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CSI (Common Surgical Injury) Investigation

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Situation

The serious nature of hospital-acquired heel pressure ulcers (hPUs) is gaining additional attention in medical research, as prevalence surveys are now regularly differentiating between sites of pressure ulcers. The site of the heel is the second most prevalent site for pressure ulcers.[1] The National Pressure Ulcer Advisory Panel (NPUAP) reported a pressure ulcer prevalence rate of approximately 15% in acute care[2] and prior reports have shown hPUs consistently account for approximately 30% of pressure ulcers.[1] Morbidity related to hPUs includes pain, reduced mobility, and limb amputation. Patients with diabetes and hPUs are at high risk for complications, with increased risk for major amputation.[3] Patients with pressure ulcers also have higher mortality rates, with an observational study[4] reporting a 1.92 relative risk index for death in elderly patients with pressure ulcers (n=303), which was nearly twice that of patients without pressure ulcers. A separate study reported septicemia as the etiologic factor in 40% of deaths in patients with pressure ulcers.[5] The economic impact of perioperative hPUs is substantial, with estimates ranging from $265,000- $525,000 a year to a 100 bed facility[6] (see Figure 1). Recent peer-reviewed publications have focused attention on the negative outcomes of hPUs in critically-ill[2] and surgical-patient populations.[7] Furthermore, the intensive efforts of the Centers for Medicare and Medicaid Services to prevent hospital-acquired conditions have also brought hPUs to the forefront in research. Skin care bundles have been put into effect in many hospitals across the nation.

The elevation of heels for offloading is a well-known recommendation for hPU prevention,[8-11] however the logistics related to maintaining consistent heel pressure offloading remain a challenge (see Figure 2). Black[9] recommends utilizing a device that elevates immobile patients' legs, specifically in patients recovering from hip and knee surgery. Research has concluded patients undergoing surgery are at increased risk for development of pressure ulcers compared to the general patient population[12-21] and, given this body of evidence, two researchers from separate facilities partnered to determine the effectiveness of heel pressure offloading in at-risk surgical patients.

Background

Two researchers partnered on an IRB-approved, 2-facility, prospective, observational study. The purpose of the study was to determine if a pressure-relieving heel protector boot prevented hPUs during and after surgery. A total of 20 patients were planned for selection for this study (10 per facility), with inclusion criteria consisting of:

- adherence to 2 or more Scott Triggers (see Figure 3);
- no pre-existing sign of heel pressure injury; scheduled for a minimum of a 3 hour procedure "time in to time out of the OR";
- scheduled for an inpatient hospital stay postoperatively;
- and all patients able to sign informed consent.

If a patient was unable to follow protocol, the procedure lasted less than 3 hours, or they were discharged before their second postoperative day, then the patient would be exluded from the study.

It became apparent after inception of this study that the timeline would need to be extended due to various unanticipated barriers. In this poster we report the preliminary findings of 15% of the desired patient population, the types of barriers encountered, and solutions which are being employed.

The heel protector boot has been effective in preventing heel skin injury during and after surgery in preliminary patient population

Figure 1: Economic impact of hPUs

Study/yr	Economic outcomes
Lyder, 2001[a]	Average cost to heal a PrU $5,000 - $70,000
Beckrich & Aronovitch, 2007[b]	Annual cost to treat surgical PrU is $750 M -$1.5 Billion
Beckrich & Aronovitch, 2007[b]	Costs of PPrU to a 100 bed facility is $265,000 - $525,000
Young, 2003[c]	Expected Treatment Cost of Stage I, II, or III Ulcers ranges from $2,000 to $30,000
Kurtzman & Buerhaus,2008[d]	Expected Treatment Cost of Stage III & IV Ulcers - $43,180

Projected costs – total knees/hips PPrU

534,000 Total Knee Replacement
+235,000 Total Hip Replacement
= 769,000 Procedures

12.75% of total procedures get Stage I-IV HA PrU[e]

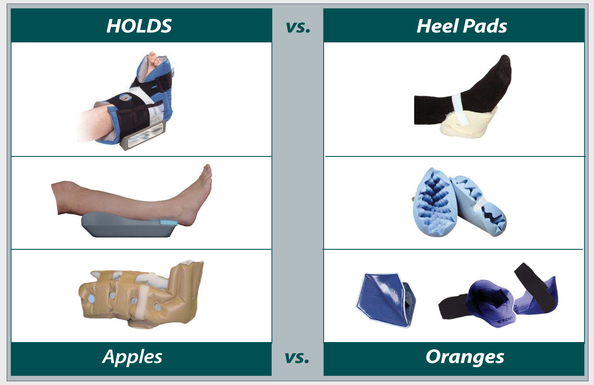
If 10% of HA PrU are Stage III/IV, then 9,805 x $2,600[f] =$25,493,000

Estimated economic saving with prevention of hPUs

- 200 Bed Unit
- Expected Number of Heel Ulcers in a Year: 325[g]
- Expected Treatment Cost of Stage I, II, or III Ulcers: $4,832,000[c]
- Expected Treatment Cost of Stage IV Ulcers: $1,610,000[c]
- Total Projected Treatment Costs of Heel Ulcers: $6,442,000
- Annual Projected Cost of Heel Protectors: $64,810
- **Estimated Revenue Preservation with Heel Protectors: $6,377,190**

a Lyder CH, Preston J, Grady JN, et al. Quality of care for hospitalized medicare patients at risk for pressure ulcers. *Arch Intern Med*. 2001;161(12):1549-1554.
b Beckrich K, Aronovitch SA. Hospital-acquired pressure ulcers: a comparison of costs in medical vs. surgical patients. *Nurs Econ*. 1999;17(5):263-271.
c Young ZF, Evana A, Davis J. Nosocomial pressure ulcer prevention: a successful project. *JONA*. 2003;33:380-383.
d Kurtzman ET, Buerhaus PI. New Medicare Payment Rules: Danger or Opportunity for Nursing. *Am J Nursing*. 2008;108:30-35.
e Cuddigan J, Ayello E, Sussman C. Pressure Ulcers in America: Prevalence, Incidence, and Implications for the Future. Reston, Va.: National Pressure Ulcer Advisory Panel. *Adv Skin Wound Care*. 2001;14:208-215.
f Centers for Medicare & Medicaid Services. Proposed Changes to the Hospital Inpatient Prospective Payment Systems and Fiscal Year 2009 Rates. Federal Register. 2008;73. Available at http://edocket.access.gpo.gov/2008/pdf/08-1135.pdf. Accessed March 5, 2009.
g Whittington KT, Briones R. National prevalence and incidence study: 6-year sequential acute care data. *Adv Skin Wound Care*. 2004;17(9):490-494.

Figure 2: What is a Heel Off Loading Device (HOLD)?



All devices are NOT created equal

Qualitative metrics can assist with identifying unforeseen barriers and addressing with solutions

Assessment

- To date, 5 patients have been recruited to the study:
  - 3 patients completed study, 2 patients were excluded
  - There has been no skin breakdown during or following surgery in patients completing the study
- The offloading intervention appears to be effective for high-risk supine surgical patients thus far (15% of patients have been recruited – study is ongoing).
- The Scott Tiggers appear to be effective in identifying at-risk surgical patients for this type of study.
- The heel protector has been effective in preventing heel skin injury during and after surgery in preliminary patient population.

Unforeseen Barrier: The researchers underestimated the breadth and amount of education necessary for perioperative nursing staff. As this intervention extends from surgery and throughout the postoperative surgical stay, detailed in-servicing of the study protocol and appropriate application of the heel protector is essential.

▶ Solution: Additional and ongoing educational in-servicing is being provided to the perioperative nursing staff and the study is ongoing.

Unforeseen Barrier: Application of the heel protector boot and intermittent pneumatic compression (IPC) sleeves were not occurring at the same time. This resulted in additional steps for the perioperative nursing staff.

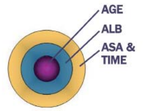
▶ Solution: Nurse education has been implemented and is ongoing regarding concomittant application of the heel protector boot and IPC sleeve.

Unforeseen Barrier: The timing of application of the heel protector boot is critical to patient compliance. Many patients are already apprehensive in the preoperative holding area, and the boot was refused on occasion due to concerns of sensations of constriction and heat.

▶ Solution: The boots are now being applied on arrival to the operative suite to lessen patient apprehension and enhance compliance with the hPU prevention protocol.

Figure 3: Preoperative Assessment Utilizing Scott Triggers

- **Assess preoperative patients for all 4 risk triggers:**
  - → Age over 62 years
  - → Serum albumin <3.5
  - → ASA Score III or greater
  - → Surgery > 3 hours (time in/time out of OR)
- **Consider type of surgery: cardiac, vascular, trauma, transplants, and bariatric**
- **2 or more triggers = high-risk surgical patient**



RECOMMENDATIONS

After assessing the current and ongoing study, and preliminary results, the following recommendations are being made by the researchers to ensure 100% recruitment of patients and provide guidance to researchers considering a similar study:

- Change management and compliance is critical to the success of any intervention. Initial and ongoing caregiver education and in-servicing sessions are essential to ensure proper understanding of the study protocol, appropriate timing for and application of the boot
- Pre-select supine operative cases such as vascular procedures, general surgical procedures, otolaryngologic procedures, or some urologic procedures
- Apply IPC sleeves and heel protectors at the same time by threading the tube to sleeve through the top of the boot
- Apply boots on arrival to the surgical suite to avoid adding to existing patient apprehension and enhancing compliance with the hPU prevention protocol

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