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### Reducing Hospital Acquired Pressure Ulcers

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REDUCING HOSPITAL ACQUIRED PRESSURE ULCERS

by

Jessica M. LeBlanc

A Major Paper Submitted in Partial Fulfillment

of the Requirements for the Degree of

Master of Science in Nursing

in

The School of Nursing

Rhode Island College

2015

## Abstract

Pressure ulcers have been a persistent issue in hospitals for many years and continue to remain a major cause of morbidity and mortality. Most hospital acquired pressure ulcers (HAPUs) are considered preventable and are identified by the National Quality Forum as a nurse-sensitive quality indicator. Intensive care patients in particular tend to be at a higher risk to develop PUs and prevention in the intensive care population continues to be a major challenge in many hospitals. Recently, some intensive care units have been utilizing a preventative silicone foam barrier dressing applied to patients admitted to the unit in order to reduce the incidence of HAPUs. The purpose of this research was to determine if a silicone foam border dressing applied to medical intensive care patients would result in a decreased sacral HAPU occurrence rate in the medical ICU. The data collection took place at the Miriam Hospital, a 247-bed tertiary care hospital in Providence, Rhode Island. The medical ICU at the Miriam Hospital is a 16-bed unit. A retrospective chart review was conducted on 250 medical records that were coded with ICD-9 codes for pressure ulcers. Group One (treatment group) included medical intensive care unit patients who had preventative dressings applied to the sacrum. Group Two (comparison group) included patients who did not have a preventative dressing applied. Results demonstrated that there was a decrease in the occurrence rate of HAPUs after the preventative dressings were initiated. Recommendations and implications for advanced practice nursing are discussed.

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## Reducing Hospital Acquired Pressure Ulcers

### **Background/Problem Statement**

Pressure ulcers (PUs) have been a persistent issue in hospitals for many years and remain a major cause of morbidity and mortality (Salcido & Popescu, 2009). Hospitals have continued to strive to prevent the problem of hospital acquired pressure ulcers (HAPUs). These efforts have been heightened since the Centers for Medicare and Medicaid implemented a value-based purchasing initiative to reduce preventable, hospital-acquired conditions. This initiative eliminates payment for 11 conditions, including PUs (Spetz & Brown, 2013). Shortly after, private insurers started developing programs to end payments for certain hospital acquired conditions.

Most HAPUs are considered preventable and identified by the National Quality Forum as a nurse-sensitive quality indicator (Spetz & Brown, 2013). Acute care hospitals treat approximately 2.5 million PUs per year, and the cost of treating all PUs in the United States (US) is estimated at up to \$11 billion annually (Landro, 2007). The cost varies based on the stage of the pressure ulcer: Stage 1 pressure ulcers can cost slightly over \$2000; Stage 2 PUs are more likely to cost between \$3,000 and \$10,000; a stage 3 PU averages between \$5,900 to \$14,840, with stage 4 PUs costing from \$18,730 to \$21,410 (Spetz & Brown, 2013). The increased cost and the increased length of patient stay as a result of a PU make it imperative for hospitals across the nation to prevent PUs. Pressure ulcers are not only a detrimental cost to healthcare organizations, but also bring additional health and mental health costs to the affected patient (Spetz & Brown). For example, stage 4 PUs can lead to osteomyelitis, which can be debilitating

and life threatening to the patient. Pressure ulcers can also become infected, leading to sepsis, which can increase morbidity and mortality rates. Pain is a potential issue in patients that suffer from PUs and can lead to depression and decreased mobility. All of these issues affect the patients' quality of life. It is also estimated that 60,000 patients die from PU related complications each year (Spetz & Brown).

Preventing HAPUs continues to remain a focus for improving the quality of care in the current Healthy People 2020 objectives ([www.healthypeople.gov](http://www.healthypeople.gov)). Despite an increased focus on preventing HAPUs, the prevalence rates range from 14% to 17% and incidence rates range between 7% and 9% (Kelleher, Moorer, & Makic, 2012). Some of the external factors that can lead to the formation of pressure ulcers are pressure, shearing forces, friction, and moisture (Berlowitz, 2010). Host factors also play a role in the development of hospital acquired pressure ulcers including immobility, incontinence, poor nutrition, skin perfusion, and neurologic disease (Berlowitz).

Intensive care patients in particular tend to be at a higher risk to develop PUs (Chaiken, 2012) and prevention in the intensive care population continues to be a major challenge in many hospitals. Factors that can make an intensive care patient at higher risk include mechanical ventilation, vasopressor requirements, moisture trapping, and shear force when repositioning patients (Chaiken). Intensive care patients tend to have hemodynamic instability, are intubated on ventilators, cannot verbalize discomfort due to sedation or paralyzation, and can sometimes have multisystem organ failure.

Pressure ulcer prevention begins at the bedside with an accurate skin assessment by the nurse. Moisture and incontinence management, nutrition consults, and frequent

repositioning are just some of the current evidenced based practices hospitals are implementing (Levine, Sinno, Levine, & Saadeh 2013). Nurses can also use available risk assessment scales to determine if the patient is at low or high risk for the development of a HAPU. Prevention strategies include using mattress overlays, specialty beds, and waffle cushions for buttocks and heels. Advanced practice nurses need to also be aware of prevention methods that are currently utilized; so that they can best prevent PUs from developing.

Sometimes these prevention implementations are just not enough to prevent PUs, particularly in critically ill or other high risk patients. Recently, some intensive care units have been utilizing a preventative silicone foam barrier dressing applied to patients admitted to the unit in order reduce the incidence of HAPUs. The purpose of this research was to determine if a silicone foam border dressing applied to medical intensive care patients would result in a decreased sacral HAPU occurrence rate in the medical ICU. At the study site, the Miriam hospital medical ICU, a skin bundle had been used since late 2010 on all intensive care patients. Interventions from the skin bundle included Braden Scale scores that are documented daily on the critical care flow sheet. A Braden Scale score of 18 or less initiates a skin integrity plan of care in the patient's chart. Frequent repositioning of patients, moisture management, nutrition consults, incontinence care, skin assessments every shift, and obtaining pre-albumins were all part of the practice in the ICU. In late 2011, the medical ICU also began applying a preventative silicone foam dressing to the sacrum of all ICU patients to help reduce PU occurrence,



based on the premise that all of their patients were at high risk. This research explored the impact of the silicone foam dressing in this ICU.

Next, the review of literature will be presented.

## **Literature Review**

A review of literature was conducted using Pub Med and Ovid Database and combining the words pressure ulcer, prevention, risk assessment scale, dressing, and intensive care, from the years 2005-2014.

### **Incidence and Etiology of Pressure Ulcers**

The incidence rates of pressure ulcers reported in the critically ill can reach up to 56% (De Laat et al., 2007). In the acute care setting, the rate of HAPUs range from 7% to 33% (Ballard et al., 2008). Between 1995 and 2008, the incidence of HAPUs increased by as much as 80% (Sullivan & Schoelles, 2013). In the United States (US), it is estimated that 2.5 million patients will develop a PU annually. These rates are predicted to increase since the patient population most at risk of developing PUs is increasing, including people with diabetes, obesity, and the elderly.

Pressure ulcers usually develop over bony prominences, where unrelieved pressure damages underlying tissue. “Muscle and subcutaneous tissue are more susceptible to pressure than skin” (Ayello & Lyder, 2007, p. 36). Essentially four factors lead to the development of a PU, including pressure, shearing forces, friction, and moisture. The most significant cause is from pressure that interrupts arterial and venous blood flow to and from the skin or deeper tissues (McCance, Huether, Brashers, & Rote, 2010). Some of the following intrinsic factors are associated with the greatest risk: older adults in hospitals; neurologic disorders that can lead to loss of mobility or sensation; immobilization; incontinence; lying in bed for extended periods of time without repositioning; lying for hours on a operating room table; and malnutrition (McCance et

al.). The critically ill patient has additional extrinsic risk factors such as vasopressor requirements, fecal incontinence, anemia, those greater than 60 years of age, renal insufficiency, lengthy hospital stay, and sepsis. Pressure sores generally tend to develop over bony prominences that include, but are not limited, to the sacrum, heels, ischia, and the greater trochanters (McCance et al.).

The National Pressure Ulcer Advisory Panel (NPUAP, 2007) developed the staging system that is currently used to determine the stage of PUs. A stage 1 is a nonblanchable erythema over intact skin that is generally over a bony prominence. Stage 2 pressure ulcers are partial-thickness skin loss involving epidermis or dermis looking like a shallow open ulcer that has a red or pink wound bed without any slough. A stage 3 involves full-thickness tissue loss. Subcutaneous fat may be visible but bone, tendon, or muscle is not exposed. Slough may be present but does not obscure the depth of tissue loss. Stage 3 pressure ulcers can also involve tunneling or undermining of the wound. Stage 4 pressure ulcers have full-thickness tissue loss with exposed bone, tissue, or muscle. Slough or eschar may be present along with tunneling or undermining. Stage 4 can extend into muscle and other supporting structures such as fascia, tendon, or joint capsule. An unstageable pressure ulcer is a full-thickness tissue loss that has a base covered with slough and/or eschar in the wound bed which can make the depth of wound unknown. Lastly, a suspected deep tissue injury is a localized area of intact skin that is purple or maroon in color, or a blood filled blister due to damage of underlying tissue which is caused from pressure or shearing. The deeper the pressure ulcer the more detrimental it can be to the patient. The necrotic tissue in the wound initiates the

inflammatory response that can lead to pain, fever, and leukocytosis. Patients who are immunosuppressed or have diabetes can develop an infection that can lead to septicemia. Some deep pressure ulcers may require surgical debridement of the necrotic tissue, and skin grafting for wound closure and healing. The primary goal for these at risk patients is prevention of pressure ulcers (NPUAP).

### **Risk Assessment**

Many hospitals have been and continue to implement strategies to attempt to reduce the incidence of HAPUs. A variety of assessment scales exist; however, the Braden Assessment Scale is one of the most widely used around the world (Slowikowski & Funk, 2010). The Braden Pressure Sore Risk Assessment Scale is used to identify patients who are at risk for developing a pressure ulcer. The bedside nurse uses this scale along with his/her assessment skills to identify factors that are known to increase a patient's risk for a pressure ulcer. Compared to other risk assessment scales, the Braden Scale has demonstrated the best overall sensitivity and specificity for predicting PU risk in all acute care patients. The weighted positive predictive value is 22.9% (Pancorbo-Hidalgo, Garcia-Fernandez, Lopez-Medina, & Alvarez-Nieto, 2006). Although the Braden scale is used across patient populations, its discriminatory value in the ICU setting has been questioned since most patients tend to be classified as "at risk" (Slowikowski & Funk, 2010).

The Braden Scale has score ranges from 6 to 23. The scale is composed of six factor subscales: mobility; activity; sensory perception; nutrition; moisture; and friction/shear. The total patient score is used to predict the overall risk of developing

pressure ulcers. Scores of 19-23 usually are indicative of no risk, 15 to 18 are associated with mild risk, a 13 to 14 is a moderate risk, 10 to 12 is high risk, and 6 to 9 is very high risk (Tescher, Branda, Byrne, & Naessens, 2012). Critical care patients generally fall in the high to very high-risk scores a majority of the time. When a patient has a Braden score of 18 or less, it indicates that interventions need to be taken to protect the patient from developing a pressure ulcer and the specific factors placing them at risk (Tescher et al., 2012).

Tescher et al. analyzed Braden Risk Scores to improve identification of risk factors for PU development. The purpose of their study was to determine whether factors other than the Braden Scale score could be used to more accurately predict the development of PUs among the patients that were identified as at risk. The goal of the study was to improve the ability to identify high-risk patients and the specific factors that placed them at high risk. The study was designed as a retrospective cohort analysis of electronic medical record data from adult patients at the Mayo Clinic Rochester campus and included patients in the progressive care and intensive care units from January 1, 2007 to December 31, 2007. Medical records for 12,566 patients were examined and only hospital-acquired stage 2 to 4 pressure ulcers were included. Age, gender, body mass index (BMI), medical versus surgical treatment within the first 24 hours of admission, Braden Scale score and subscale scores at unit admission, length of stay, ICU admission at the time of hospitalization, and presence of acute renal failure, respiratory failure, or diabetes were also extracted from the medical records. The data analysis focused on the Braden Scale assessment performed at the time of admission. The authors

also used the length of time from admission to first documentation of PU development for data analysis. The mean age of the population was  $64 \pm 17$  years. Of the 12,566 patients who met inclusion criteria, 416 developed a stage 2 to 4 pressure ulcer (3.3%). The total Braden score was shown to be highly predictive of PU development. The Braden subscale scores were also found to be predictive of PU development, with friction and shear having the greatest predictive power. The findings suggest that the total Braden scores alert clinicians to the need for more aggressive assessment of ICU patients at risk for PU development. Limitations included other PU interventions that may have influenced results, that only high-risk patients were studied, and that the focus was on risk status at time of admission.

In 2006, a systematic review was conducted to determine the effectiveness of using risk assessment scales for PU prevention in clinical practice, degree of validation of risk assessment scales, and effectiveness of risk assessment scales as indicators of risk of developing a PU (Pancorbo-Hidalgo et al., 2006). Thirty-three studies were included in the review; three were on clinical effectiveness and the rest were on scale validation. The authors found that the use of the risk assessment scales increased the intensity and effectiveness of prevention interventions. The Braden scale showed optimal validation and the best sensitivity/specificity balance (57.1%/67.5%) and that the score was a strong pressure ulcer risk predictor. The Norton scale had reasonable scores for sensitivity (46.8%), specificity (61.8%), and risk prediction, and the Waterlow scale showed high sensitivity score (82.4%), but had low specificity (27.4%), with a good risk prediction score (Pancorbo-Hidalgo et al.). The nurses' clinical judgment demonstrated moderate

scores for sensitivity and specificity, but was not a good risk predictor. The authors concluded that there was not enough evidence to claim that the use of a risk assessment scale decreases the incidence of a PU, but validated scales do increase the number of early interventions used to reduce the incidence of a pressure ulcer (Pancorbo-Hidalgo et al.).

Slowikowski and Funk (2010) reported on development of a PU risk assessment tool for use in this specific population that would incorporate co-morbidities and other factors that are currently not addressed in other scales. The method was a prospective, descriptive, cross-sectional study that was carried out in two phases between March 2005 and May 2008. The setting was a 14 bed surgical ICU at Yale-New Haven Hospital. During phase 1, the authors reviewed literature to determine co morbid conditions associated with PU incidence in the critical care setting and developed the first draft of the SICU Pressure Ulcer Risk Assessment Scale (SPURA). Factors that were identified included age, gender, diabetes mellitus, end-stage renal disease, hemodialysis, continuous renal replacement therapy, peripheral vascular disease, neurological deficit, hypotension, vasopressor use, anemia, edema, ventilator support, time in operating room greater than four hours, not being repositioned, immunosuppression, receiving steroids, no nutrition, orthotics, and the Braden scale score. Three experts then validated the scale and based on a review of 230 SICU patients, the authors then modified the scale.

Phase 2 involved data collection on an additional 139 patients. The results showed that 88 patients developed PUs; 60% of the patients were deemed high risk. Three factors were significantly and independently associated with PU development:

lower Braden score; presence of diabetes mellitus; and an age of  $\geq 70$ . The authors noted that the sensitivity of the Braden scale is not well understood in the ICU setting compared with general or long-term care floors. One limitation in the study was the use of a convenience sample, and that they did not have complete data on all variables.

Additional research is needed to determine the potential value of the SPURA to determine PU risk in the critical care settings.

### **Strategies to Prevent Pressure Ulcers in the ICU**

Preventing PUs in the intensive care population has been gaining more attention over the past few years. Intensive care patients in particular tend to be at a higher risk to develop PUs (Chaiken, 2012) and prevention in the intensive care population continues to be a major challenge in many hospitals. Although the Braden scale is used in intensive care units as a risk assessment tool, its value has been questioned since most intensive care patients are seen as being high risk (Chaiken). Current evidence-based practice suggests some of the following modalities for prevention and treatment of HAPUs: repositioning; enteral and parenteral feedings; specialized mattresses; wound liaison nurse; risk assessment scales; and staff education (Levine et al., 2013).

Ballard et al. (2008) described how nurses in one ICU reduced the number of HAPUs. A task force made up of leadership and bedside nurses developed a plan to reduce the number of HAPUs in the ICU. The hospital joined NDNQI in 2004; at that time quarterly prevalence rates of HAPUs in the ICU over the course of the first year were 30%. The ICU was a 44 bed mixed surgical and medical unit. The nursing staff consisted of 125 RNs who used the primary nursing model to deliver patient care. The



task force developed seven strategies to improve HAPU rates in the ICU. The first strategy was to redesign risk assessment and documentation. It had been found that routine skin assessment and documentation were inconsistent, and there were knowledge deficits among staff related to PU prevention and wound care. Strategy number 2 was to translate numeric data from the NDNQI quarterly reports into easy to understand graphs. The third strategy was increased staff awareness by posting a communication board in both ICUs, and discussing the data at staff meetings. Next, turn rounds were implemented, which led to an increase in the frequency of turning and improved patient outcomes. Strategy five included increased prevalence assessment and a redesigned “skin team”. Utilizing evidenced based practice followed: the Braden scale score was charted once a shift instead of weekly; staff were instructed on how to use the score to implement prevention strategies; pressure relief surfaces were ordered more frequently; and a trial of a new skin wipe was implemented. Last, a database was created to track weekly prevalence. Decreased HAPU rates (goal of less than 12.4%) were achieved in all but one quarter over the following 18 months.

A quality improvement project was conducted on a 17 bed SICU in an academic medical center in Colorado. The project focused on the effect of nurse-to-nurse bedside rounding as a strategy to decrease HAPUs (Kelleher et al., 2012). The authors implemented weekly peer-to-peer bedside skin rounds on the SICU. The wound/ostomy nurse trained two nurses to be skin champions to conduct weekly skin rounds, which included discussions about key elements of the patients’ skin status, including Braden Scale scores. They also discussed the implementation of specific interventions related to

the subscale risk assessment. When a PU was present, the current plan of care was reevaluated for its effectiveness. During the quality improvement project, the frequency of preventative interventions increased, including the use of prevention surfaces, repositioning, nutrition interventions, and moisture management. Before the implementation of nursing rounds, the HAPU prevalence on the unit was 27%, and after the rounds were conducted the HAPU rates trended down and were 0% for three consecutive quarters.

### **Preventative Dressings Utilized in the ICU**

Bots, Vrouwe Gasthuis, and Apotheker (2004) conducted a study in which a trial of self-adhesive hydropolymer foam dressings demonstrated prevention of friction-related PUs on heels of patients. The study evaluated the dressings' effectiveness in surgical patients. A total of 140 surgical patients were screened, and were assigned to one of two groups: an intervention group and a comparison group. The dressings were applied to the patients' heels based on a risk assessment using a modified Norton scale, and the heels were inspected daily for up to 10 days. A 76.7% reduction in heel PUs in the group that used the preventative dressing was demonstrated. Following the trial, use of the foam dressing became a standard preventative measure in the ICU and the prevalence of heel ulcers decreased by 72% in two years.

Torra et al. (2005) compared the effects of Mepentol, which is a hyper oxygenated fatty acid preventative dressing with a placebo in preventing PUs. This research study consisted of a multicentre double-blind randomized clinical trial. A total of 331 patients completed the study: 167 in the control group and 164 in the study group.

Pressure ulcer incidence during the study was 7.32% in the prevention group versus 17.37% in the placebo group. The conclusion was that Mepentol was a cost effective measure for preventing PUs.

Nakagami et al. (2006) conducted a quasi-experimental clinical trial to compare the shear forces exerted over the heel between a preventative PU dressing and a thin-film dressing. The study enrolled 30 elderly hospitalized patients, all of whom had a Braden score less than 14. A shear force sensor was attached to one heel with the dressing applied over both heels. Results included that the dressings did not reduce interface pressure ( $p = .4198$ ). Results suggested that heel elevation in immobile patients is still needed. More research is needed to determine if preventative dressings can reduce shear force and can also reduce PU formation in other body parts.

### **Silicone Foam Border Preventative Dressings**

Over the past few years, hospitals have increasingly reported on use of a preventative type of silicone foam border dressing called the Mepilex border to decrease the incidence rates of sacral HAPUs. These preventative dressings are being applied to the sacrums of mainly ICU level patients that are deemed high risk (Brindle, 2010).

A performance improvement project was conducted in a surgical trauma intensive care unit in Virginia to address the high incidence rate of PUs in the ICU (Brindle, 2010). This three-month performance improvement project surveyed 93 patients whom were admitted to the unit. All patients were screened with the Braden scale and then the high-risk tool developed by the author. Forty-one of those patients were deemed “high risk” using a tool developed by the researcher. All patients on the unit were provided with an

intervention bundle that was standard of care; the 41 study subjects had an absorbent, soft silicone self-adherent dressing applied along with having the standard intervention bundle in place. Zero of the 41 intervention subjects developed HAPUs, while six out of the 52 patients that did not have the dressing applied developed a PU. No data were reported as to the characteristics of the two groups prior to the intervention.

The same author (Brindle & Wegelin, 2012) conducted a similar study of cardiac surgery patients to determine the impact of the preventative dressing on HAPUs. The study took place at the Virginia Commonwealth University Medical Center in Richmond, Virginia. Patients that were admitted to the unit were assigned to either the standard care comparison group (n=39), or the intervention group (n=56) that received the application of the silicone foam border dressing. Staff members were provided education prior to the start of the study on inclusion/exclusion criteria, dressing application, standard interventions for prevention, and data collection procedures. Patients that received the standard care had a zinc-based skin protectant applied twice a day along with other standard daily skin interventions and a low air loss surface applied to the bed. The intervention group had the preventative dressing changed every three days throughout the length of stay in the cardiac surgery ICU. Eight of the PUs occurred in four out of 35 patients (11.7%) in the control group, and one PU in the intervention group (2%) that was a deep tissue injury. The author concluded that PU incidence was lower than expected in both groups, which may have been influenced by the staff utilizing the critical care prevention bundle as part of their standard interventions.

Chaiken (2012) conducted a study in a community based, level two trauma, 303-bed hospital in Chicago. The investigators used a nonexperimental prospective design for data collection to determine the prevalence of HAPUs in the ICU over a 35-month period prior to application of a silicone foam border dressing. They then studied the rates for six months after application of the border dressing. Staff inspected the participants' skin every 24 hours for skin conditions and dressings were changed twice a week on prescheduled days and more often for incontinence. During the 35-month observation period, the HAPU prevalence in the ICU was 12.3%; four out of the five patients that developed pressure ulcers during the prospective observational period had died. The preventative sacral dressing was then applied to 273 patients in the experimental group, with two patients refusing to participate. The comparison group involved 291 patients. During the six-month treatment period, five patients developed sacral HAPUs. All five PUs occurred during the first month of prospective data collection during the six month treatment period. The sacral HAPU prevalence rate in the ICU during the observation period was 12.3%. The author concluded that the ICU in the study was able to reduce their HAPU incidence rate to 1.8% after applying the silicone foam border dressings. The limitations were that the educational sessions with staff may have influenced the results, and that daily visits to the ICU by the wound nurse might have influenced the staff to reposition patients more frequently.

Walsh et al. (2012) conducted a similar study in Danbury, Connecticut at Danbury Hospital, a 371-bed regional medical center. The investigators applied the silicone foam border dressing to 69 patients admitted to the ICU that met inclusion criteria. The

investigators collected data for three months. The dressings were applied to the sacrum and remained there for the duration of the stay in the ICU. The patients were also placed on a low air loss mattress with a single draw sheet and a single absorbent incontinent pad. The ICU staff were provided education on the use of the dressings. Three out of 62 patients (4.8%) developed a sacral pressure ulcer, with Braden scale scores being 11 or 12. Authors found that the HAPU incidence decreased from 12.5% in 2009 to 7% in 2010, and attributed this to the standard preventative care that was implemented a year prior, along with application of the sacral silicone foam border dressings. It was suggested that the dressing absorbs moisture, enhances tissue tolerance to pressure, and decreases shear forces to the sacral area.

In summary, though the literature related to use of preventative dressings is limited, the available research supports the use of preventative dressings, along with other evidence based practice protocols for preventing PU in the ICU.

Next, the theoretical framework that guided this study will be presented.

### **Theoretical Framework**

The theoretical framework that will be used is Virginia Henderson's principles and practice of nursing. Henderson was educated during the empiricist era in nursing, which focused on patients needs (McEwen & Wills, 2011). Henderson believed that her theory grew through her experiences. The theory represents the patient as a sum of parts with biopsychosocial needs, and the patient is neither client nor consumer (McEwen & Wills). Henderson called her definition of nursing her "concept". Henderson stated that "the nurse is, and should legally be an independent practitioner and able to make independent judgments as long as he, or she, is not diagnosing, prescribing treatment for disease, or making a prognosis, but is the authority on basic nursing care" (Henderson, 1991, p. 22).

The major assumption of the theory is that a nurse cares for a patient until the patient can care for himself or herself. Henderson also assumed that nurses are willing to serve and that "nurses will devote themselves to the patient day and night" (Henderson, 1991, p. 23). She assumed that nurses should be educated at the university level in both the arts and sciences. Henderson believed that the nurse should assist the patient, either sick or well, in the performance of those activities contributing to health or its recovery. She defined the patient as someone who needs nursing care, but did not limit nursing to just illness care. The concept of nursing involved the nurse attending to 14 activities that will assist the patient towards independence. The 14 activities cover the whole practice of nursing, and her work is parsimonious in presentation, but complex in scope.

Henderson's work has had an impact on nursing research by strengthening the focus on nursing practice and confirming the value of tested interventions in assisting individuals to gain health (McEwen & Wills, 2011). Henderson's 14 activities include: breathe normally; eat and drink adequately; eliminate body wastes; move and maintain desirable postures; sleep and rest; select suitable clothes; maintain body temperature within normal range by adjusting clothing and modifying environment; keep the body cleaned and well groomed and protect the integument; avoid dangers in the environment and avoid injuring others; communicate with others; worship according to one's faith; work in such a way that there is a feeling of accomplishment; participate in various forms of recreation; and learn, discover, or satisfy the curiosity that leads to normal development and health (Henderson, 1991).

In Henderson's theory, some of the basic needs that she mentions are critical to the prevention of PUs. Addressing patients' nutritional needs, keeping the body clean and free of moisture, and maintaining proper body alignment are everyday nursing tasks that prevent patients from developing PUs. However, even though these needs are being met and addressed by the registered nurse taking care of the patient, pressure ulcers can still develop. This research applied basic principles from Henderson's theory and expanded them to include examination of a preventative dressing protocol which was used at the study site to examine the impact on development of hospital acquired pressure ulcers.

Next, the study methodology will be presented.



## **Methodology**

### **Purpose**

The purpose of this research was to determine if a silicone foam border dressing applied to medical intensive care patients would result in a decreased occurrence of sacral HAPUs.

### **Research question**

What is the impact of a silicone foam border preventative dressing applied to the sacrum on the occurrence of HAPUs in the medical ICU?

### **Site and Sample**

The data collection took place at the Miriam Hospital, a 247-bed tertiary care hospital in Providence, Rhode Island. The medical ICU at the Miriam Hospital is a 16-bed unit.

The sample included subjects that had been hospitalized in the medical ICU. Inclusion criteria included: either gender; age of 18 and older; length of stay in the ICU for 48 hours or more; a Braden Scale score of less than or equal to 18; and a PU diagnosis. The exclusion criteria included skin breakdown to the sacrum prior to coming into the hospital, a Braden scale score of 19 or higher, CMO status, and an ICU length of stay less than 48 hours.

### **Design**

The research involved a two group design with a retrospective chart review of medical intensive care patients who had been hospitalized at the Miriam Hospital. Group

1 (treatment group) included medical intensive care unit patients who had silicone foam border dressings applied to the sacrum, hospitalized between January 2011 through December 2011. Group 2 (comparison group) included patients cared for in the medical ICU from January 2010 through December 2010, and who did not have the silicone foam border dressing applied. The independent variable was the silicone foam sacral preventative dressing application; the dependent variable was the number of HAPUs.

### **Procedures and Timeframe**

The student researcher performed the data collection. After obtaining approval from the RIC and Lifespan IRB, the researcher obtained a list from medical records and coding department utilizing the ICD nine codes for PUs during each time frame from both groups. Records from one year before the dressings were implemented in the medical ICU (comparison group; January 2010- December 2010) were reviewed as well as for one year after the border dressings were implemented (treatment group; January 2011- December 2011). Data collection took place during the summer of 2014, during which time 200 records were reviewed on patients with documented pressure ulcers of any stage.

### **Measurement**

The researcher designed a data collection tool from the literature and clinical experience. If during record review a pressure ulcer was detected, the following data were extracted: stage of PU (stage 1-4 and DTI); sex; age; BMI; if NPO for > 48 hours; daily Braden Scale score; length of stay in the ICU; use of vasopressors; mechanical ventilation; sedation/paralytic; restraints; presence or absence of diabetes; presence of

preventative dressing; and prealbumin < 20. The medical record number was used in order to retrieve the record, but was not recorded on the data collection sheet. Data were stored in a locked file to which only the student researcher and PI had access.

### **Data Analysis**

Descriptive statistics were conducted on study variables. Rates of HAPU occurrence among the groups were calculated to determine if there was a decrease in the number of HAPUs in the ICU after the preventative dressings were utilized.

## Results

After obtaining IRB approval, a generated report of ICD-9 codes for pressure ulcers was obtained from the medical coding department at the Miriam hospital. A total of 220 patient records were reviewed to determine whether inclusion criteria were met. The coding system was not able to differentiate between HAPUs and community acquired pressure ulcers but the researcher excluded all community acquired pressure ulcers after preliminary review. The coding system also did not differentiate between HAPUs acquired on medical-surgical units versus the ICU, which required careful review by the researcher to distinguish and exclude those HAPUs not occurring in the ICU.

Out of the 220 records reviewed, only 11 patients met the inclusion criteria for this study. Two groups were identified: Group 1 included subjects who that did not receive the preventative dressing (n = 9); Group 2 included subjects who had the preventative dressing applied (n = 2).

The age range for Group 1 subjects was 53-86, with the mean age of 72; the subjects in Group 2 were older, with an age range of 74-78 and a mean of 76. In Group 1, there were 5 males and 4 females, with two males in Group 2. The BMI was an intended variable for data collection, but it was not consistently charted so will not be reported. Length of stay (LOS) for Group 1 subjects ranged from 8-29 days, with a mean of 18.2 days in comparison to 11-78 days for Group 2.

Table 1 illustrates the relevant data for subjects in the two groups.

Table 1

*Key Variables by Group (N = 11)*

Variables	Group 1 (n = 9)	Group 2 (n = 2)
	No Preventative Dressing	With Preventative Dressing
NPO > 48 hours	8/9 (89%)	2/2 (100%)
Vasopressor Use	8/9 (89%)	2/2 (100%)
Mechanical Ventilation	9/9 (100%)	2/2 (100%)
Sedation/ Paralytics	9/9 (100%)	2/2 (100%)
Restrained	9/9 (100%)	2/2 (100%)
Diabetic	4/9 (44.4%)	0/2 (0%)
Prealbumin <20	9/9 (100%)	2/2 (100%)
Braden Scale < 18	9/9 (100%)	2/2 (100%)
Pressure Ulcer ≥ Stage 2	9/9 (100%)	2/2 (100%)

Table 1 supports that subjects in the two groups were generally comparable on key variables, with the exception that no subjects in Group 2 were diabetic. The majority of the subjects in both groups were NPO for 48 hours or greater, had a prealbumin <20, were on mechanical ventilators, were being medicated with both vasopressors and sedatives/paralytics, and had Braden scores <18. All of the patients were restrained with soft wrist restraints.

The occurrence of pressure ulcers in Group 1 was nine (9/9; 100%) as compared to two (2/2; 100%) in Group 2.

Next, the summary and conclusions will be presented.

## Summary and Conclusions

Pressure ulcers (PUs) have been a persistent problem in hospitals for many years and continue to be a major cause of morbidity and mortality (Salcido & Popescu, 2009). Pressure ulcers are identified by the National Quality Forum as a nurse-sensitive quality indicator and most hospital acquired pressure ulcers (HAPUs) are considered preventable (Spetz & Brown, 2013). Acute care hospitals treat approximately 2.5 million PUs per year and the cost of treating all PUs in the US is estimated at up to \$11 billion annually (Landro, 2007). Hospitals have continued to strive to prevent the problem of HAPUs. These efforts have been heightened since CMS implemented a value-based purchasing initiative to reduce preventable, hospital-acquired conditions. Preventing HAPUs continues to remain a focus for improving the quality of care in the current Healthy People 2020 objectives ([www.healthypeople.gov](http://www.healthypeople.gov)).

Despite an increased focus on preventing HAPUs, the prevalence rates in hospitals range from 14% to 17% and incidence rates range between 7% and 9% (Kelleher et al. 2012). Intensive care patients in particular tend to be at a higher risk to develop PUs (Chaiken, 2012) and prevention in the intensive care population continues to be a major challenge in many hospitals. Factors that can make an intensive care patient at higher risk include mechanical ventilation, vasopressor requirements, moisture trapping, and shear force when repositioning patients (Chaiken). Recently, some intensive care units have been utilizing a preventative silicone foam barrier dressing applied to patients admitted to the unit in order reduce the incidence of HAPUs.

The purpose of this research was to determine if a silicone foam border dressing applied to medical intensive care patients would result in a decreased occurrence of sacral HAPUs in the medical ICU. The data collection took place at the Miriam Hospital, a 247-bed tertiary care hospital. The sample included subjects that had been hospitalized in the medical ICU. Inclusion criteria included: either gender; age of 18 and older; length of stay in the ICU for 48 hours or more; a Braden Scale score of less than or equal to 18; and a PU diagnosis. The exclusion criteria included skin breakdown to the sacrum prior to coming into the hospital, a Braden scale score of 19 or higher, CMO status, and an ICU length of stay less than 48 hours.

The researcher designed a data collection tool from the literature and clinical experience. If a pressure ulcer was detected during record review, the following data were extracted: stage of PU (stage 1-4 and DTI); sex; age; BMI; if NPO for > 48 hours; daily Braden Scale score; length of stay in the ICU; use of vasopressors; mechanical ventilation; sedation/paralytics; restraints; presence or absence of diabetes; presence of preventative dressing; and prealbumin < 20. Out of the 220 records reviewed, only 11 patients met the inclusion criteria for this study.

Two groups were identified: Group 1 included subjects (n = 9) who had not received the preventative dressing; Group 2 included two subjects who had had the preventative dressing applied. The use of mechanical ventilation, restraints, vasopressors, sedation/paralytics, prealbumin < 20, and Braden < 18. There were five males in Group 1 and four females, while in Group 2 both patients were males; mean



group ages were 72 and 76 respectively. Nine pressure ulcers occurred in Group 1 (no preventative dressing) as compared to two in Group 2 (with preventative dressing).

Limitations in this research included the use of one 16 bed ICU in one hospital. Inconsistent and incomplete data on some of the ICU documentation flow sheets limited data collection. For example, not all of the patients that were admitted to the ICU had a documented BMI score, so BMI was unable to be included. Also, the medical coding system utilizing ICD-9 codes to identify patients with documented pressure ulcers was unable to differentiate community acquired pressure ulcers from HAPUs as well as pressure ulcers acquired on the medical surgical floor from those acquired in the ICU. The ICU was implementing a skin care bundle when the preventative dressings were utilized, which may have influenced the lower overall incidence of HAPUs. Finally, no attempt was made to examine ethnicity and potential differences in treatment and outcomes by ethnicity.

In summary, this study compared the impact of standard preventative treatment versus a sacral preventative dressing in decreasing the occurrence of pressure ulcers in a medical ICU. Findings suggest that utilizing preventative sacral dressings may be helpful in reducing the occurrence of HAPUs in ICUs.

Next, recommendations and implications for practice will be discussed.

### **Recommendations and Implications for Advanced Practice Nursing**

Reducing hospital acquired pressure ulcers is now and will continue to be a focus of acute care facilities' goals of care and quality metrics. Hospital acquired conditions need to be reduced as much as is reasonably possible from health care institutions. These conditions, including HAPUs, are not only costly to the health care system, but are devastating both physically and mentally to patients and their families. Preventative measures must be utilized by health care providers to reduce occurrence rates of HAPUs and to provide exceptional care to patients. The APRN should strive to prevent HAPUs not just for financial benefits but for best patient outcomes.

All members of the health care team are responsible for providing best practices to promote wellness and prevent illness. The advanced practice nurse, bedside nurse, physical therapist, occupational therapist, nutritionist, and other key members of the health care team need to all be aware of and involved with the patients' plan of care and cohesively develop preventative measures that will provide safe, effective care. Skin assessments, multidisciplinary rounds, and reviewing the nursing record are part of the APRNs responsibility. Preventative dressing are just one of the many interventions that practitioners can implement for reducing HAPUs and promoting best practices. Advance practice nurses need to not only write the orders for the interventions but also evaluate the effectiveness. Adapting the patients' plans of care as necessary so that patients are free from harm needs to be on the APRNs agenda. Those APRNs in the ICU setting need to be even more observant of this high risk population. As patient advocates, APRNs

need to make PU prevention part of every high risk patient's plan of care. In a health care era that is wellness focused and reimbursement is determined by metrics, including quality of care, APRNs need to be extremely cognizant of not only providing the best care for the patient but reducing HAPUs that can be detrimental to the patient and the acute care institution. Advanced practice nurses have responsibility to the patient but also to the institution to which they are employed. Thus, APRNs can be instrumental in saving the health care facility money by preventing hospital acquired conditions.

Educating other members of the health care team and acting as a change agent are also qualities of the advanced practice nurse. Educating bedside nurses as well as certified nursing assistants on preventative strategies, including the application of preventative dressings, should be part of the advanced practice role. Teaching team members, including patients and families, is a key role, along with role modeling best practices. Advanced practice nurses may teach by example, through bedside patient encounters, hands on teaching and role modeling, and also through more formal means such as continuing education geared toward PU prevention. As a member of the medical team, the NP can be influential in raising the awareness of medical colleagues about PU prevention and management. The APRN should consult with other team members, including physicians, the certified wound nurse and clinical nurse specialists, to discuss current options available for high risk patients. In collaboration with others, the APRN may be instrumental in trialing new and promising products in the facility.

Advanced practice nurses are leaders and should be actively involved in developing best practice policies and guidelines that are prevention focused. Advanced

practice nurses are essential in assuring that best care practices are followed. As leaders, they need to role model best practice, whether it be discussing current research on hospital acquired conditions during medical rounds on patients, or joining different committees to be an advocate for the practice of APRNs. Advanced practice nurses need to be involved with other LIPs and members of the health care team to develop order sets for skin assessment and PU prevention. As leaders, they also need to be up to date on current health care policies not only at an institutional level, but on a governmental level. Knowing current health care policy and lobbying at the state level for change and reform need to be on the APRNs agenda. On a national level, APRNs may be aware of and potentially involved in national organizations like the National Pressure Ulcer Advisory Panel to promote updated clinical practice guidelines. Effective and open communication will promote leadership and a positive change for the profession.

Advanced practice nurses need to be up to date on current evidenced based practice and research for treatment and prevention of HAPUs in order to ensure that best practices are being followed. Advanced practice nurses should be involved in research that is focused on preventing hospital acquired conditions and may be involved in applying for grants to trial new prevention measures that may reduce the occurrence of HAPUs. Potential areas of research include trialing new preventative measures, skin bundles that other facilities may be utilizing for PU prevention, and tools and scales other than the Braden scale that may be more sensitive to determine a higher risk population for skin breakdown. More research with culturally diverse samples is needed.

Advanced practice nurses' scope of practice involves not only treating the illness but rather the whole person. A HAPU can be extremely detrimental to the patient's physical, mental, emotional, and spiritual health, and in some instances even lead to death. Providing the best, most cost effective, and safest care possible is what APRNs should strive for. This is what makes the APRN different from other LIPs. We embrace and treat the individual as a whole person rather than just looking at them as one illness or one body part. We establish a professional relationship with not only the patient but other members of the health care team to not only promote best practice but in addition, promote health and prevent illness.

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Appendix A  
Data Collection Tool

Age				
Sex				
BMI				
NPO > 48 hours				
Braden Score				
Length of stay in ICU				
Vassopressor use				
Mechanical ventilation				
Sedation/paralytics				
Restraints in use				
Diabetic				
Mepilex Border applied				
Prealbumin < 20				
Presence and stage of pressure ucler				