Pressure Ulcer Management

PROPHYLACTIC SACRAL DRESSING FOR PRESSURE ULCER PREVENTION IN HIGH-RISK PATIENTS

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Background Patients in intensive care units are likely to have limited mobility owing to hemodynamic instability and activity orders for bed rest. Bed rest is indicated because of the severity of the disease process, which often involves intubation, sedation, paralysis, surgical procedures, poor nutrition, low flow states, and poor circulation. These patients are predisposed to the development and/or the progression of pressure ulcers not only because of their underlying diseases, but also because of limited mobility and deconditioned states of health.

Objective To assess whether treating high-risk patients with a prophylactic sacral dressing decreases the incidence of unit-acquired sacral pressure ulcers.

Methods An evidence-based tool for identifying patients at high risk for pressure ulcers was used in 3 intensive care units at an urban tertiary care hospital and academic medical center. Those patients deemed at high risk had a prophylactic sacral dressing applied. Incidence rates were collected and compared for the 7 months preceding use of the dressings and for 7 months during the trial period when the dressing was used.

Results After the sacral dressing began being used, the number of unit-acquired sacral pressure ulcers decreased by 3.4 to 7.6 per 1000 patient days depending on the unit.

Conclusions A prophylactic sacral dressing may help prevent unit-acquired sacral pressure ulcers. Implementation of an involved care team with heightened awareness and increased education along with a prophylactic sacral dressing in patients deemed high risk for skin breakdown are all essential for success. (American Journal of Critical Care. 2016;25:228-234)
Patients in intensive care units (ICUs) are predisposed to pressure ulcers because of limited mobility and the severity of their disease processes. Pressure ulcers result from pressure or a combination of pressure and shear, usually over bony prominences, and cause localized injury to the skin and underlying tissues.\(^1\) The prevalence of pressure ulcers in acute care settings is estimated at 12\% to 19.7\%, of which 20\% occur on the sacrum or coccyx.\(^2\) In ICUs, pressure ulcers rates can occur in 14\% to 42\% of patients.\(^3\) For patients, pressure ulcers can be painful, embarrassing, isolating, and, in some cases, life-threatening.\(^4\)

The standard of care to prevent pressure ulcers includes routine repositioning to offload pressure points, moisture management, use of support surfaces, and assessment of nutritional requirements by registered dietitians. Despite these practices designed to mitigate risk, pressure ulcers continue to develop in many high-risk ICU patients. In practice, pressure ulcers are indicators of quality of care.\(^5\) The Joint Commission considers prevention of health care-associated pressure ulcers a National Patient Safety Goal.\(^6\) The Institute for Healthcare Improvement included pressure ulcer prevention in its 5 Million Lives Campaign.\(^7\) More recently, the federal government identified pressure ulcers as one of the hospital-acquired conditions included in the Agency for Healthcare Research and Quality composite measure PSI-90.\(^8\) Hospital-acquired conditions are included in 2 pay-for-performance programs under the Patient Protection and Affordable Care Act that have great implications for hospital finances: penalties for hospital-acquired conditions and value-based purchasing incentives.\(^9\)

Treatment of pressure ulcers is expensive, with estimates of the cost at a mean of $1200 to $1600 per day.\(^10\) The Centers for Medicare and Medicaid Services no longer reimburses facilities for pressure ulcer care when the ulcers are acquired in the hospital.\(^11\) Starting in 2015, hospitals that rank among the worst 25\% for hospital-acquired conditions, including pressure ulcers, will see their reimbursement rates decline.\(^12\) Reducing the incidence of pressure ulcers would not only reduce the negative physical and psychological impact on patients and improve patients’ outcomes, it might also reduce costs and increase reimbursement for hospitals. Yet, despite the widespread recognition of the need to prevent pressure ulcers in critical care patients, challenges remain in the ability to prevent them. Recent studies indicate that silicone dressings may hold promise for prevention of pressure ulcers. ICU patients who received a soft silicone multilayered foam dressing on the sacrum showed significantly fewer pressure ulcers.\(^13-15\)

This study sought to evaluate the effects of a prophylactic silicone adhesive hydrocellular sacral foam dressing on incidence of sacral pressure ulcers among high-risk ICU patients. The product for the trial was chosen because the facility already used Allevyn (Smith & Nephew) dressings of various sizes and shapes for care of skin tears with good results and the nurses were already familiar with this type of product. The particular dressing used in this trial is specifically designed for use on the difficult-to-fit coccyx area.

### Methods

#### Setting

This study was conducted in an urban tertiary care academic medical center that is also a level I trauma center with 951 licensed acute care beds. Three ICUs at the institution participated in the study: the surgical coronary care unit (SCCU), a 9-bed surgical cardiac ICU; the medical coronary care unit (MCCU), a 9-bed medical cardiac ICU; and a 25-bed medical ICU (MICU). The SCCU generally provides care for patients after coronary artery bypass surgery, valve replacement or repair,
implantation of a ventricular assist device, heart transplant, or extracorporeal membrane oxygenation cannulation. The MCCU provides care for patients who had a recent ST-segment elevation myocardial infarction, cardiogenic shock, or heart failure with decompensation and for patients who require optimization before cardiothoracic surgery. The MICU generally provides care for patients with liver failure, respiratory failure requiring intubation and mechanical ventilation, pulmonary hypertension, septic shock, multisystem organ failure, and acute respiratory distress syndrome. The hospital’s standard mattress in all 3 of these ICUs was the AtmosAir 9000 (KCI).

**Sample**

The study was approved by the institutional review board and granted a waiver of consent. All adults, aged 18 years and older, and admitted to any of these ICUs were screened for inclusion in the trial on the basis of their risk factors for skin breakdown. Patients assessed as having any 1 of the following criteria were included in the study: surgery longer than 4 hours or cumulative surgeries longer than 6 hours; cardiac arrest during this admission; vasopressor use for more than 48 hours; shock; sepsis; or multiorgan dysfunction syndrome. If patients did not meet the aforementioned singular criteria, they were evaluated for the following: age more than 65 years old; bed rest; traction; diabetes; liver failure; hemodynamic instability; body mass index (calculated as weight in kilograms divided by height in meters squared) less than 18.5 (underweight) or greater than 40 (morbid obesity); malnutrition (prealbumin < 20 mg/dL, albumin < 2.5 g/dL, nothing by mouth > 3 days); spinal cord injury (quadriplegia/paraplegia); sedation/paralysis for more than 48 hours; history of pressure ulcers; mechanical ventilation for more than 48 hours; nitric oxide ventilation; drive lines (left or right ventricular assist device balloon pump, extracorporeal membrane oxygenation); history of vascular disease; expected length of stay greater than 5 days; intermittent hemodialysis/continuous venovenous hemodialysis; Braden score 12 or less; or orthopedic injuries. Any patient who screened positive for 5 or more of these conditions was included in the study.

Patients with any of the following conditions were excluded from the study: urinary or fecal incontinence not managed with a urinary catheter or fecal management system, weeping edema or anasarca, diaphoresis in sacral area, or preexisting sacral pressure ulcer. Patients who were excluded from the study could still receive the study dressing if a wound ostomy and continence nurse (WOCN) recommended it, but those patients were not included in the evaluation.

**Design**

A prospective, nonrandomized, quasi-experimental observational study was conducted to compare ICU-acquired sacral pressure ulcers in patients assessed at high risk for development of pressure ulcers before and after implementing prophylactic use of silicone adhesive hydrocellular sacral foam dressings. Baseline data on the daily incidence of pressure ulcers on the sacrum, buttocks, and coccyx were collected for the 7 months before implementation of the dressings, from October 2011 to April 2012. During this 7-month period, a screening tool to determine which patients were at high risk for pressure ulcer development on the sacrum, buttocks, and coccyx was developed after an extensive literature review. This tool was validated by the 3 WOCNs employed by the facility. In preparation for intervention data collection, in February 2012, each participating ICU conducted an informal evaluation of the screening criteria for risk of pressure ulcers and the application of the sacral dressing as prophylaxis. Registered nurses were asked to assess patients using the screening criteria and apply the dressing as pressure ulcer prophylaxis in patients who met screening criteria. The nurses were also asked to evaluate the dressing for ease of application, removal, wear time, patient comfort, ease of repositioning, and patient safety. Overall, the nurses rated the aspects of the sacral dressing positively. During this study preparation, fewer than 10% of patients had clear fluid-filled blisters related to moisture develop under the sacral dressing. Following the review of these patients by the WOCN, the screening criteria and follow-up assessment criteria were clarified to minimize the risk for blistering under the dressing during the intervention phase. Before the intervention phase, staff in all 3 units and the cardiothoracic operating room, where patients had dressings applied before their procedure, received education regarding the dressing criteria tool, dressing application (Table 1), the data collection tool (Figure 1), and dressing removal.

The intervention phase of this study occurred from May through November 2012. During the trial period, each adult patient who was admitted to any of the 3 ICUs was assessed by a registered nurse upon arrival to the unit and screened for study eligibility. Patients who met inclusion criteria received a prophylactic sacral dressing. The dressing used in this study was the Alleyen Gentle Border Sacrum Dressing manufactured by Smith & Nephew. Data
on ICU-acquired pressure ulcers were collected daily by clinical nurse specialists and registered nurses for each unit.

Once the sacral dressing was applied to a patient, an assessment was performed by the primary nurse every shift (minimum every 12 hours) and documented on the data collection tool and in the electronic medical record. Skin assessments were completed per the hospital’s standard of nursing care and included peeling back the sacral dressing to perform a full skin inspection underneath. Also documented on the data collection tool were assessments of the skin condition under the dressing, whether the dressing was reapplied or changed, and the end date of the patient’s participation either because the dressing was removed or because the patient was transferred out of a participating ICU. Each patient had a data collection tool for each shift. Completed data collection tools were collected weekly by each unit’s clinical nurse specialist.

To ensure appropriate assessment and clinical care for patients with the sacral dressing, a mark was placed next to the patient’s name on the unit’s patient assignment board in the nurses’ break room. The sacral dressing was changed every 3 days while the patient remained in the study. Any patients who had exclusion criteria develop after application of the sacral dressing during this study had the dressing removed. The removal date was noted on the data collection tool as the end date of the patient’s participation. If, during the study, any skin changes occurred under the dressing, the dressing was removed unless continued use was recommended by a WOCN. Each event that required dressing removal was investigated by a WOCN, and if any further treatment was recommended, it was implemented promptly. In addition, because the study included patients at very high risk for skin breakdown, any skin breakdown or redness was noted and a WOCN evaluated further use of sacral dressing treatment.

**Statistical Analysis**

Data were entered into an Excel (Microsoft Corp) spreadsheet and imported into IBM SPSS Statistics 19 (IBM SPSS) for analysis. Descriptive statistics were used to characterize the dressing use. Pressure ulcer rates were calculated by using the industry’s standardized rate per 1000 patient days. Differences in pressure ulcer rates were obtained by calculating incidence rate ratios and confidence intervals. P values were calculated by using a $\chi^2$ test.

**Results**

Data from all 3 units (SCCU, MCCU, and MICU) were combined for analysis. Of the 584 patients assessed for inclusion, 243 (41.6%) had a sacral dressing applied but completed data were received on only 200 of those patients (Figure 2). Among the 243 who had a sacral dressing applied, surgery longer than 4 hours or cumulative surgeries longer than 6 hours (32.5%, n = 79) and sepsis (23.5%, n = 57) were the most common singular inclusion criteria (Figure 3). Table 2 lists the characteristics for the 132 patients who met inclusion criteria for 5 or more factors and had a sacral dressing applied. The mean duration for a patient to have a dressing in place was 3.26 days (SD, 3.17, n = 200), with a range of 0 to 24 days. In all, 71.5% (n = 143) of patients had a dressing applied for 3 or fewer days.

Depending on the unit, implementation of the sacral dressing reduced unit-acquired sacral pressure ulcers anywhere from 3.4 to 7.6 per 1000 patient days. The SCCU had the most dramatic reduction at 7.6 per 1000 patient days, the MCCU had a reduction of 3.4/1000 patient-days, and the MICU reduced rates by 3.6 per 1000 patient days (Table 3).
ALLEVYN Sacral Gentle Border for Pressure Reduction—Data Collection

***Consult Wound Care on Each Patient***

Room #: ____________
ICU admission date: ___/___/___
Evaluation period: Date dressing originally applied: ___/___/___
End date (either date dressing permanently removed or when patient transferred out of the ICU): ___/___/___
Did the patient die? Please circle. Yes / No

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Skin condition</th>
<th>Dressing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>AM</td>
<td>☐ Intact&lt;br&gt;☐ Nonblanchable erythema or color different from skin tone/stage I PU&lt;br&gt;☐ Partial thickness/stage II PU&lt;br&gt;☐ Full thickness/stage III or IV PU/unstageable PU&lt;br&gt;☐ Evidence of DTI&lt;br&gt;☐ Exclusion criteria met&lt;br&gt;☐ Other (describe):</td>
<td>☐ Reapplied&lt;br&gt;☐ Changed&lt;br&gt;☐ Permanently removed WOCN consulted</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>☐ Intact&lt;br&gt;☐ Nonblanchable erythema or color different from skin tone/stage I PU&lt;br&gt;☐ Partial thickness/stage II PU&lt;br&gt;☐ Full thickness/stage III or IV PU/unstageable PU&lt;br&gt;☐ Evidence of DTI&lt;br&gt;☐ Exclusion criteria met&lt;br&gt;☐ Other (describe):</td>
<td>☐ Reapplied&lt;br&gt;☐ Changed&lt;br&gt;☐ Permanently removed WOCN consulted</td>
</tr>
<tr>
<td></td>
<td>AM</td>
<td>☐ Intact&lt;br&gt;☐ Nonblanchable erythema or color different from skin tone/stage I PU&lt;br&gt;☐ Partial thickness/stage II PU&lt;br&gt;☐ Full thickness/stage III or IV PU/unstageable PU&lt;br&gt;☐ Evidence of DTI&lt;br&gt;☐ Exclusion criteria met&lt;br&gt;☐ Other (describe):</td>
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<td>☐ Reapplied&lt;br&gt;☐ Changed&lt;br&gt;☐ Permanently removed WOCN consulted</td>
</tr>
</tbody>
</table>

***PLEASE COMPLETE ON EVERY PATIENT MEETING CRITERIA FOR ALLEVYN SACRAL DRESSING***
ADD additional sheets as needed. Once completed, place in allotted bin in the unit for collection.

Figure 1  Data collection tool.
Abbreviations: DTI, deep tissue injury; PU, pressure ulcer; WOCN, wound ostomy continence nurse.

Five patients experienced unanticipated skin issues during the trial. Two patients had a deep tissue injury (DTI) develop, 1 had a stage I pressure ulcer develop, and 1 had a blister develop on the sacrum. In all of these cases, the dressing was immediately removed upon discovery of the skin changes, a WOCN was consulted, and further treatment was implemented, if recommended by the WOCN. The fifth case was a DTI located on the patient’s left buttock that resulted from pressure caused by the patient lying on a partially dislodged sacral dressing. Upon discovery of the altered dressing integrity, this patient was treated appropriately with a wound care consultation and the application of a mild topical vasodilator, and the DTI resolved.

Figure 2  Flow chart shows how study’s sample size was determined.
Discussion

Minimizing pressure ulcers is an important issue for the management of critically ill patients. The intention of the study was to see if the use of a new product on the market would improve outcomes in our patients at high risk for pressure ulcers. Study findings revealed that during the 7-month trial, use of the dressing led to decreases in the incidence of pressure ulcers on the sacral, coccyx, and buttock area in all 3 ICUs. These findings suggested that the dressing could decrease cost for institutions and improve patient care, contributing to the body of knowledge about interventions to minimize the risk of pressure ulcers. Our results were similar to those of Santamaria et al, Chaiken, and Walsh et al. Education and reminders to the bedside staff on exactly how to apply and use the dressing are imperative to the prevention of pressure ulcers in patients.

Limitations and Strengths

Because of the nature of the prospective study design, demographic information was not collected. This lack of demographic data prevented a direct comparison between the pretrial population and the population during the trial. Other risk factors for pressure ulcers, not related to the prophylactic dressing, may have differed between these 2 populations, thus biasing the results of this trial. Additionally, the study sample was nonrandomized; it was a convenience sample that looked only at feasibility. Interrater reliability could not be assessed because repositioning of patients was not monitored. Documentation was incomplete in 43 of the patients who had the dressing applied, making it impossible to track the reason for application and wear time in those patients. Multiple initiatives were taking place during this time frame that also focused on prevention of pressure ulcers. A multidisciplinary hospital-acquired pressure ulcer committee was developed in September 2011 that evaluated wound care practices, policies, and products and implemented changes, all with the common goal of decreasing the incidence of pressure ulcers. Dermal defense champions were chosen in February 2012, and their focus was to receive monthly education on pressure ulcer prevention and then relay that information at the unit level to staff nurses. The units had increased education and awareness during this period, which caused more active participation. The decrease in pressure ulcer incidence during the intervention phase improved patients’ outcomes.

Conclusion

The results of this study indicated that a prophylactic sacral dressing may prevent ICU-acquired sacral pressure ulcers. Future studies could evaluate the effects of prophylactic dressings in conjunction with a critical care bundle for prevention of pressure ulcers that addresses nutritional status and frequent repositioning. Conducting a randomized controlled trial would be beneficial for further
Table 3
Improvements seen in each unit in the study during the Allevyn trial period

<table>
<thead>
<tr>
<th>Unit</th>
<th>Pressure ulcer incidence (per 1000 patient days)</th>
<th>Rate difference (per 1000 patient days)</th>
<th>Incidence rate ratio</th>
<th>95% CI</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgical coronary care</td>
<td>13.00</td>
<td>5.38</td>
<td>7.62</td>
<td>0.41</td>
<td>0.16-1.09</td>
</tr>
<tr>
<td>Medical coronary care</td>
<td>7.40</td>
<td>3.96</td>
<td>3.44</td>
<td>0.54</td>
<td>0.16-1.78</td>
</tr>
<tr>
<td>Medical intensive care</td>
<td>6.98</td>
<td>3.40</td>
<td>3.58</td>
<td>0.49</td>
<td>0.14-1.73</td>
</tr>
</tbody>
</table>

analysis of the effects of the dressing itself. It would be useful to study the cost-effectiveness of such interventions. Also, it would be useful to study prophylactic dressings on other body areas prone to pressure damage, such as around devices or specialty equipment.

FINANCIAL DISCLOSURES
Some of the Allevyn dressings were donated by the manufacturer, Smith & Nephew (120 dressings comprising approximately 50% of 1 month's supply). However, this donation covered only a portion of necessary supplies. Additional supplies were provided by Thomas Jefferson University Hospital. Smith & Nephew played no role in the design of the research study or the collection of data and was not considered a contributing partner or coauthor.

REFERENCES

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SEE ALSO
For more about preventing pressure ulcers, visit the Critical Care Nurse Web site, www.ccnnonline.org, and read the article by Cooper, et al, “Against All Odds: Preventing Pressure Ulcers in High-Risk Cardiac Surgery Patients” (October 2015).

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