STOP IT BEFORE IT STARTS! EXAMPLARY HEEL ULCERS PREVENTION PILOT.

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Abstract

Prevention of heel pressure/diabetic heel ulcers may be difficult due to the complexity and disease process of patients in acute care facilities. However, the implementation of a prevention strategy that includes well-designed prevention protocols and the application of offloading devices has been shown to have positive outcomes. In this study, there were 38 participants.

This study was conducted in 490 bed two site hospital; Researched units had 66 Post-acute beds, 10 ICU beds and 20 acute beds. In this study, there were 38 participants from post-acute, medical and ICU wards. Participant's gender was 16 females, and 22 males. Average age was 79.7 years. 31 patients were bedridden and 7 used a wheelchair. 22 patients had the diagnosis of diabetes and were insulin dependent, 16 did not have the diagnosis of diabetes. 7 patients had pre-existing lower extremity ulcers 31 did not. Boots were applied in accordance with protocol and follow up conducted weekly. 32 patients (88.9%) wore two boots, and 6 wore one boot due to prior amputations. The average length of stay was 22.3 days, (min 7 days, max 50 days). Results: The assertion that these patients were of particular high risk was supported by the estimated relative risk of 2.01, 95% confidence interval (1.03 to 3.92), compared to the value of 1.6 provided very recently by Woo et al., (2015). Despite higher risk of developing pressure/diabetic heel ulcers, none of the patients developed a new pressure ulcer during their length of stay despite over 80% being bedridden. Cost of prevention were significantly lower than costs of treatment. While impact on wellbeing and quality of life cannot be attached to any monetary value.

Introduction

Relieving the pressure on feet and ulcers by offloading is crucial for healing. An offloading boot or suspension boot (foam-based, pillow-based, or air-based), is a soft device that can be applied to the foot and leg, elevating the heel in a pressure-free environment that completely eliminates pressure as the heel is floated in a protective space. This boot removes friction and shearing and can provide adequate pressure relief for patients who cannot be repositioned[7,8].

The goal:

The study aimed to evaluate the effectiveness of an offloading suspension boot in the prevention of heel foot ulcers compared to standard care and to appraise the cost of prevention versus treatment of these ulcers.

The Study

Healing of heel ulcers in patients diagnosed with diabetes is considered to be poor, however, there is limited information on the influence of ulcer location on ulcer healing times. A study by Pickwell and colleagues (2013) has identified that time-to-healing for ulcers increased

progressively from toe to mid-foot to heel. The median time-to-healing was 147 days for toe ulcers, 188 days for mid-foot ulcers and 237 days for heel ulcers. Other factors significantly influence time, such as presence of heart failure or peripheral arterial disease and duration of diabetes[13].

Furthermore, according to Sopher et al., (2011) heel ulcers (HU) are the second most common type of pressure ulcers. Using an anatomically realistic three-dimensional finite element model of the posterior heel, they examine the effects of foot posture and stiffness of the support on strains and stresses within the fat pad of the resting heel, and study the risks for foot ulcers in bedridden patients. The study identified that an inclined foot posture puts a bedridden patient at a higher risk for HU with respect to an upright foot posture, which may be explained by the anatomy of the heel that faces a lower curvature and better cushioned region against the support when the foot is upright (18).

Heel pressure ulcers were selected for this study since they are the second most common pressure ulcer.

This study was designed to evaluate the effectiveness of an offloading suspension boot in the prevention of heel foot ulcers and to appraise the cost of prevention versus treatment of these ulcers.

A prospective cohort study model that allowed measurement of incidence, new cases of pressure ulcers rates and other descriptive measures was used.

All participants who were followed were classified according to the specific exposure and the application of an offloading heel boot while in bed or sitting in a wheelchair. Participants were followed over time for a period of six months or until discharge (whichever came first) to determine the incidence of new heel ulcers.

Observations were performed weekly for any open areas in the heel and measured with a standardized tool, reflecting length, width and depth. The sample selection was a convenient, volunteer sample of female and male acute care facility patients who had a Braden score of less than 3 for sensory, mobility and or activity along with one of the following diagnosis/risk: diabetes, peripheral vascular disease, spinal cord injury, CVA, hip fracture, malnutrition, completely bed ridden and sudden change in condition.

Methodology

Participants were selected from 3 units at an acute care centre. Intensive care unit, and in 2 medical floors (4th floor) and (3rd floor) (Table 1).

Table 1 - Number of patients

	Number of patients
ICU	13
4th floor	13
3rd floor	12
Total	38

Baseline data was collected that included the following:

A baseline assessment was performed on all patients that included a Braden scale. The entire population on these units were considered (66 Post-acute beds, 10 ICU beds and 20 acute beds). Offloading devices were applied to those who met the inclusion criteria. The prevalence of existing lower extremity heel ulcers was also documented.

Exclusion and inclusion criteria was implemented were as follow (Table 2)

Table 2 - Exclusion and inclusion criteria

Exclusions criteria:	Inclusion criteria:
• Any palliative patients. • Any patients who ambulated independently (i.e.: some limited ambulation was acceptable but, patients who could perform considerable amounts of ambulation were not included). • Any patient that scored greater than 3 for sensory, mobility and activity on the BRADEN scale and did not have the diagnosis/risks: diabetes, peripheral vascular disease, spinal cord injury, CVA, hip fracture, malnutrition, completely bed ridden and sudden change in condition.	• All patients that had a Braden score of less than 3 for sensory, mobility and or activity along with one of the following diagnosis/risk: diabetes, peripheral vascular disease, spinal cord injury, CVA, hip fracture, malnutrition, completely bed ridden and sudden change in condition.

The Braden scale is widely used to predict risk of developing pressure ulcers. The Braden score ranges from 6-20. The lower the score, the higher the risk[14].

The device chosen:

Donnelly et al., (2011) led a randomized control trial were it was determined that patients who wore offloading devices for the prevention of heel pressure ulcers did not develop heel damage due to pressure[6]. Advanced age, nutritional deficiency, decrease in skin thickness, less fatty tissue and decrease in sensory perception also contribute to risk for pressure ulcer development in the elderly. Without protection, these factors predispose the elderly to more rapid tissue injury over bony prominences [5,8].

Bales (2012) compared the use of intravenous bags and the Heelift Suspension Boot to prevent heel pressure ulcers in orthopedic patients. The results established a significant difference between the pressure-relieving suspension boot and the intravenous bag as heel-pressure-relief methods. The pressure-relieving suspension boot (Heelift®; DM Systems Inc., Evanston, Illinois) was the better clinical intervention for patients with decreased mobility (2).

A Heelift® Glide and/or Heelift® AFO Boot was provided to all patients who met inclusion criteria. Patients who did not meet the inclusion criteria were provided no additional intervention beyond daily observation for skin integrity.

The purpose of heel offloading and skin protection is for prevention and treatment of pressure and diabetic ulcers on heels, feet, and ankle. Offloading boots prevent the re-occurrence of ulcers and wounds as well as manage pain, comfort, and proper positioning.

Heelift® Glide is a soft latex-free foam boot designed to elevate heels when laying down, in order to protect the foot and ankle from injury due to pressure and friction. When patients reposition as needed, the Heelift® stays in place on the foot.

Heelift® AFO (with a semi-rigid polypropylene brace) avoids impact with the kick plate of the wheelchair. The non-slip tread means that the boot can be worn during trips to the restroom, physical therapy or simple chair transfers.

A Heelift® Glide and/or Heelift® AFO Boot were applied for 24 hours/day for the length of the six-month study. They were removed every 8 hours to assess the lower extremity skin integrity and provide care, and during the patient's bath or shower.

Results

There were 38 participants. Participant's gender was 16 females, and 22 males. Average age was 79.7 years. 31 patients were bedridden and 7 used a wheelchair. 22 patients had the diagnosis of diabetes and were insulin dependent, 16 did not have the diagnosis of diabetes. 7 patients had pre-existing lower extremity ulcers 31 did not. 32 patients (88.9%) wear two boots, and 6 wear one boot due to prior amputations. The average length of stay was 22.3 days (sd 11.9), min 7 days, max 50 days.

All of these participants were determined to be at-risk of developing pressure sores associated with prolonged bedrest, at the heels. The heel-lift boot was utilized to reduce/remove pressure at the heels during bedrest; adherence was 100%.

None of the participants developed a pressure sore at the heels during the in-hospital stay.

This study demonstrated RR= 2.01, 95% confidence interval (1.03 to 3.92) for developing a pressure ulcer. Other literature shows RR= 1.62, 95% confidence interval (1.58 to 1.65), Woo et al., (2015), suggesting that participants in current study were somewhat more at risk of developing a new pressure ulcer, based on having demonstrated susceptibility to pressure sores already (likely due to sampling, which selected toward high-risk (e.g., bedridden patients, and perhaps also slightly greater mean age of sample in current study). Hence, the likelihood of patients in this study to develop a pressure ulcer was higher compared to the general population at risk. Patients were also 2 times more likely to have a pre-existing ulcer if they were IDDM.

Despite higher risk of developing pressure ulcers, none of the patients developed a new pressure ulcer during their length of stay, which averaged over 22 days, despite over 80% also being bedridden.

Cost of prevention implementation was calculated for the six months at $3,100.00 (product). Cost of prevention was less than the estimated treatment costs of one pressure ulcer $9.000 or diabetic foot ulcer $25,000.00 (lower end costs based on literature evidence).

Staff cited (a) ease of use, (b) ease of application, and (c) product availability as important influences on successful outcomes.

Discussion

This pilot study purposefully selected patients at high risk for heel pressure sores, based on clinical assessment. The assertion that these patients were of particular high risk was supported by the estimated relative risk of 2.01, which is higher than the value of 1.6 provided very recently by Woo et al., (2015) in their study of over 200,000 acute care, long term care, continuing care, and home care patients in Ontario, Canada.

None of the participants in the current study developed a new pressure sore during their hospital stay, and those patients who entered the study with pre-existing foot and lower leg wounds demonstrated substantial improvement during this period.

These results suggest that the heel-lift boot is an effective intervention to prevent development of new sores, and provide opportunity for existing sores to improve and heal.

Follow up studies should examine a larger population of patients, characterized by greater diversity in age and health status, and should include appropriate control groups to enable the researchers to confirm the effect of the heel-lift boots, controlling for other factors.

Complex medical diagnosis and acute onset of illness can have a significant impact on patients' quality of life and increased risk of death. They also greatly increase the demand for health care resources.

In this study, cost of prevention was substantially lower than costs of treatment. However, a focused cost benefit study to further explore costs savings would be of benefit.

Conclusion

Research from the Canadian Association of Wound Care's pressure ulcer prevention program shows that the introduction of a pressure ulcer prevention program will save $93,000 in one year in one long term care facility! Furthermore, it costs $9,000 to provide effective wound management for one person who develops a preventable prevention ulcer.

Prevention of heel ulcers may be difficult due to the disease process, although the implementation of a prevention strategy including well-designed prevention protocols and application of offloading devices may have positive effects. Heel pressure relief using an offloading boot must be viewed as part of an inclusive strategy in acute care facilities which aim to prevent all pressure ulcers regardless what unit/floor the patient is placed in.

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