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Abstract

Superior skin care is a nurse-sensitive outcome measure (Young, T., & Clark, M. (2009). Re-positioning for pressure ulcer prevention (protocol). The Cochrane Database of Systematic Review (2009) 3). This study sought to decrease incidence and risk of skin breakdown in the pediatric cardiac intensive care unit (PCICU). The study was conducted in a large hospital in upstate New York. A practice guideline was created and guided PCICU nurses on the interventions for potential skin-breakdown issues in their patients. The patients had a significant change in skin breakdown with a one-sided Fisher's Exact Test ($p=.0422$). A logistic regression model showed intervention as a significant factor in reducing incidence of pressure ulcers and length of stay ($p=.0389$).

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Pediatric Skin Integrity Practice Guideline for Institutional Use: A Quality Improvement Project

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Introduction

Skin breakdown, which occurs in patients during the course of their hospitalization, leads to complications that increase health risks, complicate care, and increase the cost of care (Chan, Pang, & Kwong, 2009). The Center for Medicaid and Medicare mandates guidelines for the prevention and treatment of pressure ulcers which, if not implemented, can lead to legal responsibilities and financial implications for health-care centers (Young & Clark, 2009). Care of patients' skin is a nurse-sensitive outcome measure established by the American Nurses Association (Schindler et al., 2011). Current research is trying to find appropriate practices to use for prevention and treatment of pressure ulcers. Maintaining skin integrity in the critical-care environment is difficult because of patient acuity and the highly invasive interventions and therapies they receive (Galvin & Curley, 2012). Skin integrity is especially compromised for patients in the PCICU because of immobilization, multiple medical devices attached to the patient, and decreased oxygen saturation and perfusion in the patient.

The study of skin-breakdown prevention is a relatively new trend. It was not until 1990 that the federal government sponsored an effort to standardize approaches to skin-breakdown prevention and treatment. This effort resulted in several health-care disciplines coming together in 1994 to create clinical-practice guidelines (Bansal, Stewart, & Cockerell, 2005) that are still utilized today (Bergstrom, Braden, Kemp, Champagne, & Ruby, 1992, 1994).

The prevalence, prevention, and treatment of skin breakdown have been studied in adults, but research is lacking for children (Schindler et al., 2011). PCICU patients are at high risk for skin breakdown due to the need for prolonged positioning for invasive procedures, intubation, attachment of various medical monitoring devices, prolonged immobilization, nutritional problems, and decreased sensory perception. In addition, dermatitis and maceration, caused by excessive moisture, and alterations in optimal blood flow to all skin tissues add to the risk for skin breakdown (Sillevis-Smitt, Woensel, & Bos. (2011). Due to the acute condition of the patients in the PCICU, nursing

interventions focus on support of vital functions; and skin breakdown is generally not the main concern during admission (Sillevis-Smitt et al., 2011). Ensuring that nurses in the PCICU regard preventive skin care as a priority is critical for success in skin-breakdown interventions (Drake, Wendi, Sherburne, Nugent, & Simpson, 2012).

Tools that analyze the risk of skin breakdown help caregivers prioritize initiatives to prevent skin breakdown (McCaskey, Kirk, & Gerdes, 2011). The research surrounding skin-breakdown prevention focuses on adult patients predominantly, with current risk-assessment scales focusing on long-term-care adult patients (Galvin & Curley, 2012). In 1996, Quigley and Curley modified the adult Braden Scale into a 7-category risk-assessment tool for use in the pediatric population and named it the Braden Q Scale. Each of the 7 subscales is rated from least favorable (1) to most favorable (4). A score of 21 designates a moderate-risk patient, and a score of 16 or less denotes a high-risk patient (Galvin & Curley, 2012). The incidence of pressure ulcers in infants and children is 13.1%; the incidence of pressure ulcers in patients in the pediatric intensive care unit (PICU) is 27% (Noonan, Quigley, & Curley, 2006). The incidence of skin breakdown in the PCICU is currently unknown; however, it is anticipated to be greater than skin breakdown in the PICU because of the decreased oxygenation and perfusion that takes place in most of these patients. The key factors that contribute to skin breakdown in children in the PCICU differ from those affecting children in the general-care units; therefore, it is vital to the maintenance of skin integrity to develop a risk-assessment tool specifically designed for children in an acute state in this specialized setting.

In the absence of any national standards, a lack of standardization in skin care for PCICU patients was identified at a large hospital in upstate New York. There were inconsistencies in skin-assessment practices and documentation; and many of the devices attached to these patients did not have a standard of practice for how often to inspect the skin under these devices and to replace the devices, if necessary. This lack of standardization in skin-care practice and documentation led to inconsistencies in the care of patients.

The aim of this study was to decrease skin breakdown in the PCICU patient population through the standardization of nursing practice. The specific objectives of the study were to create and implement a practice guideline for PCICU nurses and providers, so that they could execute proper interventions for potential skin-breakdown issues in PCICU patients during the acute time period from intubation to extubation, using the best possible practices identified to date. Extension of this tool to the PICU and to other pediatric areas of the hospital is a future goal for this quality improvement project. Further objectives of this study were to identify areas in which research was lacking in risk assessment, interventions, and current treatment options for pressure ulcers in PCICU patients.

Additional objectives were to identify gaps in the literature to guide further evidence-based research towards best practice for pediatric skin care, to decrease the negative outcomes from skin breakdown in the PCICU, to decrease the PCICU patient's length of stay in the hospital due to skin breakdown, to decrease costs for the hospital because of skin breakdown, and to increase PCICU nurses' knowledge of the causes and treatment of skin breakdown in their patients. The question that guided the study was, "Do nurse education and training, coupled with the implementation of an evidence-based, standardized-practice guideline, decrease the incidence of skin breakdown in the PCICU?"

An extensive chart review was completed for a needs assessment, which helped to determine the scope of the problem, as seen in Table 1. The chart review enabled the researcher to obtain expert opinion on nursing interventions and the availability of medical product for this clinical problem. With the help of a wound-ostomy and continence nurse at the study hospital, a guideline for practice, shown in Table 4, was created, which guided PICU nurses on the potential interventions for skin-breakdown issues. The researcher created an educational podcast on the guideline and skin breakdown for PCICU nurses to view. A chart review was completed 6 months after the guideline implementation, and data was collected to evaluate the both the guideline and the

educational podcast. The Iowa Model, an evidence-based model for implementing change into organizations, developed by Marita Titler et al. (2001), guided the change process.

Methods

Ethical Issues

The researcher obtained approval for the project from the Institutional Review Board at the Wegmans School of Nursing, where the researcher studied in the Doctor of Nursing Practice program. The researcher then obtained approval from the Research and Evidence-Based Review Committee at the hospital where the quality-improvement project was completed. This quality-improvement project presented minimal risk, with no potential harm or discomfort for the study subjects greater than that ordinarily encountered in daily life. The project design protected against potential risks through the nature of the practice-guideline design. The chart review of patient information served only as a needs assessment. The potential benefit to the subjects was that they would have less skin breakdown, which would result in decreased pain, decreased length of stay in the hospital, fewer negative outcomes from wounds, and less cost for the patients and the hospital.

The study population for the first chart review was obtained through a random selection of 100 patients that were admitted to the PCICU between May, 2012 and October, 2012; 100 subjects for the postimplementation chart review were randomly selected from patients admitted between January, 2013 and June, 2013. This data was available to the investigator because she works in the unit. Patient information was assigned a study number; and no individually identifiable data was stored in the research documents, with the exception of one document linking the Medical Record Number (MRN) and the study number. All information was stored on a password-protected computer used only by the primary investigator. Information gathered in the medical-chart review was routinely accessible by the primary investigator during the normal duties of her employment as an RN at the study hospital.

Planning the Intervention

The researcher completed an extensive literature review using CINAHL, Cochrane Library, ProQuest and Allied Health Source, PubMed, Science Direct, Essential Evidence Plus, and UpToDate. The researcher conducted searches on the following topics: skin breakdown, skin breakdown from medical devices, skin-breakdown risk-assessment tools, and skin-breakdown and pressure-risk-reduction equipment. The researcher attended pediatric skin-care conferences to obtain information on the treatment products that were available; and this guided the soliciting of the most current expert opinion on the prevention, identification, and treatment of pediatric pressure ulcers and skin breakdown. The researcher identified and contacted skin-care, wound, and ostomy nurses who were experts in the field and who specialized in skin care to obtain their opinion on risk assessment, skin-breakdown reduction, and treatment equipment. A chart review, which the researcher completed in the PCICU at the study hospital, functioned as a needs assessment to determine the scope and duration of wound-care implications for the patients, as seen in Table 1. The chart included the patients' age, race, gender, diagnosis, length of hospital stay, length of intubation, type of sedation used, type of paralytic used, whether they were on extracorporeal membrane oxygenation (ECMO), incidence of pressure-ulcer or tissue breakdown, stage of pressure ulcer, location of pressure-ulcer or tissue breakdown, treatment, and outcomes. The inclusion criteria for the chart review were that the patient was admitted to the PCICU between May, 2012 and October, 2012; was between the ages of 0 and 18; and was intubated at some point during their stay in the PCICU. Exclusion criteria were that the patient was admitted to the PCICU for reasons other than a heart condition or that the patient was admitted to the ICU but not intubated. The researcher, with the assistance of a wound-ostomy and continence nurse at the hospital, created a practice guideline for the acute time period, which guided PCICU nurses on the interventions to be implemented for potential skin-breakdown issues. The acute time period was defined as intubated, paralyzed or under sedation, and attached to medical monitoring devices for the purpose of this

study. The researcher created an educational podcast on the practice guideline and skin breakdown, which was mandatory viewing for all 41 PCICU nurses before implementation of the new practice guideline. The nurses' adherence to the practice guideline was documented in the hospital's electronic medical-records system in the form of a Smart-Text note in the EPIC electronic medical record that was added at the end of each shift.

Methods of Evaluation

A second chart review on the incidence of skin breakdown in the PCICU was completed 6 months after the guideline was implemented, and data were collected to evaluate the guideline and the educational podcast. The second chart review followed the same procedure for data collection as the first chart review.

Analysis

The statistician compared the two groups of patients to see if there were any significant differences in the samples. He calculated the mean and standard deviations of all continuous variables. For continuous variables, He used the Mann-Whitney Tests to compare the two groups. For categorical variables, he conducted χ^2 analyses for sex and ECMO, while using Fisher's Exact Test for Diagnosis and Race to compare the two groups. He then calculated the frequency of pressure ulcers in the preimplementation and postimplementation groups. He calculated the relative risk of patients experiencing pressure ulcers, associated with the nurses following the implemented guidelines; and he determined that the confidence interval was 95%. He used Logistic Regression to assess the effects of risk factors on the incidence rate of pressure ulcers. The risk factors in the model were: nurse's knowledge of the skin-care protocol, age, diagnosis, length of intubation, length of stay, race, a Braden Score less than or equal to 16, and ECMO. With the exception of sex, these are the same risk factors that he used to compare the pre- and postimplementation groups. He used a one-sided Fisher's Exact Test to test for a difference in pre- and postimplementation skin breakdown. He then produced a final model using stepwise model selection with entry and exit

levels of .05. A statistical test is considered significant if the p -value is less than .05. The statistician used SAS software version 9.3 for this analysis.

Results

There were no significant differences detected in the two patient groups for any of the risk factors, as shown in Table 1. Age ($p = .1646$) and ECMO ($p = .2049$) were the two risk factors which showed the greatest difference. Additionally, Table 1 shows the characteristics for patients in the PCICU which the protocol was targeted for, identifying the scope of the problem. Patients admitted to the PCICU before implementation of the protocol were 1.35 times more likely to have skin breakdown than those admitted after implementation. The postimplementation patients had a significant decrease in skin breakdown ($p = .0422$). When the statistician constructed a full model using logistic regression, intervention showed significance ($p = .0389$), as well as length of intubation ($p = .0156$), as shown in Table 2. The statistician identified a 41% incidence of skin breakdown before implementation of the protocol and an 18% incidence after implementation. The chart review showed a 25% incidence of pressure ulcers before implementation of the protocol and a 4% incidence after implementation; and the length of stay decreased by 3 days after implementation of the protocol, as shown in Table 3.

Discussion

This project reviewed current best practice for skin care in the PCICU population. Also included in the project were an educational podcast for the PCICU nurses and a new skin-care-practice guideline that the nurses implemented for patients in the acute period of their admission. This project demonstrated a high incidence of skin breakdown and pressure ulcers in the PCICU setting. Another important finding was that patients are at increased risk for skin breakdown during times of intubation and ECMO. The project also showed that 74% of patients in the PCICU had a Braden Q score of 16 or lower, identifying them as being at risk for pressure ulcers, as shown in

Table 1. Monitoring patients' skin more closely by implementing a standard of care during intubation resulted in decreased skin breakdown and fewer pressure ulcers. This study is consistent with other studies citing the rates and incidence of pressure ulcers in critically ill pediatric patients, with a prevalence rate of 27% (Noonan et al., 2006).

The educational podcast and skin-practice guideline can assist PCICU nurses in earlier identification of patients with skin breakdown, leading to consistent care and proper treatment. This project also identified gaps in the research, so that future research can be directed toward identifying best practice for those at risk for skin breakdown, especially those with skin breakdown in the PCICU. The skin-care-practice guideline identifies assessments of devices and skin assessments that are not consistently monitored or documented in the critical-care setting. This skin-care-practice guideline can be adopted by other critical-care pediatric units within the inpatient setting to implement a consistent practice for skin care, resulting in a reduction in skin breakdown in pediatric patients. Parts of the skin-care-practice guideline can be used in other pediatric inpatient areas, to provide consistency in monitoring devices and documenting skin assessments.

One limitation of this study was that the sample size was small: 200 total chart reviews and 41 nurses participating in the study. Another limitation was that the primary investigator was employed as a nurse on the unit, with the possibility of bias in the results. To limit the bias, the results were analyzed by a statistician with no connection to the hospital or the primary investigator.

Conclusion

The skin-care guideline was useful in decreasing skin breakdown and pressure ulcers in the PCICU during the acute time period. The skin-care protocol could also be extended to the PICU; and pieces of the protocol could be useful during the nonacute time period, as well as in other pediatric areas. Maintaining skin integrity has many benefits, including decreased costs for hospital stays, lower infection rates, and increased patient satisfaction. Skin care is difficult to maintain in the PCICU environment during the acute time period, and nurses are charged with the responsibility

to monitor and maintain skin integrity. This skin-care protocol allows for a standard of practice that has produced positive results.

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