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## Provider Education to Increase Knowledge and Identification of Pressure Injuries in Patients with Dark/Pigmented Skin

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**Provider Education to Increase Knowledge and Identification of Pressure Injuries in  
Patients with Dark/Pigmented Skin**

A DNP Project Presented to the Faculty of the  
Nicole Wertheim College of Nursing and Health Sciences  
Florida International University

In partial fulfillment of the requirements for the Degree of Doctor of Nursing Practice

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## Abstract

**Background:** Pressure injuries (PIs) represent a significant threat to individual and population health as well as contributing to increased healthcare costs. In patients with dark/pigmented skin, the prevention and early detection of PIs is more difficult, increasing patient risk for adverse outcomes. Provider education for skin assessment in patients with dark or pigmented skin can reduce the incidence of pressure injuries.

**Purpose:** The purpose of this Doctor of Nursing Practice (DNP) quality improvement project was to educate nurses about proper skin assessment in patients with dark/pigmented skin to determine if knowledge of the topic increases from baseline as a result of education.

**Methodology:** This quality improvement project utilized a quasi-experimental pre-/post-intervention design. Using a sample of nurses working on a medical/surgical floor, baseline knowledge of skin assessment in patients with dark/pigmented skin was evaluated. An educational program delivered via YouTube was provided to all nurses and post-intervention knowledge was assessed.

**Results:** In total  $N = 15$  nurses, with a mean age of 39.6 years (SD 4.87 years) were enrolled in the project. Baseline knowledge scores increased from the pre- ( $M = 62.4\%$ , SD 3.70) to post-intervention phase ( $M = 96.3\%$ , SD 2.39). Inferential analysis (a Mann-Whitney U-test) indicated that there was a statistically significant increase in knowledge scores following the educational module  $U(N_{\text{baseline}} = 15, N_{\text{post-intervention}} = 15) = 451.22, z = 2.29, p < .002$ .

**Conclusions:** Nurse education of skin assessments in patients with dark or pigmented skin did increase knowledge of the topic. This is an evidence-based intervention that is aligned with current research, suggesting that the use of education can be effective in practice to help prevent PIs in patients with dark or pigmented skin.

*Keywords:* pressure injury, skin assessment, PI, nurse, education, dark skin, pigmented

## **Provider Education to Increase Knowledge and Identification of Pressure Injuries in Patients with Dark/Pigmented Skin**

Pressure injuries (PIs) represent one of the most frequently occurring adverse events that occur in healthcare, despite the fact that many are preventable (Chaboyer et al., 2018). These injuries occur as a result of localized tissue damage that occurs when skin is exposed to intense or prolonged pressure or shear (Hess, 2020). Current epidemiological evidence indicates that 2.5 million patients develop pressure injuries each year (Padula & Delarmente, 2019). Older adults and those who are malnourished or have comorbid health conditions are more likely to develop pressure injuries and these events can lead to increased pain, reduced quality of life and increased morbidity and mortality (Alderden et al., 2017). Each year an estimated 60,000 patients die as a result of complications associated with a pressure injury (Padula & Delarmente, 2019).

In an effort to prevent pressure injuries the National Pressure Injury Advisory Panel (NPIAP) has established a classification system based on the specific characteristics of the pressure injury (Hess, 2020). In this taxonomy, PIs are classified as Stage 1, an area of non-blanchable erythema; Stage 2, thickness loss of skin and exposed dermis are present; Stage 3, thickness loss of skin and exposed adipose tissue are present; Stage 4, skin and tissue loss occurs exposing fascia, muscle, or tendon; and Unstageable, in which skin loss occurs but the extent of the tissue damage cannot be determined due to the presence of eschar and slough (Hess, 2020). Prevention of PIs in patients begins with assessment and early identification of these events to halt their progression (Ricci et al., 2017). While various methods for assessment and treatment have been proposed in patients with dark/pigmented skin, early detection of PIs can be difficult

(Gunowa et al., 2018). Providers may lack awareness of how to assess dark/pigmented skin for PIs, leading to an increased rate of PIs in this patient population (Weller et al., 2018).

## **Problem Statement**

### **Problem Identification**

Pressure injuries are a growing issue of concern for the healthcare system. As noted 2.5 million patients each year experience these adverse events, resulting in 60,000 deaths (Padula & Delarmente, 2019). Scholars consistently note that these events are primarily preventable through early assessment and standardized nursing care (Padula et al., 2019). As a result PIs are commonly used as a quality metric for evaluating the scope and level of care provided to patients (Padula et al., 2019). The ability to prevent PIs has been of notable concern for national healthcare agencies including the Centers for Medicare and Medicaid Services (CMS). For this reason, in 2015, CMS began imposing a 1% reimbursement penalty on facilities that have the highest pressure injury rates (Padula et al., 2019). Although pressure injury prevention can be enhanced through early detection and intervention, in patients with dark or pigmented skin, providers may lack the knowledge needed to effectively identify the early stages of pressure injuries (Weller et al., 2018).

Although specific data regarding the incidence and prevalence of pressure injuries in patients with dark or pigmented skin has not been extensively reviewed in the literature, surveys of various healthcare systems across the United States have consistently demonstrated that patients with dark skin tones have a higher prevalence rate of PIs when compared with patients who have lighter skin (Bates-Jensen et al., 2017). More specifically, African American patients have been found to not only have a higher incidence rate of PIs but also to have more severe PIs (McCreath et al., 2016). While the specific reasons for this problem are not completely

articulated in the literature, there is substantial evidence indicating that providers may lack the knowledge and skills needed to identify the early stages of pressure injuries in patients with pigmented skin (Bates-Jensen et al., 2017; Weller et al., 2018). The increased incidence and severity of PIs in patients with dark skin increases risks for morbidity and mortality, creating a significant health disparity for this population group (Bliss et al., 2017).

## **Background**

As noted pressure injuries are preventable events that are quite common in the healthcare setting. Scholars reviewing the prevention of these events consistently note that pressure injury prevention is typically a nursing-focused concern (Yan et al., 2022). Nurses are required to perform regular and consistent skin assessments of patients at-risk for developing this condition (Gunowa et al., 2018). However, many nurses may not be aware of how skin tone or pigment influences the ability to detect pressure injuries, leading to missed opportunities for early PI identification and intervention (Gunowa et al., 2021). Scholars assert that while nurses should be aware of and document variations in skin tone, this is often not done (Gunowa et al., 2018). One potential reason that this may occur stems from the fact that guidance for nurses to recognize and identify variations in skin tone may be lacking (Hess, 2020). Confusion over this issue is understandable when reviewing national guidance regarding pressure injury detection and staging in clinical practice.

In the introduction to this work, it was noted that due to the preventable nature of pressure injuries in the clinical setting, the NPIAP has established a taxonomy for the classification of these wounds (Hess, 2020). Scholars reviewing this taxonomy argue that it has been revised several times in an effort to provide better guidance for clinicians in identifying Stage 1 pressure injuries to prevent progression of the injury and to prevent PI-related



complications (Hess, 2020). Even though guidance from the NPIAP has been updated, experts note that it has only been in the most recent iteration of the guideline that the NPIAP has acknowledged the role and importance of skin tone in assessing PIs for patients (Gunowa et al., 2018). Consequently, many nurses may be unfamiliar with this requirement and may fail to adequately assess patients with pigmented skin for pressure injuries, exacerbating both the incidence and severity of PIs in patients with pigmented skin (Gunowa et al., 2018).

### **Scope of the Problem**

The scope of the problem is quite broad and has widespread implications for patients, providers, and the healthcare system. More than 2.5 million patients each year experience a PI, resulting in 60,000 deaths (Padula & Delarmente, 2019). For comparison, Padula and Delarmente (2019) report that in 2016, 63,600 people died from drug overdoses, 44,000 people committed suicide, and 56,000 people died of influenza. Data also indicate that pressure injuries are more common in older adults and those with underlying health conditions (Alderden et al., 2017). As the number of aged in the United States continues to increase, there are concerns that the current challenges associated with preventing pressure injuries will result in higher rates and severity of PIs as well as increased patient morbidity and mortality (Alderden et al., 2021). Further, evidence indicates that the current population in the United States is becoming more diverse (Williams et al., 2016). Evidence also indicates that when it comes to pressure injury incidence and severity, there is a significant health disparity for patients of color (Bliss et al., 2017). Consequently, it is reasonable to believe that as the population ages and becomes more diverse, the failure to prevent PIs, especially in patients with darker skin tones will result in further disparities for managing and controlling this health issue.

## **Consequences of the Problem**

The consequences of the problem can be seen in terms of the impact of pressure injuries on the patient as well as in terms of the overall costs associated with treating pressure injuries. As previously noted, patients with pressure injuries often experience significant pain as well as a decline in their overall quality of life (Alderden et al., 2017). The development of a pressure injury can result in a non-healing wound that can impact the patient over the long-term (Jackson et al., 2018). Nonhealing wounds have various implications for patient quality of life as well as for increasing morbidity and mortality (Jackson et al., 2018). Prevention of pressure injuries is viewed as being the most effective method for preventing this medical sequela and ensuring that optimal health outcomes are achieved for the patient (Alderden et al., 2017). Evidence also indicates that since 2009, the rate of pressure injuries that occur in healthcare facilities has increased from 8.8% to 12.1%, suggesting that failure to address the problem will result in more patients being adversely impacted by these events in the coming years if efforts are not made to effectively prevent these events (Ricci et al., 2017).

Also of concern when looking at the consequences of the problem are the costs associated with treating pressure injuries. Current data indicate that in the United States, direct care costs associated with pressure injuries total more than \$11 billion annually (Chaboyer et al., 2018). Further, scholars argue that if efforts are not made to address PI prevention in an effective manner, the costs for treating these events could increase to \$26.8 billion in the next decade (Padula & Delarmente, 2019). When this information is juxtaposed against demographic data indicating that the population is aging and becoming more diverse, it is reasonable to believe that without prevention efforts, the incidence, severity, and costs associated with pressure injuries will only continue to increase, especially for patients with dark skin tones.

## **Knowledge Gaps**

Current knowledge gaps regarding the problem appear to stem from the fact that many nurses and healthcare providers may be unaware of the role and impact of skin tone on patient assessment for pressure injuries (Gunowa et al., 2018). As noted the NPIAP has diligently worked to update recommendations for the identification and staging of PIs (Hess, 2020). Despite this, it has only been recently that the organization has actively acknowledged the role of skin tone in evaluating early stage pressure injuries (Gunowa et al., 2018). Without effective guidance and support for understanding the role that skin tone plays in pressure injury development, nurses may lack critical information needed to help prevent these events from occurring, leading to increased rates and severity of PIs in patients with darker skin tones.

Also of concern when reviewing the topic of pressure injury prevention is the fact that scholars assert that many nurses may lack an understanding of PI staging and intervention in general (Barakat-Johnson et al., 2018). Skin assessments provided by nurses are noted in the literature to often be time consuming and tedious, with many nurses failing to adequately assess the patient for pressure injuries (Ricci et al., 2017). Experts note that this may be one of the root causes of increased PI rates among all patients seen in the clinical setting (Ricci et al., 2017). What is evident is that nurses may require more education and support not only to prevent pressure injuries in the clinical setting but also to prevent these events from occurring in patients with darker skin tones.

## **Proposed Solution**

The proposed solution to address the current problem is to provide nurse education for better identification and prevention of pressure injuries in patients with dark/pigmented skin. A cursory review of the literature on this topic does indicate that nurse education to improve

pressure injury prevention has been effective for reducing pressure injury rates in the clinical setting (Dalvand et al., 2018). When nurses are provided with structured or formal education to prevent pressure injuries, the rates of these events do decline (Dalvand et al., 2018). Education appears to increase nurse awareness of the issue and the need for proper skin assessment, leading to early identification and intervention of Stage 1 pressure injuries to prevent their progression and related complications (Dalvand et al., 2018). Evidence also indicates that targeted education for nurses regarding the role of skin tone and its assessment in pressure injury development has also been effective for reducing the number of PIs that occur in patients (Gunowa et al., 2020). What this information indicates is that there is an evidence-based foundation upon which to recommend the use of provider education as a means to enhance pressure injury prevention for patients with dark/pigmented skin in the clinical setting.

### **Significance of the Issue**

Pressure injuries (PIs) are typically viewed as being preventable healthcare-associated events that increase patient morbidity and mortality (Dalvand et al., 2018). Despite efforts to prevent these events from occurring, evidence indicates that each year approximately three million patients develop pressure injuries (Mervis & Phillips, 2019). Interestingly, despite ongoing efforts to raise clinician awareness of pressure injury prevention and early intervention, over the course of the last 20 years, the number of pressure injuries experienced by patients has remained relatively unchanged and, in some settings, has actually increased (Mervis & Phillips, 2019). While the aging of the population and increased rates of institutional care may contribute to this lack of progress on pressure injury prevention, scholars do note that many clinicians including registered nurses often lack the knowledge to effectively assess and prevent pressure injuries from occurring (Barakat-Johnson et al., 2018).

Although the current data regarding pressure injuries is troubling, especially in light of increased awareness and effort to prevent these events from occurring, research consistently demonstrates that in patients with dark or pigmented skin tones, the problem may be even worse (Bates-Jensen et al., 2017). Despite a lack of national data regarding the incidence and prevalence of pressure injuries in patients with dark or pigmented skin, studies conducted on this topic have demonstrated that patients with darker skin tones are not only more likely to develop pressure injuries but are also more likely to have a more severe disease trajectory (McCreath et al., 2016). This prompts the need to consider what can be done to effectively address the problem in clinical practice. Provider education to recognize and identify the initial stages of a pressure injury in dark or pigmented skin appears to represent a useful approach to reducing PIs in this specific patient population (Guihan & Richardson, 2019). Consequently, a quality improvement project to provide clinician education to improve knowledge for pressure injury prevention in patients with dark or pigmented skin was proposed.

### **Summary of the Literature**

To support this quality improvement project, a solid evidence-based foundation is required. Evidence-based practice is built upon three pillars including current literature supporting change, clinician expertise, and patient preferences (Melnyk et al., 2018). With these issues in mind, this document includes a review of the pertinent literature regarding provider education to increase knowledge of pressure injury prevention in patients with dark or pigmented skin. More precisely, this document includes a review of the search strategy employed to identify relevant evidence to support the quality improvement project as well as a review and synthesis of the literature to demonstrate the utility of provider education while also providing a foundation upon which to build the quality improvement project. For the purposes of this literature review,

Polit and Beck's (2017) level of evidence taxonomy was utilized to review and grade the evidence located. A literature matrix table is included in Appendix A summarizing the most pertinent features of the literature on this topic.

### **Search Strategy**

The search for evidence to support this quality improvement project began with the identification of five electronic databases containing articles primarily related to health and patient care: CINAHL, Ovid, ProQuest, PubMed, and Science Direct. Google Scholar was also used as a supplemental resource for identifying additional articles on the topic. Search terms for locating articles utilized targeted terms related to the quality improvement project including: “pressure injury prevention,” “dark skin,” and “provider education.” To expand the availability of results available for potential inclusion in the evidence base, terms similar to those noted here (i.e., synonyms) were also used. Primary search terms were combined with the Boolean operator AND synonyms were combined with the Boolean operator OR. The search terms and related synonyms that were used to complete the search are listed below in Table 1.

**Table 1**

#### *Database Search Terms*

<b>Primary Search Terms</b>	<b>Synonyms</b>		
Pressure injury prevention	Pressure ulcer prevention	PI prevention	PU prevention
Dark skin	Pigmented skin	Skin tone	African American
Provider education	Education	Training	Provider training

All database searches were completed utilizing specific limiters placed on each search. The limiters used for each search were as follows: articles published within the last 10 years (2012 through 2022), included in a peer-reviewed publication, available in full-text and English, and ordered by relevance of the search terms used. The top 100 results from each search were

reviewed. More specifically, the abstract was parsed to determine if the study met the criteria of being a primary study utilizing provider education in pressure injury prevention. Abstracts indicating that this content was included were retained and following the completion of the literature search, each full-text article associated with the abstract was evaluated to determine if the study did include usable results for the quality improvement project: i.e., demonstrating that provider education was effective for improving knowledge of pressure injury prevention. Articles that met these criteria were evaluated using Polit and Beck's (2017) level of evidence taxonomy to identify the highest quality evidence for the project. A total of eight studies were identified demonstrating the quantitative impact of provider education to prevent pressure injuries in patients with dark and pigmented skin tones. A PRISMA flow diagram for the selection of articles can be found in Appendix B.

### **Literature Summary and Synthesis**

The literature synthesis and summary provided here includes a review of the eight articles identified demonstrating the relevance of provider education to prevent pressure injuries in dark and pigmented skin tones. This literature review also includes a review of the specific instructional content that should be used as the basis for providing the education to prevent pressure injuries in patients with dark or pigmented skin tones. More specifically, the following sections are included in this literature review: overview of quantitative studies demonstrating the efficacy of provider education, overview of the literature regarding what educational content should be provided to clinicians to prevent PIs, and the implications of this literature for clinical practice.

## **Overview of the Literature: Provider Education**

A cursory overview of the literature obtained for this quality improvement project demonstrates that of the eight studies selected, only one was a Level I study (systematic review/meta-analysis) as per Polit and Beck's (2017) taxonomy (Kim et al., 2020). This study demonstrates the highest level of evidence for supporting practice change (Polit & Beck, 2017). The remaining seven studies were Level III studies involving quasi-experimental pre-/post-intervention designs (Aquino et al., 2019; Baykara et al., 2021; Gaballah & El-Deen, 2021; Henry, 2019; Price et al., 2017; Sankovich et al., 2019; Zubkoff et al., 2020). A further review of the studies indicates that while each included information regarding dark/pigmented skin tones as part of the educational program, only three directly measured outcomes for this variable (Aquino et al., 2019; Kim et al., 2020; Price et al., 2017).

Additional evaluation of the literature reviewed indicates that not all of the studies assessed provider knowledge directly. Two of the studies only assessed outcomes from education such as documentation or reduction in PI rates (Aquino et al., 2019; Zubkoff et al., 2020) while six reviewed knowledge gains made by providers (Baykara et al., 2021; Gaballah & El-Deen, 2021; Henry, 2019; Kim et al., 2020; Price et al., 2017; Sankovich et al., 2019). Even though the two studies focused on outcomes other than knowledge gains which limits the ability to assess provider knowledge, it is assumed that improvements in practice are the end result of improvements in knowledge. Also, it is important to note that all studies included in this review demonstrated positive and statistically significant results indicating improvements in provider knowledge and/or patient care as a result of the educational interventions utilized.



### *Review of Individual Studies*

With a general overview of the literature provided, it is also helpful to consider a review of the individual studies and what they demonstrate regarding the quality improvement project. Aquino et al. (2019), for instance, utilized a quasi-experimental pre-/post-intervention design to educate all registered nurses working in a single adult medical intensive care unit.

Documentation of PIs and rates of PI as measured through the electronic medical record system was used to assess outcomes for the project. An analysis of the data collected by the authors indicated that documentation of skin assessment even with darker skin tones increased by 18% and was statistically significant:  $P = 0.015$ . Further, PI rates were found to decline from 7.7% pre-intervention to 6.6% post-intervention. An additional quasi-experimental pre-/post-intervention was undertaken by Baykara et al. (2021) to evaluate the use of a targeted education program for nurses to prevent PIs through an assessment of knowledge gained by nurses. In total 194 nurses working in an urban medical center were provided with education and knowledge assessments before and after the educational intervention. Data collected by Baykara et al. indicates that nurse mean knowledge scores were  $55.36\% \pm 14.40$  at pre-intervention and  $69.92\% \pm 9.73$  following the intervention. This was statistically significant at  $P < 0.05$ .

Quasi-experimental, pre-/post-intervention designs were also used by Gaballah and El-Deen (2021) and Henry (2019). Looking first at the study conducted by Gaballah and El-Deen the aim of this study was to investigate the use of a PI educational program on nurse's performance with skin assessment and pressure injury wound healing rates. The study included 30 nurses and 50 patients that were being provided with care on two different units. The study separated the nurses and patients into control (no education) and intervention (education) groups for comparison. To measure outcomes the authors utilized a pressure injury questionnaire, an

observational checklist, and the electronic medical record to evaluate patient wound healing outcomes at five weeks. Results from this study indicated that pre-program knowledge increased from  $44 \pm 5.5$  to  $68.3 \pm 2.1$  in the post-program phase when compared with controls. These results were found to be statistically significant:  $P = 0.000$ . Henry (2019) also noted positive results from the use of an educational program to increase nurse knowledge regarding pressure injury prevention. In this study a sample of 129 nurses working in three different adult critical care and step down units in the same hospital were enrolled. Knowledge assessments completed before and following the intervention indicated a statistically significant increase in nurse knowledge following the educational intervention:  $P < 0.05$ .

Three additional studies utilizing a quasi-experimental, pre-/post-intervention design were also located for inclusion in this literature review (Price et al., 2017; Sankovich et al., 2019; Zubkoff et al., 2020). Price et al. (2017) utilized a sample of 164 nurses and personal care workers employed at an aged care facility to evaluate provider knowledge and PI prevalence following the use of an educational program. Results from this study indicated that knowledge scores increased from  $17.5 + 5.5$  in the pre-intervention phase to  $41.9 + 4.8$  in the post knowledge phase and the results were statistically significant  $P < 0.001$ . Further, the authors noted that providers spent more time on skin assessment and evaluation ( $P < 0.001$ ) in the post-implementation phase and indicated better accuracy for darker and pigmented skin tones. Further, Price et al. found that PI prevalence rates declined from 12.5% to 6.8% following the intervention and the results were noted to be significant:  $P = 0.02$ .

The quasi-experimental study conducted by Sankovich et al. (2019) also demonstrated positive results for using an educational intervention to increase nurse knowledge of proper staging for pressure injuries. In this investigation, 41 nurses and 2 licensed practical nurses

(LPNs) working in a 315-bed community-based acute care hospital and Level II trauma center were included. Nurse knowledge regarding PI and the use of skin assessments were the primary outcome measures assessed. The results indicated that nurses completed more skin assessments following the intervention. Further, the data revealed that knowledge and staging of PIs in all patients including those with darker skin tones increased following the intervention  $P = 0.004$ . The final study reviewed was undertaken by Zubkoff et al. (2020) and included all staff working at 28 different Health Administration (VHA) facilities across the United States. Pressure injury rates before and after the educational intervention were evaluated with the results indicating that PI rates declined from 1.0 to 0.8 per 1,000 bed days following the intervention, with the outcomes being statistically significant:  $P = 0.01$ . Additionally, the authors found that pressure injury rates declined in the three months following the intervention from 0.8 to 0.4 per 1,000 bed days. These results were also statistically significant at  $P = 0.021$ .

Kim et al. (2020) completed the only Level I study located for inclusion in this literature review. This systematic review and meta-analysis provided useful insight into the scope of the impact of provider education on various aspects of pressure injury prevention and management. Using data from five electronic article databases, the authors located 23 studies on the topic of provider education that included 1,067 healthcare providers working in different types of facilities and areas of specialization. Statistical assessment of the data was made in three areas: increases in nurse knowledge as a result of training, visual discrimination ability of nurses including darker skin tones, and clinical judgment for providing care for patients with or at-risk for PIs. Improvements were noted in all three areas and the results were statistically significant. With regard to nurse knowledge outcomes were measured through standard mean difference (MD) which indicated that for those undergoing education,  $MD = 1.23$  95% confidence interval

(CI) 0.50-1.96,  $P < 0.001$ . Visual discrimination of PIs was also measured through MD with the results indicating that MD = 1.13, 95% CI 0.88-1.38,  $P < 0.001$ . Finally, clinical judgement was assessed through odds ratio (OR) with the results indicating OR = 1.52, 95% CI, 1.46-1.57,  $P < 0.001$ .

### ***Strengths and Limitations of the Research***

An assessment of the strengths and limitations of the research does provide an important foundation for linking the evidence to the quality improvement project. When the results of the literature review are collectively aggregated it is possible to see that there is overwhelming support to utilize provider education as a means to improve pressure injury prevention, pressure injury identification, lower PI rates, and improved practice skills to document and manage PIs in various clinical settings. The results also demonstrate that education is effective when provided in different care settings with different provider groups. Also, various educational programs were reviewed in the included studies and each was shown to be effective. This indicates that education can be provided in different ways to diverse provider groups with the results supporting the intervention to help improve provider knowledge and patient outcomes. Through the use of an educational program in the quality improvement project, it should be possible to enhance provider knowledge and, over the long-term, improve care for the patient through a reduction in PI rates.

While the literature does demonstrate some important strengths for supporting the quality improvement project, there are some pertinent weaknesses of the literature that must be discussed. For instance, it is important to note that only one Level I study and no Level II, randomized controlled trials were located for this investigation. Level I and Level II studies represent the highest levels of evidence for practice change (Polit & Beck, 2017). Although the

majority of the studies included Level III quasi-experimental designs that did demonstrate a correlation between education and positive outcomes for provider knowledge and patient care, these studies lack causality, making it difficult to know for sure if the intervention was the sole cause of improvement in provider knowledge and patient care. Also of concern when reviewing the literature is that most of the studies utilized small sample sizes and either one site or one type of site. This limits the generalizability of the findings and makes it difficult to ensure that if the findings are applied to different practice settings with different provider populations that the same results could be obtained.

Additional limitations noted from the review include the fact that only a small number of studies (three) specifically measured outcomes for education with regard to nurse knowledge or assessment practices as they relate to dark or pigmented skin (Aquino et al., 2019; Kim et al., 2020; Price et al., 2017). While each of the studies made some mention of including education for dark or pigmented skin as part of the educational intervention, it is not possible to state with certainty that knowledge in this particular area did increase in all of the studies reviewed. Without a direct assessment of knowledge outcomes on this topic, there is a gap in the literature which has implications for ensuring that the educational intervention for this quality improvement project will be successful. Finally, it is important to note that not all of the studies directly measured increases in provider knowledge. While it is assumed that changes in practice related to education are the result of increases in knowledge, without actual data to measure knowledge outcomes it is difficult to state with certainty that these increases in provider knowledge have occurred.

## **Overview of the Literature: Educational Content**

With a review of the literature regarding the impact of provider education on outcomes for preventing pressure injuries in dark and pigmented skin provided, it is now possible to consider the content that should be included to build clinician knowledge of the topic. A review of the literature on the specific content needed for provider education does indicate that educational resources are scant. However, there are some high-quality resources that provide an important foundation for fostering clinician education. In particular, the National Pressure Injury Advisory Panel (2020) offers a webinar regarding staging of PIs for dark skin tones. In the webinar, information is presented regarding some basics of skin assessment as well as specific recommendations for assessing dark skin. Pertinent areas for education of the provider regarding skin assessment include the following:

- Instruction of providers for completing a comprehensive skin assessment including identifying blanching responses, evaluating the presence of localized shear on the skin, and evaluating for edema and hardness (induration).
- Performing regular skin assessments at consistent intervals that are consistent with the health status of the patient and are increased if the patient's condition deteriorates.
- Questioning the patient about any localized pain or discomfort through a more thorough inspection.
- Specifically evaluating skin for pressure damage that is associated with the use of medical devices.

While these general issues for skin assessment should be performed with all patients, the NPIAP (2020) webinar also includes recommendations for assessing dark and pigmented skin for the presence of pressure injuries:

- Recognizing that intact dark pigmented skin may not blanch when pressure is applied over a bony prominence.
- Importance of applying pressure over various areas of discomfort noted by the patient. Localized skin color may change when pressure is applied. These color changes will be different from the patient's typical skin color and may be indicative of a PI.
- Without gloves, the provider should feel the patient's skin in areas where PIs are most likely to develop. The skin may be hotter or colder when touched. The skin should first be cleaned to remove any body fluids.
- In patients with darker colored skin, a previous pressure injury may be lighter in color.
- Focus specifically on areas that are subjected to pressure. Skin color changes may be subtle but may include skin that is purple, blue, or violet in color. This correlates with the erythema seen in patients with lighter skin tones.
- Touching the skin to identify areas of induration will help identify potential areas where PIs can develop. Edema is often present with skin hardness and the skin may be taught and shiny, even if no color change is present.
- When skin assessments are performed, further evaluate any areas where the patient indicates pain.

In addition to providing these recommendations for education the NPIAP also includes photos of PI stages on dark and pigmented skin that can be used for educational purposes to raise provider awareness regarding how different types of PIs will appear visually on dark skin tones. It is important for providers to be aware that one of the first signs of PI in light skin is the presence of erythema. However, this is often masked in patients with darker skin tones requiring providers to perform a direct physical assessment by touching the skin.

Although the NPIAP provides some valuable information and photographic resources for building a provider education module regarding the assessment of dark and pigmented skin tones for the prevention of PIs, there are additional resources available for use. In particular, Black and Simende (2022) writing on behalf of Wounds International provide additional recommendations for assessing dark and pigmented skin tones for the prevention of PIs. In particular, these authors make the following recommendations:

- Providers should be highly suspicious of the potential for pressure injuries to develop in patients with dark or pigmented skin. Regular and more frequent skin assessments may be needed in this population and consistent record keeping of assessments will be needed.
- Effective lighting of dark skin can make pressure injuries more readily visible. This includes the use of natural light or the use of a pen light to visualize all areas of the skin.
- Erythema is not as apparent in dark skin tones. Rather darkened skin will be present. An assessment of all skin is needed to determine if pigmentation is uniform. Comparison of areas of darker skin must be made in conjunction with an assessment of the patient's entire skin tone.
- Providers should be educated about the use of a color chart to compare with patient skin tones. The Munsell skin tone chart and the 6 Fitzpatrick skin types are recommended.
- Rehydrate the skin with water to remove ashen overtones. This will make changes in skin color more readily visible.
- Palpation of the skin is necessary to identify edema and induration. Tissue that is inflamed in dark skin may also be warmer or cooler to the touch.



- If possible utilize thermographic assessment of the skin when there is concern. These assessments are more objective than touching the skin and will reveal where areas of tissue damage are present.

These recommendations made here provide a remarkable foundation for building an educational program that can be used to train providers regarding the specific actions that should be taken to effectively assess dark or pigmented skin tones for the presence of pressure injuries. In addition to providing a review of the recommendations, information from the NPIAP (2020) suggests that visual images of PI staging in patients with darker skin tones can be an effective tool for educating providers regarding the prevention of these events. Even though resources for building educational materials are limited, the information provided here does indicate that there are definitive areas for provider education that can be useful for improving PI detection and early intervention in patients with dark or pigmented skin tones.

### **Implications of the Literature**

Even though there are pertinent limitations associated with the current literature when it comes to the use of education for the prevention of PIs in patients with dark or pigmented skin tones, there is considerable support for using education to improve provider knowledge of this topic. As noted in the introduction to this work, patients with dark or pigmented skin tones do experience a higher rate of pressure injuries and their disease is often more severe when compared with patients that have lighter skin tones (Bates-Jensen et al., 2017; McCreath et al., 2016). This issue must be addressed in order to ensure that this health disparity does not persist. What is made clear through the current literature is that education can be effective for improving provider knowledge, suggesting that this intervention should be used as the basis for practice change within the clinical setting. Education should lead to increased provider knowledge as well

as improvements in patient care ranging from better documentation, more time spent on skin assessments, fewer pressure injuries for patients, and better facility outcomes in terms of patient care quality.

The evidence reviewed here regarding what specific educational content should be provided to clinicians regarding the topic is also elucidating. In particular, the literature demonstrates that there are clear and definitive recommendations for educating providers about the topic. Content should be focused on developing the specific skills needed to adequately assess patients with darker skin tones and for ensuring that providers are aware of the tools available for assessment including the Munsell skin tone chart, the 6 Fitzpatrick skin types, and thermographic assessment. Each of these tools can be used by the provider to effectively assess the skin of patients with darker skin tones. By providing education on these topics, it should be possible for clinicians to reduce the risk of PI progression through early identification of this health issue coupled with intervention.

### **Purpose/PICO Clinical Questions/Objective**

The focus of this DNP project was to educate providers regarding the identification and staging of pressure injuries (PIs) in patients that have dark or pigmented skin. Scholars reviewing this issue argue that in patients with dark or pigmented skin pressure injuries may be difficult to detect in their early stages (Bates-Jensen et al., 2017). Because early identification of pressure injuries is needed to help prevent their exacerbation, nurses need to be able to perform effective skin assessments that allow for the early identification of PIs in the clinical setting (Weller et al., 2018). The importance of this issue can be seen when reviewing what has been noted regarding PI detection in patients with dark or pigmented skin. In particular, patients with darker skin tones

have been found not only to have a higher incidence of pressure injuries but also to have more severe PIs when compared with patients that have lighter skin tones (McCreath et al., 2016).

The problem of increased risk and severity of PIs in patients with darker skin tones must be juxtaposed against evidence indicating that pressure injuries are, for the most part, considered to be preventable events (Chaboyer et al., 2018). In fact the Centers for Medicare and Medicaid Services (CMS) has passed no-pay rules for facilities that have high rates of PIs among patients (Padula et al., 2019). Because PIs are viewed as being preventable events, increased rates of these conditions will result in CMS penalties enforced through reducing reimbursements for care (Padula et al., 2019). More specifically, the CMS rules reduce reimbursement for facilities that have high rates of Stage II PIs and above (Padula et al., 2019). Early detection of Stage I pressure injuries should prompt the use of various interventions such as repositioning and offloading to prevent worsening of the condition (Padula et al., 2019). However, if nurses are not able to identify Stage I pressure injuries in patients with dark or pigmented skin tones, halting the progress of the PI may be impossible leading to adverse outcomes for both the patient and the healthcare facility.

To address the problem, current evidence suggests that provider education to identify pressure injuries in patients with dark or pigmented skin tones may be helpful (Dalvand et al., 2018). Literature on the topic suggests that when providers are given education regarding the topic this will serve as the basis for reducing pressure injury rates in all patients, including those with dark or pigmented skin tones (Gunowa et al., 2020). With these issues in mind, the primary goal of this DNP project was to provide an educational module to healthcare practitioners working on a medical/surgical unit who work with patients that have dark or pigmented skin to help increase knowledge of how to perform accurate skin assessments for PI prevention. While

this goal was the focus of the DNP project, it is hoped that this educational intervention will have implications beyond the educational module. More specifically, it was anticipated that increased provider knowledge will lead to changes in practice that allow for the early identification of PIs in patients with dark or pigmented skin to prevent their progression.

Information provided in the introduction to this work highlights the challenges of preventing pressure injuries in patients with dark or pigmented skin. Skin color may impact the ability of providers to detect PIs in their earliest stages (Weller et al., 2018). Consequently, the purpose of this quality improvement project was to improve provider knowledge of PI detection and prevention in patients with pigmented skin. To support this purpose, a clinical population, intervention, comparison, and outcome (PICO) question was formulated to include the following: For healthcare providers working on a med/surg floor with patients who have dark/pigmented skin who are at risk for pressure injuries, does the use of a provider education program increase knowledge of PI early identification as compared with knowledge before the educational intervention? Breaking this down by PICO components, the following elements are identified:

- **P (Population):** Healthcare providers working on a med/surg floor with patients who have dark/pigmented skin who are at risk for pressure injuries.
- **I (Intervention):** Provider education program.
- **C (Comparison):** Baseline knowledge or knowledge before the educational intervention.
- **O (Outcome):** Increased knowledge of PI early identification.

### **Project Goals and Outcomes**

While the primary DNP project goal to increase provider knowledge of how to perform skin assessments in patients with dark or pigmented skin provided a foundation for building the

project, it is also helpful to consider the specific project goals that were included in the project to facilitate its operationalization within the practice setting. A review of the primary DNP project goal indicates that the project required the creation of an educational module as well as some method for quantifying changes in knowledge that occur as a result of the educational module. Based on this assessment of the primary focus of the DNP project, the following project goals were outlined utilizing the SMART (specific, measurable, attainable/achievable, relevant, and timebound) criteria:

- By August 2022, secure Institutional Review Board (IRB) approval for the quality improvement project.
- By August 2022, develop an educational module for healthcare providers that is approved by the practice site for use.
- By early September 2022, recruit at least 10 healthcare providers to participate in the educational module, including acquiring informed consent.
- By mid-September 2022, collect demographic data and baseline knowledge of participants regarding PI assessment in patients with dark or pigmented skin tones.
- By the end of September 2022, complete provider education and post-test assessments of provider knowledge.
- By mid-October 2022, evaluate data to determine if there was a change in provider knowledge and to determine if the change was statistically significant.

Because the timeframe for the completion of the project was only four weeks, the primary outcome that was measured included increases in provider knowledge. Baseline knowledge assessments of providers were conducted before the educational module was provided. Following the completion of the educational module, an assessment of provider

knowledge was also undertaken to compare the results to baseline. As previously noted, however, it was anticipated that knowledge gains made by healthcare providers as a result of this project would foster changes in practice that could lead to the earlier detection of PIs in patients with dark or pigmented skin tones. This should, in turn, improve patient health outcomes while also reducing facility PI rates.

### **Definition of Terms**

For the purposes of this quality improvement project, the following definitions are provided.

- Pressure injury: The National Pressure Injury Advisory Panel (2016) defines a pressure injury as “localized damage to the skin and underlying soft tissue usually over a bony prominence or related to a medical or other device” (p. 14). The organization goes on to note that the injury can present as intact skin or an open ulcer that may be painful and occurs as a result of prolonged pressure that is combined with shear.
- Dark or pigmented skin: This is defined as skin that has a higher concentration of melanin, especially eumelanin that results in skin that is darker (Couteau & Coiffard, 2016). However, the term is subjective.
- Skin assessment: An evaluation of a patient’s skin that is based on inspection and palpation to record any variances from what would be considered typical given the patient’s current health status (Kottner et al., 2016).

### **Conceptual Underpinning/Theoretical Framework**

This quality improvement project involved the use of a structured change to increase provider knowledge and, over the long-term, improve practice such that PI rates could be reduced for the unit. The focus on planned change indicated that Lewin’s theory of planned

change was an appropriate framework for structuring the change process. Lewin's theory has been noted in the literature to be an excellent starting point for undertaking change that can be planned (Rosenbaum et al., 2018). The framework provides a means for change agents to group change activities such that they can be coordinated across the entire change project (Rosenbaum et al., 2018). More specifically, Lewin's change theory involves three stages: unfreezing, which includes all of the activities needed to make the change; moving, which involves the implementation of the actual change; and refreezing, which involves integrating the change as part of standard practice (Rosenbaum et al., 2018).

Application of Lewin's change theory to the quality improvement project suggested that during the unfreezing stage, all activities needed to provide education would need to be accomplished. Referring to the project goals stated earlier in this deliverable, this indicated that obtaining IRB approval, developing the educational module, and recruiting providers to participate in the project were included under this umbrella. The moving phase involved baseline data collection, providing the educational program, and collecting post-test knowledge data. Analysis of the data was also considered as part of the moving stage. The final stage, refreezing, occurred once the data had been analyzed and a determination of project outcomes could be made. When applying the change theory, it was noted that if the project was effective for increasing knowledge, decisions regarding how to include this program as part of provider training would need to be considered. This may include plans to include the educational module as part of training for new hires. If, however, knowledge of providers did not improve, there would be a need to consider if the project should be changed or if it should simply be abandoned altogether. The decisions made during refreezing will have an impact on how the organization

addresses the issue of PI prevention in patients with dark or pigmented skin tones moving forward.

Various studies undertaken in nursing and healthcare have used Lewin's theory of planned change to guide implementation. Wojciechowski et al. (2016), for example note the use of Lewin's theory in building a program to enhance interprofessional collaboration in bedside shift reporting. Additionally, Abd el-shafy et al. (2019) note the use of Lewin's theory to implement evidence-based practice guidelines in the management of pediatric trauma. The scale and breadth of the research utilizing Lewin's model indicates that it provides a useful method for organizing project scope and steps to facilitate project success. Application of this model to the quality improvement project was, therefore, viewed as being a useful foundation for ensuring that each stage of the project is comprehensively planned, managed, and implemented increasing project success.

## **Methodology**

### **Setting and Participants**

The organization where the quality improvement project was implemented is an acute care facility operating in South Florida. A specific med/surg unit at the facility was the primary setting where the practice change was undertaken. In this unit and across the facility, an emphasis on quality improvement has been prioritized in recent years and nurses working on the unit have been involved in various quality improvement projects in recent months. The unit currently employs 20 registered nurses (RNs) and six advanced practice nurses (APNs) on a full- or part-time basis. While the ideal goal was to have all current nurses working on the unit participate in this quality improvement project, following recruitment for this project, 15 nurses voluntarily agreed to participate.



## **Description of the Approach/Procedures**

The approach used for this educational program involved a quality improvement framework. As noted in the literature, quality improvement frameworks are typically employed to standardize processes such that variation is reduced, resulting in predictable results that improve the quality of care and health outcomes for patients while also systemically improving the healthcare system (Wells et al., 2018). This can be done through various means including providing education and training to staff (Wells et al., 2018). Using this approach for the current project helped to ensure that nurses working on the med/surg unit were provided with access to the knowledge needed to improve care for patients with dark or pigmented skin tones who are more likely to develop pressure injuries.

To begin the project, IRB approval from Broward Health and approval from organizational leaders was obtained to conduct the educational program at the practice site. Appendix C contains the IRB approval from Broward Health. Additionally, Institutional Review Board (IRB) approval from Florida International University was sought and granted on November 1, 2022. A copy of the IRB approval letter can be found in Appendix D. During the IRB approval process an educational module for providers at the practice site was developed along with a demographic form (Appendix E) pre-/post-intervention knowledge assessment (Appendix F). The educational module was approved by the clinical preceptor to ensure that the information and educational content was aligned with current practice and the evidence base. The pre- and post-intervention knowledge assessments were constructed from the educational presentation and were validated by organizational leaders as well as two wound care experts. This was done to ensure content validity of the assessment tool.

Following the acquisition of IRB approval from FIU, it was possible to begin the implementation of the project at the practice site. This process was initiated by sending a recruitment email (Appendix G) to all nurses currently working on the med/surg unit. The facility where the quality improvement project was implemented maintains an employee email list to which the principal investigator has access. Email addresses of nurses working on the unit were used to send the letter. To protect the privacy of nurses contacted, the blind carbon copy (bcc) feature was used. The recruitment email included information about the project as well as what would be required of nurses if they chose to participate in the project. This email also included an informed consent form (Appendix H) for nurses who were interested in participating in the project. Nurses were provided with instructions regarding the completion of this form and will be asked to sign the form electronically to indicate their desire to participate in the project. The email also included instructions to return the signed informed consent form to the principal investigator within one week to indicate a desire to participate in the project. One week after the recruitment and informed consent forms were sent, nurses that had not responded to the email were sent a follow-up email detailing the study and asking them to participate by completing the attached informed consent form. Nurses that do not respond within the follow-up timeframe had their email addresses removed from further project communication.

The completed informed consent forms were used to identify study participants and the next step in the project included emailing participants a demographic questionnaire (Appendix E) and a pre-intervention knowledge assessment form (Appendix F) that evaluated knowledge of pressure injury assessment and staging in patients with dark or pigmented skin tones. As with the recruitment email, the bcc feature was used to maintain participant privacy. The forms were emailed in Microsoft Word and were fillable. Participants were instructed to download the

forms, complete them, save them to their computer, and return them by email to the principal investigator within one week. Participants that did not return the forms received a follow-up email requesting them to complete the forms within a week. Nurses that did not meet this deadline were removed as participants from the study.

After all demographic and pre-intervention knowledge forms were collected, participants were sent an online link to the educational module. The educational module consisted of a video of the principal investigator presenting a PowerPoint presentation in a classroom setting. The video was uploaded to YouTube for participants to view within a one-week time period. Participants were instructed to watch the video and to contact the principal investigator with any questions they may have had. Participants were also asked to send a confirmation email to the principal investigator after they have watched the video, confirming that this task has been completed. Participants that do not respond in the one week period were sent a follow-up email reminder to encourage them to complete the training. At the end of this follow-up period, if there was no indication that the training has been completed, the participant's data was removed from the project. To ensure participant privacy, all emails were sent using the bcc feature.

The final stage of the project involved emailing a post-intervention knowledge assessment form to participants to assess knowledge gained from the educational module. The form included the same questions as the pre-intervention knowledge assessment (Appendix F). The questions were rearranged to help reduce test bias from participants. The post-intervention knowledge assessment were also fillable and participants were instructed to download the form, complete the assessment, save the form to their computer, and send the completed assessment back to the principal investigator. Participants had one week to complete the assessment and a follow-up email for those who do not complete the assessment was sent one week after the

evaluation period. Participants that did not provide a completed assessment during the follow-up period had their data removed from the project. Again, all emails were sent using the bcc feature to protect participant privacy.

### **Protection of Human Subjects**

As with all quality improvement projects, steps had to be taken to protect the privacy, confidentiality, and safety of participants. The first action taken to protect human subjects involved acquiring IRB approval from FIU. IRB approval is an indication that an independent board or panel has reviewed the project and has deemed it to be ethically sound, having no significant or adverse impact on those who choose to participate in the project (Trung et al., 2017). IRB approval was granted from FIU on November 1, 2022 (Appendix D). In addition to acquiring IRB approval for the project, all employee and participant email addresses were kept confidential through the use of the bcc function when communicating during the duration of the project. Nurses agreeing to participate in the project were also required to sign a letter of informed consent (Appendix H). Informed consent forms provide prospective participants with information about a study along with a review of their rights, benefits of participating in the study, and potential harms that can arise (Trung et al., 2017). Nurses who did not sign the informed consent form will not be able to participate in the project.

To maintain privacy and security during data collection, all emails were sent using a secure email server that could only be accessed through a password protected account. The account password was known only to the principal investigator. All forms including informed consent, demographic questionnaires, and pre-/post-intervention knowledge assessments were downloaded from the secure email server and were stored in a password protected folder that is on the desktop of a password protected laptop. Other than participant email addresses, no

personal identifying information such as address, full name, or telephone number were collected during the course of this project. Again, only the principal investigator had access to the laptop and the folder. All data will be retained on the hard drive of the password protected laptop for a total of five years following the completion of this quality improvement project. After this time, the hard drive of the laptop will be professionally removed and all of the study data will be destroyed.

### **Data Collection**

The data collected for the project included the demographic questionnaire along with the pre- and post-intervention knowledge assessments. The demographic questionnaire included specific questions regarding the participant's gender, age, race, position, and number of years working in nursing. The pre- and post-intervention knowledge forms were fillable forms created in Microsoft Word and were developed based on the content in the educational presentation. The knowledge assessment consisted of 25 questions including multiple choice, true/false, and matching. All questions had a score of four points with the total score on the assessment ranging from 0 to 100. Content validity of the assessments were confirmed through review of the tools by organizational leaders and two wound care experts. Any recommendations for change made by these individuals was made before sending the forms to project participants.

### **Data Management and Analysis Plan**

Data management involved transferring all data from the completed demographic and pre-/post-intervention knowledge assessment forms to an Excel workbook. The workbook included two spreadsheets. The first spreadsheet included all participant demographic data. The second spreadsheet included the email address of the participant along with pre- and post-intervention scores from the knowledge assessment. Descriptive data tools including mean,

standard deviation, and frequency were used to evaluate the demographic data. This provided insight into the characteristics of the sample. To evaluate the pre- and post-intervention knowledge scores, descriptive and inferential statistics were used. Descriptive statistics included score mean and standard deviation. A comparison of mean scores for the pre- and post-intervention assessments was employed to help to determine if scores increased, decreased, or remained the same for program participants. Inferential statistics, more specifically, a Mann-Whitney U-test, was used to determine if changes in scores from the pre- to post-intervention stages of the project were statistically significant. An alpha value of 0.05 will was used to assess statistical significance of the data.

## **Results**

Included here is an overview of results collected for this project. Data analysis for this quality improvement project included descriptive and inferential statistics. Descriptive statistics were used to describe the sample population and to examine the change in knowledge scores that occurred for nurses following education. Inferential statistics were used to evaluate the mean difference between pre- and post-intervention knowledge scores.

### **Demographic Characteristics**

The demographic characteristics of the sample are provided in Table 1. The data was collected from 15 nurses working on the unit. From the information it is possible to see that the mean age for the sample was 39.6 years with a standard deviation of 4.87 years. A majority of the sample ( $N = 11$ , 73%) were female, and Latino/Hispanic ( $N = 12$ , 80%). Further the data from Table 1 indicates that most of the nurses participating in the program held a registered nurse (RN) degree ( $N = 12$ , 80%). The data also indicates that the average length of employment for nurses involved in the project had an average length of employment of 4.2 years with a

standard deviation of 2.86 years. Of the 15 nurses involved in the project, most reported conducting regular skin assessments in the clinical setting ( $N = 14$ , 93%).

**Table 1**

*Participant Demographic Data (N = 15)*

<b>Characteristic</b>	<b>Result</b>
Age	39.6 years ( <i>SD</i> 4.87)
Gender	
Male	4 (27%)
Female	11 (73%)
Race	
White	2 (13%)
African American	1 (7%)
Latino/Hispanic	12 (80%)
Other	--
Current Position	
RN	12 (80%)
BSN	3 (20%)
Average Length of Employment	4.2 years ( <i>SD</i> 2.86)
Perform Regular Patient Skin Assessments	
Yes	14 (93%)
No	1 (7%)

As noted descriptive statistics were also used to assess the median score before and following the educational intervention. The results are reported in Table 2 and do indicate that knowledge scores for participants did increase following the educational intervention. Scores increased from an average of 62.4% before the intervention to 96.3% following the intervention. For reference, the knowledge test provided to participants included 20 questions that were

awarded 4 points each for correct answers. Scores on the knowledge assessment could range from a low of 0 to a high of 100.

**Table 2**

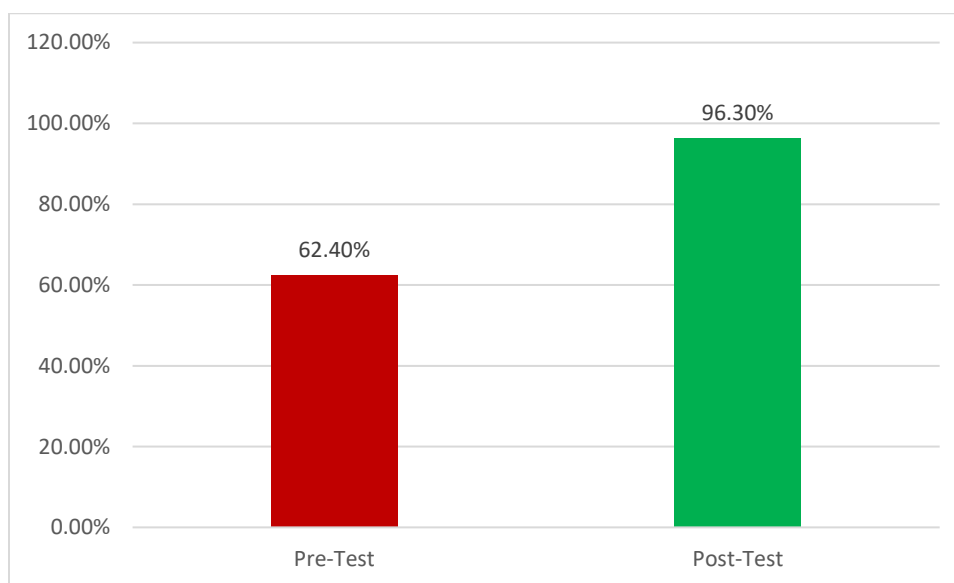
*Mean Pre- and Post-Intervention Knowledge Scores (N = 15)*

	<b>Mean</b>	<b>Standard Deviation</b>	<b>Range</b>
<b>Pre-Test Scores</b>	62.4%	3.70	33%-77%
<b>Post-Test Scores</b>	96.3%	2.39	76%-100%

The results can be further visualized in Figure 1 which includes a bar graph that depicts that changes in scores that occurred from the pre- to the post-intervention. The results were anticipated as the current evidence base researched for the project did indicate that knowledge of skin assessment in patients with dark or pigmented skin should increase following education (Henry, 2019; Price et al., 2017).

**Figure 1**

*Comparison of Pre- and Post-Intervention Knowledge Scores (N = 15)*





## **Inferential Statistics**

Inferential statistics were used to determine if there was a statistically significant difference between the mean knowledge scores recorded before and following the intervention. The sample size was 15. Application of the central limit theorem suggests that samples of  $N \leq 30$  can be assumed to be non-normally distributed (Chen & Epstein, 2022). As such, the decision was made to use a non-parametric test in order to evaluate statistical significance. The methodology for this project utilized a pre-/post-intervention design with one group. This indicates that the sample is dependent and paired indicating that a Man-Whitney U-test would be the most appropriate test for comparing the mean scores of participants (Mishra et al., 2019).

Following the educational intervention nurses displayed higher levels of knowledge ( $M = 96.3\%$ ,  $SD 2.39$ ) when compared with baseline knowledge ( $M = 62.4\%$ ,  $SD 3.70$ ). The results from the paired Mann-Whitney U-test indicate that there was a statistically significant increase in knowledge scores following the educational module:  $U(N_{baseline} = 15, N_{post-intervention} = 15) = 451.22, z = 2.29, p < .002$ . Using an alpha value of 0.05, it was possible to reject the claim that there is no statistically significant change in knowledge scores following the educational intervention. From the z-statistic and the p-value, it is possible to see that the changes in scores that occurred for the participants in the project were indeed statistically significant. This means that the results were not due to chance and that education may significantly improve knowledge of skin assessments in patients with dark or pigmented skin.

## **Discussion of the Results**

With an overview of the results provided, it is now possible to provide a discussion of the results in light of the anticipated results based on the literature. This section begins with an overview of the results and what the data means for maintaining and building the project.

Additionally, this section includes a review of the limitations of this project, the implications of the project for advanced nursing practice, and the conclusions that can be drawn from the data collected.

### **Overview of the Results**

The demographic data collected for this project was not used to evaluate the final results of the project: i.e., to determine if knowledge gains were different for specific sub-populations within the sample. However, the demographic data does provide a useful overview of the characteristics of the sample used within the project. As noted the sample was comprised primarily of female Hispanic nurses. This was not surprising given the demographics of the nursing population (primarily female) and the demographics of the South Florida community where the project was undertaken (primary Latino descent). All providers agreed to voluntarily participate in the project and each completed the pre-/post-knowledge tests while also completing the educational module.

The results obtained from the pre-/post-intervention knowledge scores do indicate that there was a substantial increase in nurse knowledge following the educational module:  $M = 62.4\%$ ,  $SD 2.88$  for the pre-test and  $M = 96.3\%$ ,  $SD 2.39$  for the for the post-test. Based on the current literature regarding provider education for increasing knowledge of skin assessments in patients with dark or pigmented skin, this outcome was expected (Baykara et al., 2021; Gaballah & El-Deen, 2021). The paired t-test, conducted to determine the statistical significance of the data, further indicated that the results were statistically significant:  $p < 0.002$ . These results suggest that the changes in knowledge scores that occurred following the educational module were caused by something more than just chance. Hence, the educational module is noted to

have been effective in this case for increasing nurse knowledge of skin assessments for patients with dark or pigmented skin.

Although the scope and timeframe of the project were not long enough to assess how increased provider knowledge would impact clinical practice, the current literature on provider education for this topic does indicate that education does have an influence on practice, reducing the number of pressure injuries that occur while also enhancing nurse documentation of skin assessments and PI incidence (Aquino et al., 2019; Zubkoff et al., 2020). Given the marked and statistically significant increases in knowledge scores that occurred as a result of this quality improvement project, it would be reasonable to argue that nurses involved in the educational program should be able to translate their knowledge into practice to improve patient care. Over time, this should lead to a decline in pressure injuries, especially in patients with dark or pigmented skin (Baykara et al., 2021). This improvement in care will have a systemic impact on patient health outcomes, quality of life, care costs, and population health.

### **Limitations**

Although the current project is evidence-based and does indicate that results obtained in the literature can be obtained in clinical practice, there are some important and notable limitations to this work. As noted, the methodology used for this quality improvement project was a quasi-experimental pre-/post-intervention design. This design has various weaknesses including threats to internal and external validity. Quasi-experimental frameworks, such as the one used for this project, often lack randomization of the sample (Miller et al., 2020). A lack of randomization in the sample indicates that the results may not reflect what is actually happening in the larger population from which the sample was drawn (Miller et al., 2020). This indicates that

the results from the quality improvement project may not be generalizable to all nurses working with patients that have dark or pigmented skin.

The methodological weaknesses of the quasi-experimental approach also include the lack of an independent control or comparison group (Miller et al., 2020). Although the current project did include a one-sample comparison of knowledge from baseline, the project did not include a separate sample that did not receive education. Without the inclusion of a control group, it is not possible to state with certainty that the intervention had a direct cause-effect relationship (Miller et al., 2020). In short, the results of this quality improvement project do not lend themselves to unequivocally stating that the educational program was solely responsible for the change in knowledge scores that occurred for those enrolled in the project. The inability to state that causality has been achieved is important as it may explain why the translation of this project to another practice site may fail to produce similar results as those noted in this project.

An additional limitation for the project was the lack of time to assess long-term outcomes from education. As noted in the literature education regarding skin assessment in patients with dark and pigmented skin, education and increased knowledge can foster practice change including reducing the number of PIs and improving documentation of skin assessments and PI findings (Aquino et al., 2019; Zubkoff et al., 2020). Therefore, it is anticipated that similar outcomes will result for nurses enrolled in this quality improvement project. However, with a lack of time to measure these outcomes, it is not possible to state with certainty that the educational program will result in the changes in practice needed for nurses to identify skin changes that may lead to the development of a pressure injury. This is a significant limitation as changes in provider skin assessment practices are ultimately what will result in reducing the occurrence of pressure injuries in all patients.

## **Implications for Practice**

The literature review conducted for this quality improvement project does indicate that provider education can be effective for reducing pressure injury rates (Aquino et al., 2019; Baykara et al., 2021; Henry, 2019). The intervention has considerable fidelity and should be effective for producing not only an increase in provider knowledge but also for ensuring that a change in practice occurs. More specifically, this change in practice should include improved skin assessment techniques that foster prevention and early identification of pressure injuries. Further, the educational module developed for this quality improvement project was based on current recommendations for the assessment of PIs in patients with dark or pigmented skin. This indicates that the content included in the educational module represents the timely and relevant data for PI prevention in the target population. For advanced practice nurses working in the clinical setting, these results would have implications for nursing education, research, practice, and leadership.

The positive and statistically significant results from this project indicate that advanced practice nurses have an obligation to expand education to other units in the facility where patients may be at increased risk for pressure injuries. Advanced practice nurses would have the motivation to educate more providers including those beyond the acute care setting as the current project demonstrates the utility of this intervention. Expanding the reach of education should help the facility to reduce pressure injury rates, leading to higher rates of reimbursement for care. Nurses prepared at the DNP level should have the skills and competencies to lead this type of educational change both at the practice site and at similar sites throughout the community. Disseminating the results would be a useful approach to educating others about the advantages of this type of educational program.

Other areas of nursing would be impacted by this project including nursing research. In terms of nursing research, it may be helpful for the advanced practice nurse to utilize different educational modalities such as a brochure to compare knowledge outcomes with the presentation created from this project. Although the educational module was developed based on evidence-based data regarding skin assessments for patients with dark or pigmented skin, the literature currently does not compare provider education methods to highlight which will work best for optimizing provider learning. Researching the specific educational modality that works best for increasing nurse knowledge may result in optimizing education to ensure that more nurses can receive this valuable information. This may also streamline the educational process to reduce the time and resources needed to deliver this education to providers.

The implications of the project for nursing practice must also be considered. In terms of practice, positive results from this project suggest the need to ensure that all nurses are educated about the topic including new nurses that are hired at the facility. This may include providing education as part of the onboarding process or providing annual training for all nurses as part of professional development. What is evident is that in order for nurses at the facility to effectively prevent pressure injuries in all patients, the knowledge to achieve this goal will be needed. In terms of the current project, this suggests that some effort must be made to ensure that nurses retain this knowledge and that new nurses hired by the facility have this knowledge. As part of nursing practice associated with this project, nurses working at the facility could volunteer to be part of a team or committee that monitors monthly, quarterly, or yearly progress toward reducing PI rates. Additionally, a comparison of PI rates in patients with dark or pigmented skin tones before and following the educational intervention may be helpful for determining if there are other tools or areas of practice that should be addressed through education.

Positive results from the project would also have implications for nursing leadership. Based on the results, advanced practice nurses would have an obligation to work with organizational leaders to help standardize the program to ensure that all nurses receive education. By leading this change and by updating the module based on new evidence to support change, the advanced practice nurse will be able to continually lead in the practice setting. While making this change at the practice site permanent will be important for ensuring that nurses have the knowledge and resources needed to provide effective patient care, this change may serve as the basis for improving the culture of the organization such that more practice changes can be implemented in the future to improve the quality of care.

### **Conclusion**

This quality improvement project sought to determine if the use of a nurse educational module would increase knowledge of skin assessment in patients with dark or pigmented skin. Patients with dark skin have higher rates of PIs and when these events occur, they are often more severe in this patient population. Specific techniques for assessing dark or pigmented skin have been shown in the literature to be effective. Additionally, education to increase provider knowledge of this topic has been shown to be effective for improving knowledge and for increasing PI documentation and preventing PIs from occurring. The translation of this evidence into practice was successful in this project. This serves to not only augment the current evidence base to support this practice change but also to foster organizational interest in maintaining the practice change over the long-term.

Although this quality improvement project has several limitations, it is an excellent example of how evidence from the literature can be translated into practice to enhance the delivery of care while also improving population health and the healthcare system. Maintenance

of the project as well as efforts to expand the project in the practice setting and beyond are clearly warranted in this case. Preventing and reducing the incidence of pressure injuries in the clinical setting will be an important contributor to better patient health and safety as well as lower costs to provide care. Clearly, this is one area where the translation of evidence into practice will have extensive benefits.



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### Appendix A: Literature Matrix

Author/Year	Purpose/ Problem/ Objective/ Aims	Study Design	Sample (Setting)	Data Collection Measures	Results	Strengths/ Limitations	Relationship to Project	Level of Evidence
Aquino et al. (2019)	To implement an educational program to improve nurse prevention of pressure injuries in an adult medical intensive care unit.	Quasi-experimental, pre-/post intervention.	All registered nurses provided care in an adult medical intensive care unit.	Documentation of PI by nurses as well as rates of PI on the unit as evaluated through the electronic medical record.	Documentation of skin assessment even with darker skin tones increased by 18% and was statistically significant $P = 0.015$ .  PI rates declined from 7.7% pre-intervention to 6.6% post-intervention.	Strengths of the article include positive results aligned with the current quality improvement (QI) project and improvements in patient outcomes.  Limitations include small sample from a single site as well as the inability to demonstrate causality in the results.	Supports the use of provider education to improve assessment of PIs in patients with darker skin tones.  Focuses on other areas of education to reduce PI rates as well.	Level III
Baykara et al. (2021)	To evaluate the use of a targeted education program for nurses to prevent PIs through an assessment of knowledge gained.	Quasi-experimental, pre-/post intervention.	A total of 194 nurses providing care at an urban medical center.	Nurse knowledge assessments before and after the completion of the educational module.	Nurse knowledge scores were $55.36\% \pm 14.40$ and their posttest mean score was $69.92\% \pm 9.73$ .  This was statistically significant at $P < 0.05$ .	Strengths of the study include robust support for provider education to improve knowledge and better evaluation of skin following training.  Limitations include small sample at a single site, causality could not be shown, and results do not assess knowledge of darker skin tones independently.	This educational program worked to increase overall knowledge and included information regarding dark/pigmented skin tones. Specific knowledge in this area was not assessed.	Level III
Gaballah & El-Deen (2021)	To investigate the use of a PI educational program on nurse's performance with skin assessment and pressure	Quasi-experimental, pre-/post intervention, with control.	30 nurses and 50 patients allocated to two different medical units in a single healthcare facility.	Nurse pressure injury questionnaire, an observational checklist, and patient wound healing outcomes.	Pre-program knowledge increased from $44 \pm 5.5$ to $68.3 \pm 2.1$ in the post-program phase. $P = 0.000$ . No	Strengths of the study include better knowledge for providers and better outcomes for patients.  Limitations include lack of	This research does support the quality improvement project demonstrating improved knowledge through education. However,	Level III

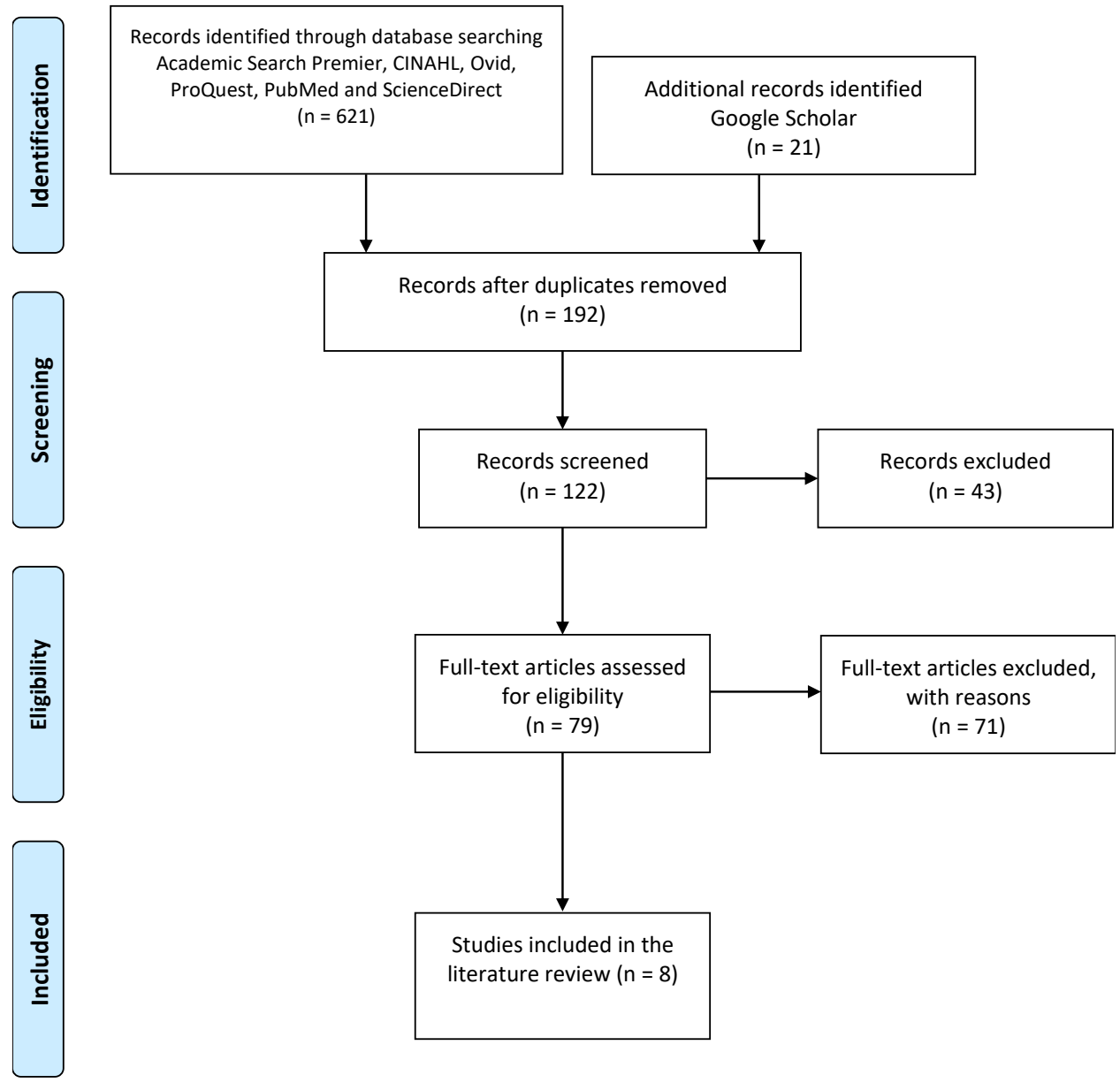


	injury wound healing rates.				change in controls were noted.  At five weeks healing in the education group was $21.3 \pm 1.5$ and $9.4 \pm 1.2$ in the control group. $P = 0.000$	generalizability of the findings due to small sample size and use of one setting as well as the inability to demonstrate causality in the results and show how knowledge of skin tone and assessment improved.	the direct impact on skin tone knowledge is not directly assessed but was included in the educational intervention.	
Henry (2019).	To evaluate nurse knowledge following the implementation of an educational program to prevent pressure injuries.	Quasi-experimental, pre-/post intervention.	Sample included 129 nurses working in three different adult critical care and step down units in the same hospital.	Knowledge assessments competed before and following the educational intervention.	Results indicated a statistically significant increase in nurse knowledge following the educational intervention: $P < 0.05$ .	Strengths of the study include demonstrating the efficacy of education and significant improvements in nurse knowledge.  Limitations include small sample from a single site, the inability to demonstrate causality between the results and intervention, and a lack of specific data on knowledge of dark skin tones.	This research does support the quality improvement project demonstrating improved knowledge through education. However, the direct impact on skin tone knowledge is not directly assessed but was included in the educational intervention.	Level III
Kim et al. (2020)	To conduct a meta-analysis of the literature regarding training programs to increase nurse knowledge of pressure injury prevention and management.	Systematic review and meta-analysis.	A total of 23 students involving 1,067 nurses were included.	Assessments of nurse knowledge from training, visual discrimination ability, and clinical judgement.	Improvements were found in all three areas measured:  Nurse knowledge: standard mean differences (MD) 1.23 95% confidence interval (CI) 0.50-1.96, $P < 0.001$ .  Visual discrimination ability: MD 1.13,	Strengths of the study include improvements in outcomes measured as well as the ability to show improvements in assessment of darker/pigmented skin tones. This is also the highest quality study for evidence-based practice.  Limitations include, small number of database searched and lack of uniformity for	The results not only support the quality improvement project but also demonstrate the direct impact of education on visual inspection of patients with dark and pigmented skin tones.	Level I


					95% CI 0.88-1.38, P < 0.001.  Clinical judgement: odds ratio 1.52, 95% CI, 1.46-1.57, P < 0.001.	educational programs reviewed.		
Price et al. (2017).	To assess the outcomes of a quality improvement project to increase nurse knowledge of PI prevention as well as to assess PI prevalence following the intervention.	Quasi-experimental, pre-/post intervention.	Sample included a cohort of 164 nurses and personal care workers at an aged care facility.	Assessments of nurse knowledge before and after the educational program.  PI prevalence rate at the facility as measured through electronic medical records.	Knowledge scores increased from 17.5 ± 5.5 in the pre-intervention phase to 41.9 ± 4.8 in the post knowledge phase. This was significant, P < 0.001.  Providers spent more time on skin assessment an evaluation (P < 0.001) in the post-implementation phase.  PI prevalence rates declined from 12.5% to 6.8% following the intervention, P = 0.02.	Strengths of the study include the robustness of the results and data indicating the knowledge of skin assessment in patients with dark/pigmented skin increased.  Limitations stem from the small sample size in a specialized care setting and the inability to demonstrate causality in the results.	The results not only support the quality improvement project but also demonstrate the direct impact of education on visual inspection of patients with dark and pigmented skin tones.	Level III
Sankovich et al. (2019)	To evaluate the use of an educational program on proper PI staging in nurses.	Quasi-experimental, pre-/post intervention.	41 nurses and 2 licensed practical nurses (LPNs) working in a 315-bed community-based acute care hospital and Level II trauma center.	Nurse knowledge regarding PIs and the use of skin assessments.	Nurses completed more skin assessments following the intervention.  Knowledge and staging of PIs in all patients including those with darker skin tones increased	Strengths of the study include the efficacy of nurse education to stage PIs and the increased use of knowledge to perform regular patient skin assessments.  Limitations of the study include small sample size, lack of	This research does support the quality improvement project demonstrating improved knowledge through education. However, the direct impact on skin tone knowledge is not directly assessed but was	Level III

					following the intervention P = 0.004	cause-effect relationship, and the inability to directly measure knowledge of PI staging in patients with dark/pigmented skin tones.	included in the educational intervention.	
Zubkoff et al. (2020).	To evaluate the use of a PI prevention education program on outcomes for pressure injury rates in a Veteran's Health Administration (VHA) facility.	Quasi-experimental, pre-/post intervention.	Staff at 28 different VHA facilities underwent training.	Pressure injury rates at each of the facilities before and after the intervention.	PI rates declined from 1.0 to 0.8 per 1,000 bed days following the intervention, P = 0.01.  Rates further declined within three months from 0.8 to 0.4 per 1,000 bed days. P = 0.021.	Strengths of the study include demonstration of the positive effect of education and reductions in PI rates.  Limitations include small sample at drawn from one type of facility, cannot demonstrate causality, does not include information regarding skin assessments in dark/pigmented skin specifically, and no information regarding knowledge increases.	The results support the efficacy of education to improve provider knowledge from the perspective of a reduction in PI rates. However no specific information regarding PI rates for patients with dark/pigmented skin was evaluated.	Level III.

### Appendix B: PRISMA Flow Diagram for Locating Articles



## Appendix C: Broward IRB Approval


**BROWARD HEALTH**  
 Institutional Review Board - Human Research Protections  
**BROWARD HEALTH**  
 Department of Nursing

1. Name of Primary Investigator: Dr. Juan Bravo
2. Position: Physician Highest Degree Earned: MD
3. Address: \_\_\_\_\_ 3000 Coral Hills Dr, Coral Springs, FL 33065
4. Telephone: Home: 954-344-3206 Business: \_\_\_\_\_ Cellular: 863-398-8362
5. Status of Investigator: Employee: Student: \_\_\_\_\_ Faculty: X
6. Academic of Affiliation: Broward Health System Dermatology Residency Department
7. Department: Wound Care Center Unit:  
 Manager: Tammy Kelleman
8. Name, Address and Telephone number of Thesis or Dissertation or PI Chairperson:  
 Dr. Carmen Framil Faculty member of Nicole Wertheim College of Nursing at FIU; Ph: 305-439-9041;  
 address: 11200 SW 8<sup>th</sup> St, Miami, FL 33199
9. Project/ Research Title: Provider Education to Increase Knowledge and Identification of Pressure Injuries in Patients with Dark/Pigmented Skin
10. Patient Care Units to be used in the study. Broward Health Coral Springs, Step Down Floor 4<sup>th</sup> East  
 Manager approval to implement study on patient care unit. yes X no \_\_\_\_
11. Project Duration: 4 weeks.
12. Is this Study/Project to meet educational requirement? Yes: X No: \_\_\_\_

Version 4 dated 7/2022 Page 1 of 4

## PROCESS IMPROVEMENT AND RESEARCH PROPOSAL CHECKLIST

Study Title:

Knowledge and Identification of pressure injuries in  
Patients with dark pigmented skin.Primary Investigator: Diana MachucaTelephone: 954-394-9160

PROCESS IMPROVEMENT / RESEARCH PROPOSAL	CRITERIA UNMET	CRITERIA MET	DOES NOT APPLY
Investigator Qualifications: Provides evidence of appropriate education and experiential background for conducting the research.		✓	
Research Proposal:			
Is satisfactory in the areas of:			
Relevance of proposal objectives to the discipline of Nursing and BHCS		✓	
Data collecting/generating procedure		✓	
Data analysis procedure		✓	
Dates project to be completed (time table)		✓	
Completes CITI tutorial (investigators, co-investigators, data collectors)		✓	
Is satisfactory in the areas of:			
Involvement of institutional personnel		✓	
Involvement of institutional materials			✓
Anticipated benefit in relation to projected cost/risk			✓
Use of routinely collected data in which consent of participant is not required.		✓	
Mechanism for communicating research findings to institution.		✓	
Procedures for progress reports		✓	
Procedure for securing/destroying raw data		✓	

PROCESS IMPROVEMENT AND RESEARCH PROPOSAL CHECKLIST

PROCESS IMPROVEMENT / RESEARCH PROPOSAL	CRITERIA UNMET	CRITERIA MET	DOES NOT APPLY
Protection of Participants' Rights: Informed consent (if applicable) Provides information with respect to: Explanation of the study		✓	
Procedures to be followed		✓	
Purpose of the procedures		✓ <i>with CNO (3)</i>	✓
Description of risk or discomfort			✓
Explanation of alternative care measures			✓
Duration of patient participation			✓
Methods used to protect anonymity and insure confidentiality		✓	
Benefits to the participant		✓	
Freedom to withdraw from the study without jeopardy		✓	
Rights of minors, special population, or impaired participant unable to give informed consent.			✓
Consent obtained from parent/legal guardian if study involves children			✓

Signatures of Reviewers:

*Rekha*      *Jennifer Jazamy*  
*Rekha Remaden*

Date: 09/21/22

Conclusion:

EBRC recommends this study to be approved as proposed. Pending CNO approval.       EBRC Does not recommend this study to be approved as proposed.

EBRC recommends this study be approved as proposed.

Final Approval  Yes     No

*M. M. M.*  
 Signature/Chief Nurse Officer



12. Is this Study/Project to meet educational requirement? Yes:  No:

13. What are the projected costs of equipment, supplies, and personnel? < \$100

14. Are you applying for Funding? Yes:  No:  Agency: \_\_\_\_\_

If yes, required submission date:  
\_\_\_\_\_

You must obtain the approval of your University's IRB prior to submitting your proposal to the Broward Health Evidenced Based Research Committee (as applicable)

\_\_\_\_\_  
Signature of Investigator

9/15/22  
\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature of Thesis/Dissertation Chairperson (if applicable)

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature of Manager (if applicable)

\_\_\_\_\_  
Date



## Appendix D: IRB Approval Letter



## MEMORANDUM

**To:** Dr. Carmen V. Framil  
**CC:** Diana Machuca  
**From:** Carrie Bassols, BA, IRB Coordinator *ceb*  
**Date:** November 1, 2022  
**Proposal Title:** "Provider Education to Increase Knowledge and Identification of Pressure Injuries in Patients with Dark/Pigmented Skin"

The Florida International University Office of Research Integrity has reviewed your research study for the use of human subjects and deemed it Exempt via the **Exempt Review** process.

**IRB Protocol Exemption #:** IRB-22-0495      **IRB Exemption Date:** 11/01/22  
**TOPAZ Reference #:** 112185

As a requirement of IRB Exemption you are required to:

- 1) Submit an IRB Exempt Amendment Form for all proposed additions or changes in the procedures involving human subjects. All additions and changes must be reviewed and approved prior to implementation.
- 2) Promptly submit an IRB Exempt Event Report Form for every serious or unusual or unanticipated adverse event, problems with the rights or welfare of the human subjects, and/or deviations from the approved protocol.
- 1) Submit an IRB Exempt Project Completion Report Form when the study is finished or discontinued.

**Special Conditions:** N/A

For further information, you may visit the IRB website at <http://research.fiu.edu/irb>.

**Appendix E: Demographic Form**

**Instructions:** Please answer the question by filling in the blank or circling the correct answer.

1. What is your age (in years)? \_\_\_\_\_

2. What is your gender (circle one)?

Male

Female

Non-binary

Prefer not to say

3. What is your race (circle one)?

White/Non-Hispanic

African American

Latino/Hispanic

Asia/Pacific Islander

Other

Prefer not to say

4. What is your current position in the organization (circle one)?

Registered nurse

Nurse practitioner

Physician Assistant

Other Medical Provider \_\_\_\_\_ (Please specify)

5. How long have you worked at this facility?

6. Do you work full-time or part-time for the facility (circle one)?

Full-time

Part-time

7. How often (times per week) do you perform skin assessments? \_\_\_\_\_



10. Intact dark or pigmented skin may not blanch when pressure is applied over a bony prominence.

True\*

False

### Multiple Choice

**Instructions:** Review the question and circle the best answer.

11. Comprehensive skin assessments include which of the following (circle all that apply):

- A. Identifying blanching responses.
- B. Evaluation of localized shear on the skin.
- C. Evaluation for edema and induration.
- D. All of the above.\*

12. In some patients with dark or pigmented skin changes in color associated with pressure injuries can be difficult to detect. What additional evidence can aid when completing a skin assessment:

- A. The identification of pitting edema in areas where pressure injuries may develop.
- B. Localized pain expressed by the patient during physical exam.\*
- C. Changes in skin temperature in areas where pressure injuries may develop.
- D. Patient reports of previous pressure injuries and their locations.

13. If a patient is stable, regular skin assessments should be undertaken:

- A. Following admission to the unit.
- B. Following admission to the unit and on each shift.\*
- C. Skin assessments are not needed if the patient is stable.
- D. Skin assessments should be performed every four hours regardless of the patient's status.

14. What technique can a provider use to detect pressure injuries that may not be seen by the eye?
- A. Applying pressure to see if the pressure elicits a pain response.
  - B. Lowering light in the room to better detect contrasting skin colors.
  - C. Removing gloves and palpating the skin for different temperatures.\*
  - D. Flushing the skin with water to note any color abnormalities.
15. Colors on dark or pigmented skin that correlate with erythema seen in patients with lighter skin tones include:
- A. Brown, black, or blue.
  - B. White or off white.
  - C. Dark green or blue.
  - D. Purple, blue, or violet.\*
16. In the absence of a pressure injury, what other changes in the skin may be indicative of localized injury that may lead to a pressure injury (circle all that apply).
- A. Hardened (indurated) skin\*
  - B. Skin that is shiny\*
  - C. Skin that is taut\*
  - D. Skin that is swollen (edema)\*
17. What should be done to improve visualization color changes in dark/pigmented skin:
- A. Skin should be washed before inspection.
  - B. Low light should be used to identify color contrasts.
  - C. Light should be increased including the use of a penlight to visually inspect skin.\*
  - D. Magnifying glasses should be used to detect color changes in dark or pigmented skin.

18. When an area of darker skin is noted for a patient with dark or pigmented skin, should this be viewed as a sign of a pressure injury?
- A. Yes, darker skin does indicate tissue damage.
  - B. Yes, action must be taken to prevent a pressure injury.
  - C. No, a comparison of the patient's overall skin tone must first be made.
  - D. No, dark skin has no relevance for identifying pressure injuries.
19. Color charts may be used to help identify pressure injuries in patients with dark or pigmented skin. Which of the tests below could be used in a clinical setting (circle all that apply).
- A. Munsell Chart\*
  - B. Katz Index Assessment
  - C. 6 Fitzpatrick Skin Types\*
  - D. Glasgow Coma Scale
20. Pressure injuries are (circle all that apply):
- A. Localized damage to the skin and underlying soft tissue usually over a bony prominence or related to a medical or other device\*
  - B. Preventable\*
  - C. Difficult to detect in patients with light skin.
  - D. A significant source of morbidity and mortality for hospitalized patients.\*

### Appendix G: Recruitment Email

Greetings Staff and Prospective Participants,

My name is Diana Machuca and I am currently enrolled as a Doctor of Nursing Practice (DNP) student at Florida International University. As part of my education, I am required to complete a quality improvement project to improve some aspect of patient care in my practice setting. For my project, I chose to focus improving skin assessment for pressure injury prevention in patients with dark or pigmented skin. More specifically, I have created an education module for staff to raise awareness about current gaps in care and techniques that can be used to improve skin assessment. The goal of my project is to increase your knowledge of this topic such that you can integrate this knowledge into care and prevent pressure injuries in patients with dark or pigmented skin.

It is my hope that you will be willing to participate in this project. In order to participate you will be asked to sign a letter of informed consent, to complete a demographic survey, to complete a pre- and post-test assessment of knowledge, and to view an online educational module regarding the topic. It is anticipated that the project will take four weeks to complete. However, all of these activities that you are required to participate in should only take 65 minutes total to complete. This educational project has been approved by the Florida International University Institutional Review Board and the presentation should benefit you in terms of improving your knowledge of the topic and ability to provide sexual health care to older adults seen in your practice.

If you are interested in participating in this project, please respond to this email as soon as you can. By participating in this project you will have the opportunity to improve patient care and expand your understanding of a very important topic. If you have any further questions about the project, please contact me through [jbravo@browardhealth.org](mailto:jbravo@browardhealth.org). I look forward to hearing from you and educating you about this important and timely topic.

Regards,

*Diana Machuca*

## Appendix F: Informed Consent



### ADULT CONSENT TO PARTICIPATE IN A RESEARCH STUDY

#### Provider Education to Increase Knowledge and Identification of Pressure Injuries in Patients with Dark/Pigmented Skin

##### SUMMARY INFORMATION

Things you should know about this study:

- **Purpose:** The purpose of the study is to educate medical providers including nurses, advanced practice nurses, and physician assistants about the identification and staging of pressure injuries (PIs) in patients that have dark or pigmented skin.
- **Procedures:** If you choose to participate, you will be asked to complete an initial assessment of knowledge, review an educational module, and complete a follow-up assessment of knowledge.
- **Duration:** This will take about 90 minutes over the course of four weeks.
- **Risks:** The main risk or discomfort from this research is potential for you to become uncomfortable while completing the educational module.
- **Benefits:** The main benefit to you from this research is to increase your knowledge of pressure injury assessment in patients with dark or pigmented skin.
- **Alternatives:** There are no known alternatives available to you other than not taking part in this study.
- **Participation:** Taking part in this research project is voluntary.

Please carefully read the entire document before agreeing to participate.

##### PURPOSE OF THE STUDY

The purpose of the study is to educate medical providers including nurses, advanced practice nurses, and physician assistants about the identification and staging of pressure injuries (PIs) in patients that have dark or pigmented skin. The study will assess provider knowledge before and following an educational module to measure changes in knowledge and to determine if these changes are statistically significant.

##### NUMBER OF STUDY PARTICIPANTS

If you decide to be in this study, you will be one of 10-15 people in this research study.



## **DURATION OF THE STUDY**

Your participation will involve 65 minutes total over the course of a four week period.

## **PROCEDURES**

If you agree to be in the study, we will ask you to do the following things:

1. Provide your email address and consent to being contacted via email for the project. All data collection and education will occur remotely in your home or a place that is comfortable to you. You will have one week to complete this task.
2. Complete a demographic form and pre-test knowledge assessment via email. This should take between 20 minutes. You will have two weeks to complete this task.
3. Watch a training module that will be uploaded to YouTube. This should take between 25 minutes.
4. Complete a post-test knowledge assessment. This should take about 20 minutes and will be sent via email. You will have one week to complete this task.
5. The study duration will be four weeks. During this time you will need to spend about 65 minutes engaged in activities related to the project.

## **RISKS AND/OR DISCOMFORTS**

The study has the following possible risks to you: First, you may become uncomfortable during the time required to review the intervention. This is unlikely to happen but if it does, you can take a break during education. Second, there are threats to privacy and confidentiality. This is unlikely to happen but may occur.

## **BENEFITS**

The study has the following possible benefits to you: increased knowledge about the topic, the ability to provide better patient care, enhanced confidence in performing skin assessments. Benefits to society include reducing pressure injuries in healthcare, lowering costs to provide care, and improving the quality and safety of patient care.

## **ALTERNATIVES**

There are no known alternatives available to you other than not taking part in this study

## **CONFIDENTIALITY**

The records of this study will be kept private and will be protected to the fullest extent provided by law. In any sort of report we might publish, we will not include any information that will make it possible to identify you. Research records will be stored securely, and only the researcher team will have access to the records. However, your records may be inspected by authorized University or other agents who will also keep the information confidential.

## **USE OF YOUR INFORMATION**

Your information collected as part of the research will not be used or distributed for future research studies even if identifiers are removed.

## **COMPENSATION & COSTS**

There are no costs to you for participating in this study.

## **RIGHT TO DECLINE OR WITHDRAW**

Your participation in this study is voluntary. You are free to participate in the study or withdraw your consent at any time during the study. You will not lose any benefits if you decide not to participate or if you quit the study early. The investigator reserves the right to remove you without your consent at such time that he/she feels it is in the best interest.

## **RESEARCHER CONTACT INFORMATION**

If you have any questions about the purpose, procedures, or any other issues relating to this research study you may contact Diana Machuca at Florida International University, (954)-394-9160, [dianamachuca@fiu.edu](mailto:dianamachuca@fiu.edu).

## **IRB CONTACT INFORMATION**

If you would like to talk with someone about your rights of being a subject in this research study or about ethical issues with this research study, you may contact the FIU Office of Research Integrity by phone at 305-348-2494 or by email at [ori@fiu.edu](mailto:ori@fiu.edu).

## **PARTICIPANT AGREEMENT**

I have read the information in this consent form and agree to participate in this study. I have had a chance to ask any questions I have about this study, and they have been answered for me. I understand that I will be given a copy of this form for my records.

\_\_\_\_\_  
Signature of Participant

\_\_\_\_\_  
Date

\_\_\_\_\_  
Printed Name of Participant

\_\_\_\_\_  
Signature of Person Obtaining Consent

\_\_\_\_\_  
Date