Use of a Sacral Silicone Border Foam Dressing as One Component of a Pressure Ulcer Prevention Program in an Intensive Care Unit Setting

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In 2008, patients in the intensive care unit (ICU) at Danbury Hospital, Danbury, Connecticut, experienced 79 pressure ulcers. As a result, pressure ulcer–prevention interventions were standardized in critical care and medical-surgical units and education was provided to all direct patient care staff about principles of skin care and prevention. Following these efforts, 53 ICU patients developed pressure ulcers in the sacral area in fiscal year 2009, representing a 12.5% incidence for the ICU as compared to a 3.4% overall pressure ulcer incidence for the total hospital. In order to achieve additional reduction in pressure ulcer incidence, we replicated an initiative that called for application of a silicone foam dressing every 3 days to determine its effect on sacral pressure ulcer incidence in the ICU. We found that the use of the dressing further diminished the incidence of sacral pressure ulcers in our patients.

Introduction

In 2006, Danbury Hospital, a 371-bed regional medical center in Danbury, Connecticut, recognized the need to change our skin management practices in order to reduce the pressure ulcer (PU) prevalence. Our hospital-wide PU prevalence was 12.8% at the time, and our short-term goal was to reduce prevalence to less than 7%, the national benchmark for PU prevalence at that time.1 Hospital leadership recognized the importance of hiring a certified WOC nurse in 2007 as part of the improvement initiatives. As a result of the initiatives implemented with the assistance of the certified WOC nurse, hospital-wide PU prevalence fell to less than 1% by May 2008. Changes included the adoption of the Braden Scale for Predicting Pressure Sore Risk.2 The patient-specific interventions were based on the total score as well as the subscale score. Additional changes included adoption of the 5 Million Lives 6 essential elements of PU prevention,3 implementation of a skin bundle, adoption of the National Pressure Ulcer Advisory Panel (NPUAP) 2007 revised PU staging,4 and streamlining and standardization of topical wound care products. We added a nutritional supplement that is a blend of Revigor (a source of an amino acid hydroxymethyl butyrate (HMD) metabolite) and arginine and glutamine (Juven, Abbott Nutrition, Abbott Park, Illinois). We also purchased new pressure re-distribution beds in the general hospital and the intensive care unit (ICU) (Care Assist frames and PrimeAire ARS mattresses for the general hospital and Total Care Sport Bed with low air loss surface and a pulmonary module in the ICU, Hill Rom, Batesville, Indiana). Education was provided to the nursing and medical staff regarding the PU-reduction initiative.

In addition to generating quarterly prevalence data, the certified WOC nurse incorporated a mechanism to track daily incidence in late 2007. Review of these data revealed that our ICU had the highest PU incidence rates of any unit in our facility. Therefore, the ICU became a focus area for additional improvements, which included the...
purchase of low air loss beds. We chose to add a low-air-loss surface to create a better cutaneous microclimate for patients deemed at high risk for PU formation and for individuals with existing PU. During fiscal year 2008, the overall hospital-acquired PU incidence was found to be 3.3%, as compared to a 21.3% incidence in our ICU incidence, representing 79 hospital-acquired PU.

An evaluation of potential reasons for this higher hospital-acquired PU incidence revealed that the ICU had implemented a protocol designed to prevent ventilator-associated pneumonia. This protocol included positioning the patient with the head of the bed (HOB) elevated to approximately 40° at all times except during personal care. The HOB elevation reduced our ventilator-associated pneumonia incidence to 0, but we believe that it exacerbated the risk for sacral deep tissue injury and stage II PU. The NPUAP/European Pressure Ulcer Advisory Panel (EPUAP) guidelines summarize current evidence that shows an increased risk of sacral PU formation from shear forces and sustained pressure when the HOB is elevated. Elevation of the HOB to 40° exceeded the 30° side-lying repositioning recommended by the NPUAP/EPUAP for prevention of PU in the sacral area. We observed that a 45° HOB elevation tended to place the patient in a slouched position creating weight-bearing and shear over the sacrococcygeal area.

In addition to the initiatives to prevent skin damage in our ICU patients described previously, the certified WOC nurse examined current best practice evidence for preventing skin damage from friction and shear forces during spring of 2009. PubMed and CINAHL databases were searched using key words “pressure,” “shear,” “friction,” “moisture,” and “critical illness” published in studies from 2000 to 2009. We identified an integrative review by Gefen that succinctly summarized research from clinical, in vivo, and in vitro studies focusing on HOB elevation, pressure, shear, and PU development. No published studies were identified that focused on the time to the onset of a PU or suspected deep tissue injury when a patient was maintained in a semiupright position created when the HOB is elevated to 30° to 40°. However, indirect evidence from animal model research and results from several in vivo studies suggest that tissue damage tends to develop between 1 and 6 hours.

The primary force hypothesized to result in tissue damage in these patients is shear. The Shear Force Initiative Task Force summarizes shear as a stress from applied mechanical forces that causes damage by deforming, tearing, and compressing of tissue and its supportive vascular structures. We also reviewed an abstract by Brindle, who examined the modifiable factors related to PU formation in his ICU. Based on this evaluation, the author applied a silicone foam dressing to the sacrum every 3 days in order to reduce shearing forces, friction, and moisture in the sacral areas of his ICU patients. The dressing was applied to all patients who met the patient selection criteria outlined in the Table. They reported a diminished incidence of sacral PU following application of the dressing.

After completing the literature review, we presented results of hospital-wide and ICU-specific PU incidence data to our ICU Joint Practice Council Committee. This committee comprises pulmonary intensivist physicians, ICU nurse leaders, pharmacologists, and a performance improvement representative. A request was made for approval to conduct a quality improvement initiative using the silicone foam dressing described by Brindle. Because use of the dressing was a novel intervention, we also obtained approval from our facility's institutional review board and Joint Practice Committee.

We then compared a retrospective chart review of ICU patients during a 6-month period who had experienced sacral PU to determine whether they had similar comorbid conditions to those described by Brindle in his abstract. We found many similarities, as well as some differences that prompted us to implement a multi-intervention PU prevention in our ICU (Table).

### Silicone Border Foam Dressing

We applied the silicone border foam dressing to 69 patients admitted to ICU who met the inclusion criteria summarized in Table and who had no sacral PU on admission. The intervention was discontinued prematurely in 7 patients, including 5 who expired during their ICU stay, 1 who was agitated resulting in friction against the dressing and frequent displacement, and 1 who did not fulfill inclusion criteria after the dressing was initially applied. Data collection continued for 3 months.

The silicone foam sacral dressing was applied to the sacral area and maintained through the patients' ICU stay. The dressing was changed every 3 days to allow for assessment of the sacral area based on 2007 NPUAP PU staging guidelines. If no PU was assessed, a new dressing was applied. If evidence of a PU was observed, care for that patient was evaluated and appropriate treatment initiated according to physician order. The PU was also noted as an outcome and the patient's record was reviewed for contributing factors.

The ICU staff was educated on the correct use of the soft sacral silicone foam dressing. To control for environmental factors, we used a single absorbent breathable incontinence pad and avoided all use of cloth pads for incontinence. Patients were placed on a single draw sheet, and placed on the Sport Bed with low air loss mattress.

The mean age of the 62 patients who completed the study was 66 years and their mean Braden Scale score was 12 (Figure 1). Three out of 62 patients (4.8%) developed a sacral PU. Their Braden Scale scores were 11 (n = 2) and 12 (n = 1). Sacral PU were detected on day 3, day 12, and day 24 following initiation of the dressing. Two PU were
diagnosed as deep tissue injuries and the third as a stage 2 PU. One DTI resolved and the stage 2 PU healed, but the third DTI progressed to an unstageable PU. All 3 patients eventually expired; 2 individuals never left the ICU.

We continued to track the monthly incidence of PU in the hospital and ICU. The hospital-acquired PU incidence in our ICU decreased from 12.5% in fiscal year 2009 to 7% in fiscal year 2010, reflecting a decline from 50 sacral PU in 2009 to 13 sacral PU in 2010 (Figure 2).

**Conclusion**

Our staff continues to use a silicone border foam dressing for prevention of sacral PU in our ICU. We believe that the decline in hospital-acquired PU in our ICU is attributable
to the hospital’s skin management policies that incorporated the NPUAP/EPUAP prevention intervention guidelines and application of the sacral silicone foam dressing. We hypothesize that the dressing prevents sacral PU by absorbing moisture and enhancing tissue tolerance to pressure, while simultaneously decreasing shear forces on the sacral area. We plan to extend the use of this preventive intervention to inpatient units other than the ICU.

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**References**

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