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**Pressure Injury Prevention: A Quality Improvement Project Utilizing Incontinence Care
Education**

Abstract

Objective: Evaluate whether the initiation of incontinence care education can improve pressure injury knowledge by an average of 5% in post-test scores over 1 month. **Design:** **Theoretical Framework:** Lewin's Three-Step Model for Planned Change and Evidence-Based Practice Improvement Model. **Setting/Local Problem:** A 20-bed acute care geriatric unit in a large metropolitan hospital in middle Tennessee with inappropriate use of incontinence management products. **Participants:** Nurses and nursing assistants employed at the project site. **Intervention/Measurements:** An educational tool was developed to improve knowledge on pressure injury prevention through incontinence management. A pre-test and post-test were conducted immediately before and after educational tool was viewed to measure knowledge gained from the tool. **Results:** Out of the 43 nurses and nursing assistants encouraged to participate in the intervention, there were nine responses. All of the responses were included in the data analysis because all of the responses were valid. The pre-test results were shockingly high, demonstrating the importance the project site places on pressure injury prevention. The average pre-test score was 93.3% and the average post-test score was 94.4%. Although it is reassuring that overall scores improved after reading the educational material, the difference in scores was minimal. This information suggests that the pre-test was too easy for the knowledge level of participants. This information can be utilized for future PDSA cycles. The results were not statistically significant, with a p-value of 0.106. Despite a lack of significance between pre and post-test scores, three respondents selected "strongly agree" and five selected "agree" for the 11th question, "I will change my practice based on what I learned". The final respondent selected

‘neutral’ for this question. The last short answer question regarding what barriers staff members face to provide appropriate skin care also delivered important information. Although four respondents did not answer the question, all five of the respondents who did answer this question included staff shortage as one of the reasons that appropriate skin care is not provided.

Conclusion: With only a 1.1% different between average pre-test and post-test score, it is evident that most respondents knew the correct answers before engaging in the education. For future PDSA cycles, it would be beneficial to modify the pre and post-test questions to a higher difficulty level. The difficulty of pre and post-test needs to match the advanced knowledge of the respondents. It could be hypothesized that participants in the intervention understand how to appropriately manage incontinence, but implementing those practices at the bedside is difficult. Future PDSA cycles might focus on motivating staff to implement evidence-based practices at the bedside. One way to do so is an educational tool that uses case studies that resemble patients frequently cared for at the project site. By centering the tool on scenarios similar to what the employees experience, it may be easier to apply what is learned. Additionally, it may be beneficial to remove briefs from the supply room. Decreasing accessibility to briefs may be the most beneficial way of encouraging nurses and nursing assistants to implement evidence-based practice at the bedside.

Keywords: pressure injury, geriatric, elderly, quality improvement

Overview of Problem Significance

Nearly 3 million adults develop pressure injuries (PIs) in the United States each year (Mervis & Phillips, 2019). PIs result in 60,000 fatalities annually (Institute for Healthcare Improvement, 2019). Additionally, PIs are the second leading cause of litigation against healthcare systems after wrongful death, resulting in 17,000 lawsuits per year (Scott et al., 2016). Pressure injuries are a healthcare issue for hospitalized adults despite advancements in research, technology and healthcare practices (Bauer, et al., 2016; Levine, 2018). PIs are the result of shear, friction, and pressure on the skin's surface that result in varying levels of skin breakdown (Kayser et al., 2019). With proper education and interventions, most PIs are preventable (Bauer, et al., 2016; Padula & Delarmente, 2019). Despite improved outcomes and cost-savings benefits from PI prevention, 8.3 out of 100 patients will develop a PI (Padula & Delarmente, 2019). The issue is even more prevalent when analyzed from the scope of geriatric care. Approximately 10.8% of adults age 65 and over will develop a PI within 36 hours of hospitalization (Latimer et al., 2019).

PI prevention requires a multifaceted approach, however urinary incontinence has shown to be one of the greatest risk factors for PI development (Spencer et al., 2017). In acute care hospital settings, urinary incontinence is often managed with the use of incontinence briefs, or adult diapers. Skin is the body's first defense against infection and injury. Trapping urine against the skin with the use of an incontinence brief disrupts the skin's natural protective properties, promoting a microclimate that encourages bacteria growth and skin breakdown. Despite consistent evidence against the use of incontinence briefs in the non-ambulatory patient, it is still a practice widely used across the nation (Bauer et al., 2016). Unfortunately, the geriatric population suffers from urinary incontinence at a disproportionate rate of 8-50%

(Sabzwari & Amin, 2020). Urinary incontinence is not a normal part of aging, but certain age-related risks predispose geriatric people to urinary incontinence. By managing this risk factor, PI incidence rate can be decreased. Although there are many risk factors for PIs, urinary incontinence is often one that is mismanaged, and with proper education, this risk can be mitigated.

Addressing the issue of urinary incontinence in regard to PI prevention broaches the topic of brief use. A quantitative, cross-sectional study showed that healthcare team members were unable to cite a reason why 38% of participants were using a brief. The indiscriminate, unsystematic approach to determining whether a patient requires the use of a brief leads to negative patient outcomes. Briefs trap heat and bacteria, altering the skin's bactericidal pH and reducing its natural ability to resist friction and pressure forces. Brief use also contributes to urinary tract infections and low self-esteem (Bitencourt, et al., 2018). Inappropriate brief use often leads to incontinence-associated dermatitis (IAD), a reddened, inflamed perineal area from extended exposure to urinary/fecal incontinence. Although IAD and PIs are two separate conditions, they are closely linked because the skin breakdown of IAD promotes the development of PIs (Bender, et al., 2017; Paulin & Dowling-Castronovo, 2019; Beeckman, 2017). The National Pressure Injury Advisory Panel (NPIAP) currently recommends the use of a breathable incontinence pad instead of a brief. Prompt cleaning with pH balanced, disposable incontinence wipes is also recommended (NPIAP, 2016). Briefs should only be used when other urinary incontinence strategies, such as bladder training, recording bladder diaries, and pharmaceutical management, have failed (Colborne & Dahlke, 2017).

On a geriatric unit at a large teaching hospital in middle Tennessee, current practice for urinary incontinence management is the concurrent use of briefs, incontinence pads, and a

urinary wicking device for females or a condom catheter for males. It is very common for patients to have all of these measures in place at the same time, despite evidence-based practice suggesting the use of just one incontinence pad to manage urinary incontinence (NPIAP, 2016).

Purpose of Scholarly Project

In the practice setting, PI prevention is a priority, however more progress can be made by improving incontinence care through a quality improvement project. In this setting, every patient is placed on a repositioning mat, draw sheet, incontinence pad, and brief. This presents a challenge with PI prevention because each linen layer increases PI risk by 20% (Kayser, et al., 2019). The use of the brief also promotes PI development because it allows urine to further break down skin in areas of the body that are already vulnerable (Bitencourt, et al., 2018). The goal of this project is to reduce PI incidence rate by aligning daily practice with evidence-based guidelines through limiting the use of briefs for non-ambulatory, incontinent patients.

EBP Model and Change Theory

The Evidence Based Practice Improvement (EBPI) model was chosen for the quality improvement project at this site. Successful implementation of evidence based practice (EBP) is a complex process, involving social, societal, and cultural change. The EBPI model encourages the support of an EBP champion. Research has shown that the support of an EBP champion leads to better quality improvement project outcomes. This model also requires the support of change agents who are willing to propel the change in a positive, encouraging, and persistent manner (Singleton, 2017). The EBPI model suits this project because the project site has a multitude of supportive change agents willing to take action in pursuit of better patient outcomes.

Bringing EBP to the bedside requires the delicate, complex process of initiating cultural and social change in the healthcare setting. Developed in the 1950s, Lewin's Three-Step Model

for Planned Change is a highly recognized and tested change theory widely used today. The model is based on three steps: 1) Unfreezing, 2) Changing, 3) Refreezing. Unfreezing represents the stage of change where the person, or agency, is educated and realizes the need for change. The entity recognizes the area for improvement, and demonstrates willingness to change after seeing how change can be beneficial. The second stage is the action of pursuing this change in behavior. The second stage does not necessarily involve just one change, but perhaps sampling different alternatives to the initial habit. For this project, this involves an alternative to using incontinence briefs for every patient without exploring alternative, more evidence-based alternatives. The third stage is cementing this change into habit with diligence and the passage of time. Lewin's model is built to continue cycling through change. If in another five years, consistent, substantial research reveals a different alternative that leads to better patient outcomes, then the process will be repeated. This way, healthcare practices can continue to unfreeze, change and refreeze, adjusting to the most current recommendations.

PICO Question

The PICO for this project is, "In hospitalized geriatric patients, how does the introduction of an incontinence care education program to geriatric unit nurses and nursing assistants compared to no incontinence care education affect staff knowledge on pressure injury prevention?"

Literature Search Strategy

Pubmed, CINAHL, and Scopus were utilized to discern credible evidence regarding the impact that PI prevention education has on nursing knowledge regarding skin care practices. Boolean connectors that reflected aspects of the PICO statement were utilized to identify relevant evidence, including ("pressure ulcer*" OR "pressure injur*" OR bedsores* OR sore*) OR (incontinen*) AND (educat* OR nurs* OR staff* or prevent*) AND (skin care OR

incontinence care). The search was further refined to provide sources published in the last five years that only included adults over age 65 and were published in the English language. Lastly, the search results were further narrowed down to clinical trials, randomized-control trials, meta-analyses, and systematic reviews. With this search criteria, six articles were found on CINAHL, 24 on PubMed, and none on Cochrane Library. Review of the gray literature revealed nine articles that were screened and assessed for eligibility based off of similarities to PICO question components.

A total of 33 records were reviewed based on title and abstract after duplicates were removed among databases. Two articles were excluded due to irrelevance of content to the PICO question. Finally, 31 articles were evaluated in full text to determine eligibility for inclusion resulting in six of those being eliminated. Four of those studies were inconclusive on recommendations for practice change regarding skin care education. One of them was specific to contact dermatitis education for infants and the other was specific to spinal cord injury patients. Critical appraisal of 25 articles were completed, resulting in five articles that were included in evidence for practice change.

Recommendation for Practice Change

The review of literature and critical appraisal process has revealed significant evidence regarding skin care and PI prevention. A summary and grading of evidence identified can be located in *Table 1*. There is significant evidence which supports the claim that educating healthcare professionals regarding skin care practices is beneficial to patient outcomes. All five articles suggested that knowledge of PI prevention was insufficient across a multitude of disciplines and healthcare facilities. Therefore, the final recommendation would include initially conducting online education, then providing written education materials as needed. By

implementing an intervention, analyzing its effects and adjusting another intervention to those results, the second segment, the PDSA cycle, of the EBPI model is being followed (Institute for Healthcare Improvement, n.d.). In-person and e-learning are both effective at improving knowledge regarding pressure injury prevention and skin care practices in general (Awali, et al., 2018; Fullbrook, et al., 2019; Suva, et al., 2018; Kim, et al., 2020; Stankiewicz, et al., 2016).

Setting

The quality improvement project is on a 20-bed acute care geriatric unit in a large metropolitan hospital in middle Tennessee. The average age of the patient admitted to this unit is 77 years old, so it is clear that the population served is almost entirely geriatric. There is a total of 33 registered nurses and six nursing assistants employed. Four nurses work per shift, each caring for five patients. Two nursing assistants work per shift, each caring for ten patients. Although the incontinence education is formulated with the assistance and feedback from all members of this team, the education will be directed toward the nurses and nursing assistants.

Stakeholders and Project Team

Project implementation is dependent on the key stakeholders of this project. Stakeholders assist with project implementation because each member are affected by the changes made through the quality improvement project. Key stakeholders include the project leader, project chair, community member, statistician, unit manager, nursing education specialist, clinical staffing leaders, nurses, nursing assistants, patients, patient family members, physicians, materials management, and wound care nurses. This multidisciplinary group of healthcare professionals have different approaches, but all share the same goal of an improved standard of care. With this blended approach, new ideas can be generated to promote quality improvement through unique, but similar translations of evidence into practice (Laycock, et al., 2019).

Obtaining support from a multi-disciplinary team also improves fluidity among goal achievement across the healthcare team. If team members across many disciplines are supportive of the quality improvement project, then the project is more likely to succeed from different angles (Hamilton, et al., 2017).

Intervention Implementation

The quality improvement project involved voluntary participation in an educational intervention directed at the nurses and nursing assistants at the project site. The education was focused on evidence-based practice for skin care and in particular, the indiscriminate use of briefs in the geriatric population. The education was based off the evidence that knowledge of PI prevention practices regarding skin care is lacking (Dalvand, et al., 2018; Jiang, et al., 2020; Barakat-Johnson, 2018). The education was further directed at the indiscriminate use of briefs for management of urinary incontinence (Beele, et al., 2017). When used inappropriately, briefs promote a microclimate that is conducive to skin breakdown (Motta & Milne, 2017; Paulin & Dowling-Castronovo, 2017). Therefore, educating healthcare professionals regarding the appropriate management of incontinence and use of briefs helps improve skin care practices, and thus, reduce the incidence of PIs.

The intervention was adapted after thorough research regarding the lapse of knowledge regarding incontinence management. The project site prioritizes education, which is evident in the number of skin care champions employed. Skin care is a high priority, but incontinence management is still lacking. Therefore, incontinence management is the primary topic of education provided.

The quality improvement project was based off the pre-test, education and post-test model. The tests and education were conducted consecutively in the same occurrence in order to

ensure only those taking the pre-test also took the post-test. A pre-test regarding incontinence management for PI prevention was provided. An adapted Pieper Pressure Ulcer Knowledge test was given via anonymous survey. The education offered between taking the pre-test and post-test was an eight slide PowerPoint presentation educating participants about how to properly care for incontinent patients in order to prevent PIs. The use of an e-learning education model caters to those who benefit more from e-learning than traditional classroom-style learning. (Suva, et al., 2018; Kim, et al., 2020). The post-test had the same questions as the pre-test, except for two follow up questions on the post-test regarding practice change that were not scored. The correct responses were not available to the respondents until after taking the post-test in order to avoid the possibility of respondents memorizing the responses for the post-test. The survey was available for ten days. Nurses and nursing assistants were encouraged to complete the survey by the project leader. After the ten day window closed, the scores of the surveys were averaged and measured with the help of a statistician and a sampled t-test.

If further remediation is needed as evidenced by poor post-test results, an educational poster is available for viewing in common areas such as the break room, bathroom, and nurse's station. This tool is based off the literature review and will provide factual, straightforward education specific to the deficits noted in the post-test results. The educational posters will remain posted in the common areas of the unit. This potential change in the implementation plan follows the PDSA cycle of testing different interventions in order to achieve the best possible result. Another option for a third PDSA cycle is posting an educational video to YouTube. This video is another method of education to be used for project sustainability after the project is completed in December. Due to time constraints of data collection and analysis, the implementation and data collection was limited to the fall of 2021.

IRB Determination

Careful consideration was given to the privacy and confidentiality of participants at the project site. All interventions were directed to the nurses and nursing assistants employed at this location. The intervention included skin care educational materials provided in a PowerPoint display, sent via email, and displayed in the breakroom and bathroom. The pre- and post-test surveys were conducted anonymously. By focusing the intervention on education of the healthcare professionals at the project site, patient information and privacy was not jeopardized. The review process was conducted by the University of Tennessee and the project site. This project was deemed confidential.

Outcome Measures

The guiding principle of this project is the health and safety of the patients, nurses and nursing assistants. The primary goal is improving the patient's quality of life, then ensuring that the nurses and nursing assistants are functioning at greatest capacity. The project site prioritizes a spirit of inquiry, holding each employee to a higher standard, which is attributable to its national success. Therefore, the primary outcome of this project is to improve the knowledge of the healthcare professionals, which in turn improves the quality of the life of the patients. As explicitly stated in the PICO question, the measurable outcome of greatest interest for this quality improvement project is staff education. Therefore, the outcome used to determine the effectiveness of the project is the score comparison between the pre- and post-test results. The tool contains project specific questions that allow for simplistic and accurate measurement of the project outcomes (Benetato, et al., 2020).

Data Analysis Plan

The data was analyzed with the assistance of statistician, Cary Springer, affiliated with the University of Tennessee, Knoxville. Data is reported in the aggregate. The test results obtained before intervention implementation are compared to test results obtained after intervention implementation. Comparisons were drawn between test scores from these two time points using Statistical Package for Social Science (SPSS) and a paired sample t-test.

The data is more likely to be matched because respondents will be taking the pre-test, reading the educational PowerPoint, and taking the post-test immediately after. This method encourages that the same respondents who take the pre-test also take the post-test, which provides more powerful data regarding the efficiency of the incontinence care education. The intervention was available to nurses and nursing assistants on the project site, which totals 43 possible responses if each person participated.

Results

Out of the 43 nurses and nursing assistants encouraged to participate in the intervention, there were nine responses. All of the responses were included in the data analysis because all of the responses were valid. Of the nine total responses, five were completed by accessing the link sent via email and the remaining four were completed by accessing the QR code. Three responses were collected on October 18th, the day the survey opened. Three additional responses were collected two days later on October 20th. For the next three days, one response was collected per day. No responses were collected from October 24th through October 28th. This data is significant because it suggests the likelihood of participants responding after a seven day timeframe. After seeing this data, a future PDSA cycle might be reduced from ten days to seven in order to collect data promptly.

The pre-test results were shockingly high, demonstrating the importance the project site places on pressure injury prevention. The paired sample statistics can be viewed in table format in *Table 10*. The average pre-test score was 93.3% and the average post-test score was 94.4%. Although reassuring that overall scores improved after reading the educational material, the difference in scores was minimal. This information suggests that the pre-test was too easy for the knowledge level of participants. This information can be utilized for future PDSA cycles.

The results were not statistically significant, with a p-value of 0.106. An explanation of paired samples correlation can be viewed in *Table 11*. As mentioned previously, the 9th question was missed most frequently, with 44% of respondents getting the answer wrong on the pre-test, and 66.7% getting the answer correct on the post-test. The improvement in scores, although modest, demonstrates that respondents learned the importance of gently drying the skin after cleansing occurs. Perhaps more clear language could have elicited a higher post-test score for this question.

Despite a lack of significance between pre and post-test scores, three respondents selected “strongly agree” and five selected ‘agree’ for the 11th question, “I will change my practice based on what I learned”. The final respondent selected ‘neutral’ for this question. It is possible that although respondents knew proper incontinence care, respondents did not know exactly how important it was so conduct it properly. The last two years of enduring a pandemic have altered priorities for healthcare facilities across the world. Navigating an unfamiliar territory with a novel respiratory virus may have shifted priorities away from skin care. With the COVID incidence rate currently trending down, it is possible that healthcare workers now have the time and energy to prioritize the entire body instead of the systems mainly affected by the

COVID-19 virus. Therefore, it is with high hopes that skin care will once again receive the appropriate attention and respondents will modify behavior based on the education provided.

The last short answer question regarding what barriers staff members face to provide appropriate skin care also delivered important information. This question offered staff members an anonymous way to voice their opinion. Although four respondents did not answer the question, all five of the respondents who did answer this question included staff shortage as one of the reasons that appropriate skin care is not provided. Another reason cited was the inability of staff members to know when patients are incontinent. If the staff member is unaware that the patient had an incontinent episode, the staff member may not cleanse the patient in a timely manner, thus leaving the patient exposed to the harmful effects of urine and feces on the skin. Although a brief does not solve this issue, it is possible that a brief contains the incontinence so when cleansing happens eventually, it will take less time to complete the task. This thought process might reinforce the use of briefs. Future PDSA cycles will account for this information and provide education emphasizing the importance of turning patients at risk of pressure injuries every two hours. The education will draw a connection between turning the patient every two hours and checking for incontinence.

Limitations

The primary limitation of this quality improvement project was the reduced time frame to conduct PDSA cycles. The COVID-19 pandemic caused a shift in priorities across many healthcare facilities in the world. It was difficult to conduct the project at the initial project site, so approximately one year into project development, the project site was changed to one that could accommodate a quality improvement project. Although this one year delay severely restricted the time available to conduct the project, it proved to be extremely useful for the

success of the project overall. The support received by the project site where the project was conducted was exceedingly beneficial for successful implementation. Therefore, although the lack of time to thoroughly conduct PDSA cycles was detrimental, it was an inevitable side effect to changing project sites.

A second obvious limitation of the study was the ease of the pre and post survey. The extent of the respondent's knowledge was underestimated. With only a 1.1% difference between average pre-test and post-test score, it is evident that most respondents knew the correct answers before engaging in the education. For future PDSA cycles, it would be beneficial to modify the pre and post-test questions to a higher difficulty level. The difficulty of pre and post-test needs to match the advanced knowledge of the respondents. However, it is possible that most of the respondents were clinical staff leaders, who receive more education and training than other nurses. It is thought that most of the respondents were clinical staff leaders because having a leadership role creates a desire to be involved in the future of the unit. The clinical staff leaders may have been more motivated to participate in the education because of the belief that this intervention would affect future decisions made for the project site. If most of the respondents were clinical staff leaders, then the level of education may not be accurately represented in the pre and post test results. It would be interesting to see how the results would compare if all of the 43 of the nurses and nursing assistants who were encouraged to participate had engaged in the intervention.

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Tables and Figures

Table 1. Recommendations for Practice Change

Recommendation	References in Support of Recommendation	Rationale	JHNEBP Level of Evidence and Quality Rating
1. In-person and e-learning are both effective at improving knowledge regarding pressure injury prevention and skin care practices in general.	Awali, et al., 2018	Study supported that an in service regarding pressure injury prevention is effective at improving skin care practices	IIA
	Fullbrook, et al., 2019	Study supported that both e-learning and in-person learning promote evidence-based skin care practices but in-person learning might be more effective	IIIA
	Suva, et al., 2018	Study supported that e-learning is better than in-person learning for PI evaluation	IIB
	Kim, et al., 2020	Study supported that nurse's knowledge of PI prevention & management improved after in-person, e-learning, and hybrid education	IIB
	Stankiewicz, et al., 2016	Study supported than in person education addressing skin care management and evaluation is effective at improving PI prevention knowledge	IIB

Figure 1. The Evidence-Base Practice Model for Improvement

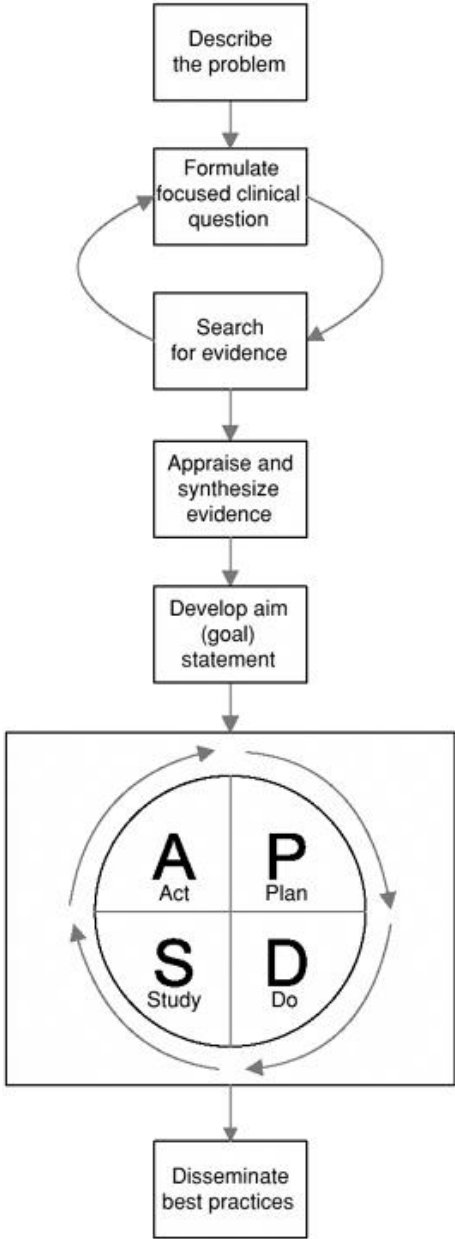


Table 2. Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pretest Score	9.3333	9	.50000	.16667
	Posttest Score	9.4444	9	.72648	.24216

Table 3. Paired Samples Correlations

		N	Correlation	Significance	
				One-Sided p	Two-Sided p
Pair 1	Pretest Score & Posttest Score	9	.574	.053	.106