecast FLEX and 3M semi-rigid focused rigidity casts with barefoot and the generic heel cup significant reductions in pressures were seen in all areas while seated and in the distal area while supine. However, there was no statistical difference between the two FRC devices, or between barefoot and the generic heel cup in either position.  

**CONCLUSION:** This study demonstrates that FRC heel devices effectively reduced heel pressures in healthy individuals and therefore could be used in practice when a reduction in pressure is required for the management of heel pressure ulcers in bedbound or chair-bound patients.

10. **Preventing Heel Pressure Ulcers: Sustained Quality Improvement Initiative in a Canadian Acute Care Facility.**

The setting for this quality improvement initiative designed to reduce the prevalence of facility-acquired heel pressure ulcers was a regional, acute-care, 490-bed facility in Ontario, Canada, responsible for dialysis, vascular, and orthopaedic surgery. An interdisciplinary skin and wound care team designed an evidence-based quality improvement initiative based on a systematic literature review and standardization of heel offloading methods. The prevalence of heel pressure ulcers was measured at baseline (immediately prior to implementation of initiative) and at 1 and 4 years following implementation. The prevalence of facility-acquired heel pressure ulcers was 5.8% when measured before project implementation. It was 4.2% at 1 year following implementation and 1.6% when measured at the end of the 4-year initiative. Outcomes demonstrate that the initiative resulted in a continuous and sustained reduction in facility-acquired heel pressure ulcer incidence over a 4-year period.

11. **Prevention of heel pressure ulcers among older patients - from ambulance care to hospital discharge: A multi-centre randomized controlled trial.**
Bååth Carina Applied Nursing Research 2016;30:170-175.

The aim was to investigate the effect of an early intervention, a heel suspension device boot, on the incidence of heel pressure ulcers among older patients (aged 70 +).  

**Background:** Pressure ulcers are a global healthcare issue; furthermore, the heel is an exposed location. Research indicates that preventive nursing interventions starting during the ambulance care and used across the acute care delivery chain are seldom used.  

**Methods:** A multi-centre randomized control study design was used. Five ambulance stations, two emergency departments and 16 wards at two Swedish hospitals participated. Altogether, 183 patients were transferred by ambulance to the emergency department and were thereafter admitted to one of the participating wards. Results: Significantly fewer patients in the intervention group (n= 15 of 103; 14.6%) than the control group (n= 24 of 80; 30%) developed heel pressure ulcers during their hospital stay (p=0.017).  

**Conclusions:** Pressure ulcer prevention should start early in the acute care delivery chain to increase patient safety.
Rajpaul Kumal British Journal of Nursing 2016;25:-.

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.

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13. A randomised controlled trial of the effectiveness of soft silicone multi-layered foam dressings in the prevention of sacral and heel pressure ulcers in trauma and critically ill patients: the border trial

The prevention of hospital acquired pressure ulcers in critically ill patients remains a significant clinical challenge. The aim of this trial was to investigate the effectiveness of multi-layered soft silicone foam dressings in preventing intensive care unit (ICU) pressure ulcers when applied in the emergency department to 440 trauma and critically ill patients. Intervention group patients (n = 219) had Mepilex(®) Border Sacrum and Mepilex(®) Heel dressings applied in the emergency department and maintained throughout their ICU stay. Results revealed that there were significantly fewer patients with pressure ulcers in the intervention group compared to the control group (5 versus 20, P = 0·001). This represented a 10% difference in incidence between the groups (3·1% versus 13·1%) and a number needed to treat of ten patients to prevent one pressure ulcer. Overall there were fewer sacral (2 versus 8, P = 0·05) and heel pressure ulcers (5 versus 19, P = 0·002) and pressure injuries overall (7 versus 27, P = 0·002) in interventions than in controls. The time to injury survival analysis indicated that intervention group patients had a hazard ratio of 0·19 (P = 0·002) compared to control group patients. We conclude that multi-layered soft silicone foam dressings are effective in preventing pressure ulcers in critically ill patients when applied in the emergency department prior to ICU transfer.


* Objective: Critically ill patients are at high risk of developing pressure ulcers (PU), with the sacrum and heels being highly susceptible to pressure injuries. The objective of our study was to evaluate the clinical effectiveness of a new multi-layer, self-adhesive soft silicone foam heel dressing to prevent PU development in trauma and critically ill patients in the intensive care unit (ICU). * Method: A cohort of critically ill patients were enrolled at the Royal Melbourne Hospital. Each patient had the multi-layer soft silicone foam dressing applied to each heel on admission to the emergency department. The dressings were
retained with a tubular bandage for the duration of the patients' stay in the ICU. The skin under the dressings was examined daily and the dressings were replaced every three days. The comparator for our cohort study was the control group from the recently completed Border Trial. * Results: Of the 191 patients in the initial cohort, excluding deaths, loss to follow-up and transfers to another ward, 150 patients were included in the final analysis. There was no difference in key demographic or physiological variables between the cohorts, apart from a longer ICU length of stay for our current cohort. No PUs developed in any of our intervention cohort patients compared with 14 patients in the control cohort (n=152; p<0.001) who developed a total of 19 heel PUs. * Conclusion: We conclude, based on our results, that the multi-layer soft silicone foam dressing under investigation was clinically effective in reducing ICU-acquired heel PUs. The findings also support previous research on the clinical effectiveness of multi-layer soft silicone foam dressings for PU prevention in the ICU. * Declaration of interest: This research project was funded through an unrestricted research grant from Molnlycke Health care AB, Goteborg Sweden. None of the authors have competing interests to declare.

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15. **Pressure-ulcer reduction using low-friction fabric bootees.**
Gleeson D. British journal of nursing (Mark Allen Publishing) 2015;24(6):S26-.

At St Helens and Knowsley Teaching Hospitals NHS Trust, implementation of pressure management measures has reduced the incidence of hospital-acquired pressure ulcers. There is now a focus on those pressure ulcers still occurring despite these measures, particularly grade 2 ulcers on the heel, which are often attributed to friction and shear. During 2012 and 2013 low friction fabric bootees (Parafricta®) were used on at-risk patients (where possible) to attempt to address this issue. The bootees were first introduced in 2012. There was a decline in heel ulcers of 78% in the 2 years, which accounted for a sizeable portion of the overall decline in all grade 2 pressure ulcers. There was also a substantial change in the ratio of heel to all other grade 2 pressure ulcers, which fell from 0.67 to 0.24. On the basis of heel pressure ulcers avoided, there is an implied net saving to the NHS. The trust concluded that routine use of low-friction fabric bootees made a significant further contribution towards achieving zero harm targets and had done so while providing substantial cost benefits.

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16. **Reduction of plantar pressures in leprosy patients by using custom made shoes and total contact insoles.**
Tang SF Clinical neurology and neurosurgery 2015;:S12-.

**OBJECTIVE:** The purpose of this study was to observe whether our custom made shoes and total contact insoles can effectively increase the plantar contact areas and reduce peak pressures in patients with leprosy.<br /><strong>DESIGN:</strong> In the rehabilitation laboratory of a tertiary medical center. Six male and two female leprosy patients were recruited in this study. In this study, parameters related to foot pressures were compared between these patients wearing commercial available soft-lining kung-fu shoes and our custom made shoes with total contact insoles. The custom made shoes were made with larger toe box and were able to accommodate both the foot and the insoles. Custom made total contact insoles were made with the subtalar joints under neutral and non-weight-bearing positions. The insole force measurement system of Novel Pedar-X (Novel, Munich, Germany) was used to measure the plantar forces. The parameters of contact area (cm(2)), peak plantar pressures (kPa), contact time (s), and pressure time integral (kPa s) were measured.<br /><strong>RESULTS:</strong> There were significant
contact area increases in the right and left foot heel areas, left medial arch, and second to fifth toes after wearing the custom made shoes and insoles. There were significant decreases in peak plantar pressures in bilateral heels, left lateral midfoot, bilateral second to fourth metatarsal areas, and left fifth metatarsal head after wearing the custom made shoes and insoles (p<0.05).<br /><strong>CONCLUSIONS:</strong> Plantar ulceration is a common serious disability in leprosy patients. As a result, footwear and measures able to reduce plantar pressures may be beneficial in preventing plantar ulcers from occurring in these patients. Our custom made shoes and total contact insoles were proven to be effective in increasing contact areas and decreasing peak pressures in plantar surfaces, and may therefore be a feasible treatment option in preventing leprosy patients from developing plantar ulcers.

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17. The biomechanical efficacy of dressings in preventing heel ulcers

The heels are the most common site for facility-acquired pressure ulcers (PUs), and are also the most susceptible location for deep tissue injuries. The use of multilayer prophylactic dressings to prevent heel PUs is a relatively new prevention concept, generally aimed at minimizing the risk for heel ulcers (HUs) through mechanical cushioning and reduction of friction at the dressing-support interface. We used 9 finite element model variants of the posterior heel in order to evaluate the biomechanical performance of a multilayer dressing in prevention of HUs during supine lying. We compared volumetric exposures of the loaded soft tissues to effective and maximal shear strains, as well as peak stresses in the Achilles tendon, without any dressing and with a single-layer or a multilayer dressing (Mepilex<sup></sup> Border Heel-type), on supports with different stiffnesses. The use of the multilayer dressing consistently and considerably reduced soft tissue exposures to elevated strains at the posterior heel, on all of the tested support surfaces and when loaded with either pure compression or combined compression and shear. The aforementioned multilayer design showed (i) clear benefit over a single-layer dressing in terms of dissipating tissue strains, by promoting internal shear in the dressing which diverts loads from tissues; (ii) a protective effect that was consistent on supports with different stiffnesses. Recent randomized controlled trials confirmed the efficacy of the simulated multilayer dressing, and so, taken together with this modeling work, the use of a prophylactic multilayer dressing indicates a great promise in taking this route for prevention.<br/>

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18. The cost-benefit of using soft silicone multilayered foam dressings to prevent sacral and heel pressure ulcers in trauma and critically ill patients: a within-trial analysis of the Border Trial.

Little is known about the cost-benefit of soft silicone foam dressings in pressure ulcer (PU) prevention among critically ill patients in the emergency department (ED) and intensive care unit (ICU). A randomised controlled trial to assess the efficacy of soft silicone foam dressings in preventing sacral and heel PUs was undertaken among 440 critically ill patients in an acute care hospital. Participants were randomly allocated either to an intervention group with prophylactic dressings applied to the sacrum and heels in the ED and changed every 3 days in the ICU or to a control group with standard PU prevention care provided during their ED and ICU stay. The results showed a significant reduction of PU incidence rates in the intervention group (P = 0·001). The intervention cost was
estimated to be AU$36.61 per person based on an intention-to-treat analysis, but this was offset by lower downstream costs associated with PU treatment (AU$1103.52). Therefore, the average net cost of the intervention was lower than that of the control (AU$70.82 versus AU$144.56). We conclude that the use of soft silicone multilayered foam dressings to prevent sacral and heel PUs among critically ill patients results in cost savings in the acute care hospital.


**PURPOSE:** This study examined the effectiveness of a universal pressure ulcer prevention bundle (UPUPB) applied to intensive care unit (ICU) patients combined with proactive, semiweekly WOC nurse rounds. The UPUPB was compared to a standard guideline with referral-based WOC nurse involvement measuring adherence to 5 evidence-based prevention interventions and incidence of pressure ulcers.<br />
**DESIGN:** The study used a quasi-experimental, pre-, and postintervention design in which each phase included different subjects. Descriptive methods assisted in exploring the content of WOC nurse rounds.<br />
**SUBJECT AND SETTING:** One hundred eighty-one pre- and 146 postintervention subjects who met inclusion criteria and were admitted to ICU for more than 24 hours participated in the study. The research setting was 3 ICUs located at North Memorial Medical Center in Minneapolis, Minnesota.<br />
**METHODS:** Data collection included admission/discharge skin assessments, chart reviews for 5 evidence-based interventions and patient characteristics, and WOC nurse rounding logs. Study subjects with intact skin on admission identified with an initial skin assessment were enrolled in which prephase subjects received standard care and postphase subjects received the UPUPB. Skin assessments on ICU discharge and chart reviews throughout the stay determined the presence of unit-acquired pressure ulcers and skin care received. Analysis included description of WOC nurse rounds, t-tests for guideline adherence, and multivariate analysis for intervention effect on pressure ulcer incidence. Unit assignment, Braden Scale score, and ICU length of stay were covariates for a multivariate model based on bivariate logistic regression screening.<br />
**RESULTS:** The incidence of unit-acquired pressure ulcers decreased from 15.5% to 2.1%. WOC nurses logged 204 rounds over 6 months, focusing primarily on early detection of pressure sources. Data analysis revealed significantly increased adherence to heel elevation (t = -3.905, df = 325, P < .001) and repositioning (t = -2.441, df = 325, P < .015). Multivariate logistic regression modeling showed a significant reduction in unit-acquired pressure ulcers (P < .001). The intervention increased the Nagelkerke R-Square value by 0.099 (P < .001) more than 0.297 (P < .001) when including only covariates, for a final model value of 0.396 (P < .001).<br />
**CONCLUSION:** The UPUPB with WOC nurse rounds resulted in a statistically significant and clinically relevant reduction in the incidence of pressure ulcers.

20. Elevation devices for the prevention of heel pressure ulcers: a review.
Clegg Rosie British Journal of Nursing 2014;23:-.

Aim: The objective of this systematic literature review was to gain insight into the effectiveness of off-loading devices to prevent heel pressure ulcers within the acute hospital setting. Background: Heels have been identified as the second most common site for pressure ulcers. Devices which off-load pressure can include pillows, wedges and boots. It is unclear as to which method or device is best at preventing pressure ulcers. Design and methods: A systematic review was carried out through the search of electronic databases and bibliographies of relevant publications. Randomised controlled trials (RCTs) and systematic reviews that compared devices which off-load heels to prevent pressure ulcers were identified. Results: A total of five studies were included in the review. The
methodological quality of the studies was generally poor. The studies reported that heel-boot elevation devices appeared more beneficial. However, poor compliance with wearing the devices was identified, as well as a perceived increased risk of falls. There were little data on cost-effectiveness. Conclusions: There is little high-quality trial evidence to support the routine use of heel devices to prevent pressure ulcers. However, they may have a role to play within a multifaceted programme of pressure-ulcer prevention.

Available online at this link

21. Using an alternating pressure mattress to offload heels in ICU.
   Masterson Sarah British Journal of Nursing 2014;23:--.

   The heel continues to be one of the most common sites of pressure damage. This article reviews the anatomy and physiology of the heel and explores significant risk factors, including those found in the critically ill patient. Interventions to prevent heel pressure ulceration by offloading the heel are explored. An evaluation of the Nimbus 4 alternating pressure mattress was undertaken within an intensive care unit (ICU) to consider the efficacy of its unique Wound Valve Technology, which is designed to help prevent heel pressure ulceration. During the evaluation period none of the patients using the Nimbus 4 developed a pressure ulcer. Staff observed that the Wound Valves provided effective pressure redistribution and, although the cells frequently needed to be adjusted, patient safety was maintained throughout. The Wound Valves were most effective on patients who were less prone to voluntary movement.

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22. Managing heel ulcers in the community.

   As the size of the older population increases, the incidence of falls and injuries, in addition to chronic wounds, is likely to increase concurrently. This article highlights the risk of both pressure ulceration and diabetic foot ulceration and gives an overview of appropriate treatment and management.

23. Preventing In-Facility Pressure Ulcers as a Patient Safety Strategy: A Systematic Review

   Complications from hospital-acquired pressure ulcers cause 60 000 deaths and significant morbidity annually in the United States. The objective of this systematic review is to review evidence regarding multicomponent strategies for preventing pressure ulcers and to examine the importance of contextual aspects of programs that aim to reduce facility-acquired pressure ulcers. CINAHL, the Cochrane Library, EMBASE, MEDLINE, and PreMEDLINE were searched for articles published from 2000 to 2012. Studies (any design) that implemented multicomponent initiatives to prevent pressure ulcers in adults in U.S. acute and long-term care settings and that reported pressure ulcer rates at least 6 months after implementation were selected. Two reviewers extracted study data and rated quality of evidence. Findings from 26 implementation studies (moderate strength of evidence) suggested that the integration of several core components improved processes of care and reduced pressure ulcer rates. Key components included the simplification and standardization of pressure ulcer–specific interventions and documentation, involvement of
multidisciplinary teams and leadership, use of designated skin champions, ongoing staff education, and sustained audit and feedback.

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24. Prevention of pressure ulcers in nursing home residents.

Pressure ulcer prevention strategies are applicable to all anatomical sites; however, the main focus of this article is heel ulceration in the nursing home setting. The thinness of the subcutaneous tissue between the skin and bone, and the propensity for lower limb diseases, makes the heel the second most common site for pressure ulcer development. This article provides a review of the effect of education and knowledge on the prevention of heel pressure ulcers in nursing home residents. Where there is paucity of evidence, pressure ulcers in general will be examined.

56, 58 this link

56, 58 this link

25. Report on a clinical evaluation of the KerraPro Heel silicone heel pad.

Heels are at increased risk of injury due to the posterior prominence and lack of padding over the calcaneus. Pressure injuries, once established, are extremely costly, both in terms of the detrimental effect on psychosocial wellbeing and threat to life, as well as financially due to length of hospital stay and resources used to heal the wounds. A new and inexpensive silicone heel pad has been designed to simplify the necessary decisions and to address the problems associated with pressure injuries to the heels. This article will describe an observational evaluation of the product. KerraPro Heel pads were evaluated in two separate cohorts of 17 participants over a 4-week period with the primary aim to evaluate the efficacy of the product in preventing and alleviating pressure injuries on the heels. All participants had been reported as ‘at risk’ or ‘at high risk’ of pressure injury to the heels and had a history of developing such lesions. The KerraPro heel pads were compared with the participant's standard protocol. The outcome of the evaluation demonstrated the effectiveness of the KerraPro Heel pads in the prevention and treatment of heel pressure injuries.

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26. How to reduce hospital-acquired pressure ulcers on a neuroscience unit with a skin and wound assessment team.
McGuinness J. Surgical neurology international 2012;3:138-.

BACKGROUND: In 2008, the incidence of hospital acquired pressure ulcers (HAPUs) continued to increase on a neuroscience unit that included both neurosurgical and neurological patients in a 14-bed intensive care unit, and in a 18-bed floor unit.<br /><strong>METHODS:</strong> To reduce HAPUs, several changes were instituted in 2008; (1) turning patients every 1-2 h/repositioning, (2) specialty beds, and (3) a "skin and wound assessment team (SWAT)" that included one (or two) "expert" nurses/nursing assistants who made rounds on all the patients in the unit at least once a week. They would examine patients from "head to toe", document/measure all pressure
ulcers, and educate primary nurses/nurse assistants on the plan/products needed for the patients wound care based on their assessments. In 2010, further measures included: (1) adding eight Stryker beds, (2) adding pressure relieving heel protector boots, and (3) requiring that all new hospital orientees work one shift (7.5 h) shadowing the SWAT team.<br /><strong>RESULTS:</strong> The SWAT team initially decreased HAPUs by 48% in 2009; this reduction was further increased in 2010 (57%), and 2011 (61%). Additionally, in 2010, the SWAT team was required to educate nurses in all other units. By 2011, all nurses had to complete the hospital acquired pressure ulcer prevention tutorial.<br /><strong>CONCLUSIONS:</strong> Since instituting a specialized SWAT team for our neuroscience unit, the incidence of HAPUs (cost estimated for grade IV, US $129,248) was decreased by 48% in 2009, by 57% in 2010, and by 61% in 2011. The SWAT program is now hospital-wide.

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An NHS trust that supplied nurses with a pocket-size mirror to ensure at-risk patients' heels were inspected properly has reduced its pressure ulcers by more than four fifths.

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