As is so often the case, research projects are born out of nurses asking “why” questions about their practice. This project was no different and is best illustrated with this patient story.

Max, in his early 60s, was an un-kept, homeless man admitted to the hospital with a large myocardial infarction for a nearly five-week stay. His size (six foot, 4 inches, 420-pound frame) and illness had a strong effect on the staff's ability to provide care. He did not fit in the bed, and the pressure on his legs and heels, as well as the presence of 3+ pitting edema, led to sloughing of his skin. The insertion site from the coronary angiogram and intra-aortic balloon pump procedures done on admission had not healed due to the presence of a body rash from the use of multiple antibiotics, combined with the effects of urinary and fecal incontinence and moisture from perspiration.

The first day, Mary, a registered nurse, cared for Max; he was well into his stay (23rd hospital day). She was determined to provide a bath this day because Max had been successful in resisting one for a week. Mary opened the cabinet in Max’s room to reveal more than a dozen skin care products: lotion, soaps, foams, and powders. It was obvious that each caregiver was approaching skin care for Max in a different manner. Mary was at a loss as to where to begin and was discouraged by the inconsistency of his skin care. She wondered, “Were we doing more harm to the skin when using these different products? When mixed together over time, do the products hasten skin breakdown?”

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Perineal protection products were compared for their efficacy in preventing skin breakdown in the hospitalized patient with urinary and/or fecal incontinence. Each product was used for the duration of the hospital stay with daily observations for perineal skin condition. Results indicated the spray product and wipe product were comparable in rate of skin breakdown prevention. Findings suggest the wipe product is more cost-effective for use during hospitalization, and the spray product preserves skin integrity over a longer period of time, beyond average hospitalization duration.

Key Words: Urinary/fecal incontinence, dermatitis, skin care/nursing, cost-benefit analysis, dermatologic agents/therapeutic use.

Mary Brunner, Carol Droegemueller, Sonja Rivers, and William E. Deuser

Prevention of Incontinence-Related Skin Breakdown for Acute and Critical Care Patients: Comparison Of Two Products
Incontinence contributes to skin breakdown in the hospital setting. Although protocols address care of the patient with incontinence for preventing skin breakdown, it is common to see myriad incontinence skin care products at the bedside, as well as various nursing interventions. The inconsistencies in practice contribute to unpredictable patient outcomes, overuse, and misuse of product and undo expense.

Aim

This study compared two incontinence skin care products to determine which is more effective for preventing skin breakdown and which is more cost-effective.

Method

This study was a quasi-experimental design with 64 participants from critical care and acute care units with random assignment to one of two best practice incontinence products for perineal skin cleansing and protection during hospital stay. Product A was a one-step disposable cleanser/moisturizer/barrier wipe. Product B was a two-step cleanser and barrier film spray. Outcome measures included incidence and type of incontinence, time to breakdown, severity of breakdown, and cost of product.

Results

Seventy-five percent (75%) of all participants maintained intact skin, with 17.2% having mild skin breakdown and 7.8% with moderate skin breakdown. No significant difference between products with respect to overall skin breakdown rate existed. Cost per study day was substantially higher in Product B group ($6.59) vs. Product A group ($2.67) (F [1, 62] = 8.26, p = 0.006). Average time to skin breakdown was significantly longer in Product B (n = 6; 213.3 hours) group vs. Product A group (n = 6; 91.1 hours) (F [1, 11] = 5.27, p = 0.045).

Conclusions

When products that are considered best practice for skin care are applied following incontinence, they are comparable in either the spray or wipe form with respect to overall skin breakdown rate. The primary difference is related to cost and time to skin breakdown.

Level of Evidence – III

(Melnyk & Fineout-Overhold, 2011)

and implemented. Ultimately, this skin care experience led to further discussion and research. Mary’s question was the catalyst for the We Help Incontinent Patients’ Skin (WHIPS) study.

It is widely accepted that fecal and urinary incontinence can contribute to skin breakdown, ranging from mild erythema to chemical erosion and pressure ulcers (Beeckman, Schoonhoven, Verhaeghe, Heyneman, & Defloor, 2009; Carr & Benoit, 2009; Driver, 2007; Fiers, 1996; Gray, 2004; Gray, Ratliff, & Donovan, 2002; Gray et al., 2007; Hunter et al., 2003; Junkin & Selyko, 2007; Lewis-Byers, Thayer, & Kahl, 2002; Nazarko, 2007; Nix, 2002, Thompson, Langemo, Anderson, Hanson, & Hunter, 2005; Wishin, Gallagher, & McCann, 2008). This is especially challenging in critical care and acute medical-surgical areas where patients are less mobile with multiple, compromising health problems (Bliss, Johnson, Savik, Clabots, & Gerding, 2000; Wishin et al., 2008). Although hospital protocols may be in place that address care of the patient with incontinence or preventing skin breakdown, it is common to see a variety of incontinence skin care products at the bedside, as well as various interventions used by nursing. The inconsistencies in practice contribute to unpredictable patient outcomes, overuse and misuse of product, and undo expense (Nix, 2000).

Literature Review

Much has been written about urinary and fecal incontinence; however, many published articles focus on risk factors and generalized skin care. Long-term care facilities are typically sites of clinical research on the prevalence and incidence of urinary and fecal incontinence, as well as the effectiveness of various skin-care protocols and product use (Bale, Tebble, Jones, & Price, 2004; Hunter et al., 2003; Lewis-Byers et al., 2002; Thompson et al., 2005; Zehrer, Lutz, Hedblom, & Ding, 2004). These facilities allow researchers to evaluate the use of skin-care protocols and the effectiveness of various products for greater lengths of time. A search of Medline and CINAHL with the key words incontinence and skin care revealed 379 articles. Further breakdown of the literature revealed nine articles that specifically addressed incontinence related skin care in the acute care setting. These limited publications, although significant, focus primarily on the relationship between incontinence and pressure ulcer development (Carr & Benoit, 2009; Wishin et al., 2008).

Incontinence and the Skin

The skin is the body’s largest organ and the first line of defense against the internal and external environment, and it plays an important part in maintaining health. Urinary and/or fecal incontinence challenges the integrity of the skin by breaking down its natural barriers. Gray (2004) discusses how the skin functions as a barrier and states: “Several factors contribute to the skin’s ability to act as a barrier between internal and external environments, including 1) the integrity of the skin and its histologic structure, 2) the presence of intra- and extracellular lipids, and 3) the skin’s pH” (p. 52).

Aging skin poses another challenge to maintaining skin
In an attempt to standardize care, incontinence was categorized with varying breakdown related to incontinence: "moisture, skin pH, colonization with microorganisms, and friction" (p. 170), and the authors discuss sources of moisture in the incontinent patient, including urine, perspiration, or liquid stool. Prolonged moisture causes maceration of the skin, resulting in a change from its normal acidic base to an alkaline base. Skin consistently subjected to moisture grows more bacteria, resulting in further insult. Destruction of the epidermis from friction occurs when macerated skin rubs against the surface of the bed linens or incontinence pads (Beeckman et al., 2009, Gray et al., 2002, 2007).

**Skin Assessment**

Assessing the degree of skin breakdown poses a challenge to nursing professionals. Unlike the Braden Scale (Braden & Maklebust, 2005), an evidence-based tool used to assess the risk of skin breakdown using six criteria, no common tool exists, nor is there common language defining the level of skin breakdown related to incontinence. In a study comparing two skin-care protocols in a long-term care setting, Lewis-Byers and colleagues (2002) used a scale rating the condition of the skin from 0 (normal skin condition) to 4 (skin erosion). Study limitations did not identify inconsistency of caregiver skin assessment. Junkin andSelekof (2007) determined the prevalence of incontinence-related skin injury in the acute care setting, and skin breakdown related to incontinence was categorized with varying degrees of redness combined with weeping and/or blistering. In an attempt to standardize categories of incontinence-related skin breakdown, Nix (2002) developed a numerical rating tool that included intensity of irritant, duration of irritant, perineal skin condition, and contributing factors.

**Protocols and Products**

The prevalence of fecal and urinary incontinence in the acute care setting is estimated to be 19.7% (Junkin & Selekof, 2007). Despite the high prevalence rate in acute care, research surrounding incontinence products and protocols frequently takes place in long-term care facilities, with relatively few research studies done in the acute care setting, where the level of patient acuity is greater and the impact of incontinence-related skin breakdown may be more problematic.

Cleansing patients after episodes of incontinence can be one of the most challenging tasks in the hospital setting. In an attempt to cleanse and protect the patient’s skin, nurses and assistive personnel often resort to a variety of familiar products without using evidence-based practice to guide product selection. Significant research exists to support the use of a cleanser containing a surfactant – an agent used to lift debris from the surface of the skin – a moisturizer, and a barrier, which are key steps in preventing incontinence-related skin breakdown (Driver, 2007; Fiers, 1996; Gray, 2004; Nix, 2000; Wishin et al., 2008). Nix (2000) suggests that individuals with limited knowledge of skin-care needs often make institutional contracts for product purchase. Describing factors to consider when selecting skin-care products, Nix (2000) further states: “Product selection decisions primarily should be based on identification of intended users, clinical goals, and an understanding of ingredients and formulation concepts” (p. 260).

**Method**

**Purpose**

The study team set out to compare two incontinence care products to determine which is more effective for preventing skin breakdown and which is more cost-effective. Specifically, the research question was, “Is there a difference in effectiveness between Product A and Product B for the incidence of skin breakdown for incontinent patients?”

**Framework**

Donabedian’s 1966 framework of structure, process, and outcome has been used when examining quality of health care for decades (Donabedian, 2005) and was used as the guiding framework for the study reported here. The Donabedian model is linear and assumes that structure, such as unit type, staff, or available product, affects processes such as skin care protocol, and thus, influences positive or negative outcomes, such as skin breakdown in the presence of incontinence or health care costs.

**Participants**

The organization’s Nursing Research Committee provided Institutional Review Board approval. The study design was a quasi-experimental, two-group design without a control. Identified incontinent patients with intact skin from five inpatient units (three critical care and two acute care) of a large urban hospital participated in the incontinence product study. Participants provided informed consent and were randomly assigned to use one of two products for skin cleansing and protection for the duration of their hospital stay. Sample size of 100 participants for each group was determined to reach desired significance level of 0.05.

**Product**

Recognizing from the literature that best practice in providing incontinence skin care requires the use of a pH-balanced cleanser, a moisturizer, and a barrier (Beeckman et al., 2009; Gray, 2004; Gray et al., 2007; Nix, 2000), the study team selected...
two products for study. Product A was a one-step cleanser, moisturizer, barrier washcloth impregnated with 3% dimethicone (Comfort Shield® Perineal Care Washcloth, Sage® Products Inc.). The second product (Product B) was a two-step pH-balanced, no-rinse cleanser and moisturizer containing glycerin dimethicone (3M™ Cavilon™ Skin Cleanser) and film forming polymeric solution spray (3M™ Cavilon™ Skin No Sting Barrier Film).

Design and Procedure

The study team provided education to staff of the participating units on patient inclusion and exclusion criteria, data collection tools, product use steps, and skin breakdown grading tool. Inclusion criteria included patients 18 years of age or older with incontinence. Exclusion criteria included patients with any erosion or open sore on perineal skin/epidermis, diagnosed skin disease of the perineum, or known multiple allergies influencing skin integrity. The “WHIPS hotline,” a dedicated phone number used to contact a member of the study team regarding potential participants, product needs, and patient consultation in a timely manner, existed for staff assistance.

A member of the study team assessed the participant’s skin each day. Skin classification included either intact or skin breakdown (mild, moderate, or severe). Time to breakdown was measured in hours and minutes from time of enrollment to either skin breakdown or discharge, whichever occurred first. Outcome measures included number of incontinent episodes, type of incontinence (urinary, fecal, or both), time to breakdown, patient characteristics, and product cost per study day.

Demographic data collected from the patient’s chart consisted of age, gender, and an admission screening tool score from the Blaylock Risk Assessment Screening (BRASS) index for functionality. BRASS also provided some indirect measures of comorbidity, such as number of emergency room visits, hospital admissions, medications, and active medical problems (Blaylock & Cason, 1992). The bedside collection tool developed by the study team contained incidence of incontinence episodes, type of incontinence, and any evidence of skin breakdown data. Statistical analysis compared rate of skin breakdown for the two study protocols and Chi-square analysis, and observed proportions of intact versus non-intact skin in the patient’s group for each product. In addition, the mean cost per day was compared to examine whether products were similar with respect to cost per patient day. The formula used for calculating cost per study day was purchase price for products used divided by number of days in the study. Data were analyzed using Statistical Package for Social Sciences (SPSS Inc., 2001d) version 11 for Windows.

Results

The study enrolled 64 participants (see Table 1). Participant average age was 67.3 years (range 18 years to 88 years). The gender distribution was 67.2% male (n = 43) and 32.8% female (n = 21). The majority of all participants maintained intact skin (75%, n = 48); 17.2% (n = 11) experienced mild skin breakdown, and 7.8% (n = 5) were categorized as moderate skin breakdown. No participants developed severe skin breakdown (see Table 2). No significant difference existed between the two product groups with respect to age distribution, BRASS index, gender, skin tone, number of incontinent episodes with respect to urine and/or stool, and skin breakdown rate. Cost per study day was higher in Product B ($6.59) compared to

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### Table 1.

**Study Demographics**

<table>
<thead>
<tr>
<th>Gender = n (%)</th>
<th>Product A</th>
<th>Product B</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female = 13 (39.4)</td>
<td>Female = 8 (25.8)</td>
<td>Female = 21 (32.8)</td>
<td></td>
</tr>
<tr>
<td>Male = 20 (60.6)</td>
<td>Male = 23 (74.2)</td>
<td>Male = 43 (67.2)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Average age (years)</th>
<th>Product A</th>
<th>Product B</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>66.4</td>
<td>68.1</td>
<td>67.3</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit at time of enrollment = n (%)</th>
<th>Product A</th>
<th>Product B</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Care = 17 (51.5)</td>
<td>Acute Care = 14 (45.2)</td>
<td>Acute Care = 31 (48.4)</td>
<td></td>
</tr>
<tr>
<td>Critical Care = 16 (48.5)</td>
<td>Critical Care = 17 (54.8)</td>
<td>Critical Care = 33 (51.6)</td>
<td></td>
</tr>
</tbody>
</table>

### Table 2.

**Skin Breakdown Results by Type and Study Product Used**

<table>
<thead>
<tr>
<th>Skin breakdown</th>
<th>Product A n (%)</th>
<th>Product B n (%)</th>
<th>Total n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intact skin</td>
<td>24 (72.7)</td>
<td>24 (77.4)</td>
<td>48 (75)</td>
</tr>
<tr>
<td>Mild skin breakdown</td>
<td>5 (15.2)</td>
<td>6 (19.4)</td>
<td>11 (17.2)</td>
</tr>
<tr>
<td>Moderate skin breakdown</td>
<td>4 (12.1)</td>
<td>1 (3.2)</td>
<td>5 (7.8)</td>
</tr>
<tr>
<td>Severe skin breakdown</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Total</td>
<td>33</td>
<td>31</td>
<td>64 (100)</td>
</tr>
</tbody>
</table>
Product A ($2.67) (F [1, 62] = 8.26, p = 0.006). Average time to skin breakdown was longer in Product B (n = 6; 213.3 hours) compared to Product A (n = 6; 91.1 hours) (F [1, 11] = 5.27, p = 0.045).

Discussion

Research on the best products for use in the acute care setting for the prevention of skin breakdown for incontinent patients is limited. This study was unique in its use of a hospital setting (using both critical and acute care areas) rather than a long-term care setting from which to draw study participants. In this study setting, the average length of stay for a hospitalized patient was 4 to 5 days.

Limitations

There is no standard method nurses use to measure skin breakdown related to incontinence; therefore, how each nurse might assess skin is variable. How nurses approach incontinence care and incontinence-related skin breakdown on a day-to-day basis was the intentional design of the study environment. The study team provided simple education, systematic instructions for product use but did not oversee each episode product application/technique. For instance, one nurse may use an entire package of wipes or more for cleansing one incontinence episode, while another nurse may use one wipe as the final step in cleansing the skin. Alternatively, one nurse may use the barrier spray with each incontinence episode, and another nurse may use it once each day. There were many caregiver variables, such as timing of cleansing of incontinent episode, attitude toward incontinence, attitude toward product, or patient care load.

The study team provided study products and cleared enrolled patients’ rooms of other available skin care products for the duration of the study period. Contamination of the study remained a risk, however, due to easy access to other products in the larger unit area. It is likely the similarities of each product reflecting the principles of best practice for preventing skin breakdown (cleanser, moisturizer, and barrier) contributed to the lack of significant differences in skin breakdown rates. Factors limiting generalizability of this study include the study setting, number of participants, and reliance on the RN staff for accurate documentation of skin assessments, incontinence events, and product use as outlined in the study. While the number of participants did not reach the predicted enrollment necessary for detecting significance, the magnitude of difference between the two products was so strong that statistical significance was reached despite the lower enrollment.

Nursing Implications

Given the results of the two study products, one could provide evidence for the use of both products in the acute care setting. Decision around which product would be most effective when based on a financial perspective would include the use of a one-step product, such as Product A (one-step) when patients have an expected average length of stay of 3 to 4 days. Patients with an expected length of stay of greater than 4 days may be best suited with a multiple application product, such as Product B (two-step). Research provides evidence for the effectiveness of Product B (two-step) in long-term care settings (Bale et al., 2004, Zehrer et al., 2004). Product packaging differences between Product A and Product B influence cost. Product A (one-step) is a “pay as you go” type product because its packaging allows for less waste, such as restocking of the product for another patient when intact packages remain after the discharge of a patient. When using Product B (two-step), one must purchase an entire bottle of a liquid/spray delivery system. Despite its effectiveness long-term, the partially used bottle goes home with the patient or is discarded at the time of discharge and is not available for another patient to use by the institution.

Determining which product would be most effective when based strictly upon skin protection from breakdown would vary based upon patient length of stay. Both products demonstrated the ability to protect patients’ skin within an average length of stay. As length of stay increased, Product B (two-step) provided greater protection for the skin.

Factors not considered in this study but could be part of a decision-making process include the environmental impact of a product and the responsibility of an institution for providing a post-hospitalization skin-care product. For example, using a disposable cloth (Product A) generates a waste stream with each incontinence episode that includes the used cloths plus the packaging. Using a spray product (Product B) generates less waste with each incontinent episode and may continue to provide for the ongoing incontinence care needs beyond hospitalization before packaging becomes a part of the waste stream. One could ask the question, “Does the health care team have the responsibility to differentiate and then provide initial product upon discharge for continuity?” If so, selection of the multi-use/spray (Product B) product would best meet this need.

Research Implications

Areas of further study might explore the relationship of particular illness on incontinence skin breakdown rates; the differences, if any, between caregiver outcomes (RN versus NA); potential interventions to influence incontinence incidence while hospitalized; and factors to consider when selecting an incontinence product (for example, is there value in predicting the length of stay of one patient over another in product selection?). Given the...
paucity of research on incontinence skin care products used in the hospital setting, opportunities for further study are numerous. There is a need for better understanding of best skin products to use for preventing incontinence-related skin breakdown.

**Conclusion**

Based on these findings, when products considered best practice for skin care are applied following incontinence, they are comparable in either spray or wipe form with respect to overall skin breakdown rate. Cost and time to breakdown are the primary differences. Given the current spotlight on health care costs, it is important for hospitals to establish protocols for incontinence care with products that are economical and effective.

**References**


