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## Application of Teaching Regarding Injury Appearance in Darker Pigmented Skin Patients: A Quality Improvement Project

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**Application of Teaching Regarding Injury Appearance in Darker Pigmented Skin Patients:  
A Quality Improvement Project**

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A DNP project submitted in partial fulfillment of the requirements for the degree of Doctor of  
Nursing Practice

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August 2022

## Approvals

This is to certify that the DNP Project Final Report by

Tiffany Akiba

has been approved by the DNP Project Team on

August 1, 2023

for the Doctor of Nursing Practice degree

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Dorothea Esposito, DNP MSN/ed, APRN, FNP-BC; DNP Project Faculty Advisor

Maurice Hinson, MD, Project Manager

All Providers and Nurses who participated in this project.

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## Abstract

**Significance and Background:** The skin is the largest organ of our body, and skin injury prevention begins with accurately inspecting skin. Current practices stress on looking for any signs of redness which often signify that the skin is possibly injured or compromised. However, darker skin tones do not appear red when injured. Assessing for redness is a practice that is suited better for lighter skin tones.

**Purpose:** Provide education to providers on current skin assessment practices of darker skin tones.

**Methods:** The IHI Model of Improvement was used for this project, and the Plan-Do-Study-Act cycle was used to test for changes.

**Outcome:** There was an overall increase of 4.65% in documentation in the skin sections of the EMRs, and a 47/90 (41.11%) increase in all audited charts with words of ashen/ashy gray, dark brown, and purple. In all documented charts, there was a 37/47 (78.72%) increase of the above descriptors. All providers and RNs agreed feeling an increase in knowledge on this subject.

**Discussion:** Overall, there was an increase in documentation in the skin sections of patient's charts, and with words of either ashen/ashy gray, darker brown, and purple. In the future this project may be helpful to apply in inpatient settings. The next steps would be to continue expanding on this knowledge and continue teaching providers, and to incorporate a narrative system into the EMR systems.

**Keywords:** *darker skin tones, assessment practices, skin injury, education, teaching*

# **Application of Teaching Regarding Injury Appearance in Darker Pigmented Skin Patients: A Quality Improvement Project**

## **Phase 1: Problem Identification & Evidence Review**

### **Background and Significance of Problem**

Skin injury prevention begins with inspecting all areas of the skin, as well as assessing potential areas of injury such as over-bony prominences. Common areas where skin injuries develop are in the back of the head, elbows, sacrum, and heels of the feet, among other places (Al Aboud et al., 2022). To decrease the rate and development of skin related injuries, potential areas of injury must be assessed appropriately to avoid skin injuries from occurring (Al Aboud et al., 2022). One of the most practiced methods for evaluating skin is visual. Darker skin-toned patients and lighter skin patients present skin injuries differently (Oozageer Gunowa et al., 2018; Oozageer Gunowa et al., 2020). The current practice is to assess for areas where (blanchable) redness can be visually seen. However, these practices do not have the same benefits for darker pigmented patients (Oozageer Gunowa et al., 2018; Oozageer Gunowa et al., 2020; Sullivan, 2014).

During a nursing skin assessment, suspected skin injuries are often first identified by whether the skin in question is blanchable and inspecting for any redness. Visualization of any hue of discoloration over any area on the skin is one of the first signs of a possible skin injury. However, identifying redness is not as easily recognizable in dark-skinned patients (Okonkwo et al., 2020; Oozageer et al., 2018). Erythema in darker skin tones will appear as either an ashen gray, darker brown, or present with a violaceous hue (Sangha, A.M., 2021). Thus, different practices need to be adapted to suit the needs of dark-toned patient populations (Oozageer Gunowa et al., 2018; Oozageer Gunowa et al., 2020).



Furthermore, there was an apparent gap as this author searched for literature on darker skin tones. The gap is also recognized by researchers such as Oozageer Gunowa et al. (2018). The literature thus far makes it apparent that a knowledge gap exists when correctly assessing patients of darker skin tones. The barriers are likely from a lack of education, where Oozageer Gunowa (2020) found that five higher education institutions in England had limited inclusion of information regarding skin tone diversity concerning pressure injuries (PI). The above is a problem not just faced in institutions in England but likely in the United States as well, evidenced by the lack of knowledge in existing practicing nurses. There is a strong indication that the current practices are not suited for darker-skinned persons. Thus, studies have suggested revising guidelines for identifying PIs in darker-skinned patients, from which patients will likely benefit (Oozageer Gunowa et al., 2020; Sullivan, 2014). Revising guidelines would be beneficial as a study by Harms et al (2014) found that prevalence of PIs were highest amongst African-Americans, followed by Hispanics, then Whites, where PI admissions was 1.7x greater in Blacks than Whites.

Another dermatological condition that presents differently in lighter skin tones and darker skin tones is atopic dermatitis (Sangha, 2021). Sangha (2021) states that erythema is more difficult to detect in darker skin tones, as a result providers may minimize a disease's severity. This again highlights the importance of educating providers with how darker skin tones present erythema so appropriate treatment can be initiated.

### **Description of Local Problem/Organizational Priority**

In March 2021, at a private practice in Manhattan, New York, there was an increase in the number of pressure injuries found in darker skin-toned patients. The rise in pressure injuries in darker skin-toned patients prompted this quality improvement project.

### **Focused Search Question**

In darker pigmented skin toned patients (P) does the use of visual inspection using educational techniques taught to the nurses about dark and light skin assessment (I) compared to standard practices of using visual inspection to look for (blanchable) redness (C) reduce the risk of developing compromised skin (O)?

### **Evidence Search**

#### *External Evidence*

The following databases were used to find articles; CINAHL, Cochrane Database of Systematic Reviews, and MEDLINE. Key words used for the search included; dark skin, darker skin tone, assessment, pressure injuries, skin injuries, barriers, and prevention. MEDLINE generated the most amount of results, which populated 1129 articles. However, adding words such as assessment, pressure injuries, atopic dermatitis, skin injuries, skin, and limiting the years and language, narrowed the search where in turn the results were minimal generating a few articles. Overall, the literature is scant when it comes to assessing darker skin tones.

All searched articles that were relevant to this project were in the English language and published between 1996-2022. Articles of older publication dates were generated, however were not relevant for the purpose of this project and were therefore eliminated. Articles were chosen from reading the abstract and introduction of every article that were thought to be relevant. From there, the articles that were not relevant were further eliminated. The ones that were

thought to be relevant were then read in their entirety. From there, articles that were relevant were included, and if they were not relevant, again they were eliminated.

### *Internal Evidence*

#### **Evidence Appraisal, Summary, and Recommendations**

A literature review was performed on articles that pertained to darker skin tones and skin injuries, which included rashes, erythema, and pressure injuries. Finding articles related to darker skin tones and skin assessment practices was challenging. The following databases were used to generate articles; CINAHL, MEDLINE, and Cochrane databases. CINAHL populated 266 results, MEDLINE generated 1129 articles in total, and Cochrane resulted in 0 articles. After reading the titles and the articles, few articles were viable for the search. There were repeating articles which were eliminated. A total of seven articles were used.

There is evidence to support the notion that there is a lack of knowledge when appropriately assessing darker skin tones (Al Aboud et al., 2022; Harms et al., 2014; Oozageer Gunowa et al., 2018; Oozageer Gunowa et al., 2020; Sullivan, 2014; Okonkwo et al., 2020). Some of the recommendations from articles are to increase knowledge in assessing darker skin tones and suggest using dermatologic tools so an objective assessment can be made, rather than relying on visual assessments as reliability is subjective and based on the assessor (Okonkwo et al., 2020). However, with increased education on darker skin tones, skin that is compromised may be able to get detected faster and may be identified without the use of dermatological tools (Okonkwo et al., 2020). In order to do so, literature recommends assessing providers' baseline knowledge and teaching how ashen gray tones, darker browns, and purple and blue hues are markers of compromised skin in darker skin-toned patients (Sangha, 2021). The above method

will increase knowledge and is an efficient method in identifying compromised skin in skin tones that may not display (blanchable) redness (Sangha, 2021).

Due to resources and time, implementing dermatological tools may not be the most efficient method in my setting. However, educating providers on how compromised skin appears in darker skin tones is efficient, attainable, affordable, and will allow for evaluating skin (Okonkwo et al., 2020). Therefore, this author will initiate teachings on how darker skin tones, when injured or bruised, will appear as either ashen gray, darker brown, or purple/blueish hues rather than (blanchable) redness, which is more apparent in lighter skin tones – which are also the current standard practices. Educating on purple/blue hues expands the knowledge and will make it more inclusive for all patients. With the increase in knowledge, this author believes that assessing for visual cues will increase efficiency and safety for both the patient and provider. This method will also not increase the providers' time at work.

## **Phase 2: Project Planning**

### **Project Goals**

SMART Goals is an acronym that stands for: Specific, Measurable, Achievable, Relevant, and Time-Bound. They help guide the projects objectives. The objectives of this project are SMART, as they identify a specific problem, the results can be measurable through the EMR system, and achievable through education, relevant to the practice/problem, and done in a reasonable time manner.

1. Identify best practices for assessing darker skin tones, which is classified as skin tones which will not show redness.
2. Educate the providers and implement new assessment practices to include education and methods when assessing darker skin tones. This author will make sure every provider is

taught about assessing darker skin tones. A roster will be maintained, and the providers will sign their name next to the roster once teaching has been completed.

3. Under Praxis (the Medical Record System (EMR)) there is a section on Skin where the providers will document whether the patient has any skin discoloration. The EMR will then be audited by this author to see whether there is an increase in documentation for any skin discoloration. Teaching will be successful if there is an increase in documentation because it will show that skin compromise is being identified at an earlier stage. This will take place over two months and will be compared to the prior three months' data.

### **Framework**

The IHI Model for Improvement was the framework used for the project. The IHI is a tool used to advance improvements. The model uses the Plan-Do-Study-Act (PDSA) cycle to test for the changes. The steps to the PDSA cycle include:

- Plan: State the objectives (who, what, where, and when).
- Do: Implement education.
- Study: The patient's EMR's will be audited, and data will be collected and analyzed to see whether there has been an increase, decrease, or no change in skin documentation in darker skin tones over a period of three months. Furthermore, the providers who attended the education will be surveyed to see whether providers found teachings to enhance their knowledge and improve their practice.
- Act: Adjust any processes that did not work successfully and continue to collect data relative to this project.

### **Context**

The project setting will be done through a telehealth practice located in Manhattan through which providers make home visits. The patient population are mostly of underserved communities and are of patients who use Medicaid and Medicare. The patients are all located in New York, mostly in the borough of Manhattan. The education will be given to the providers who work for this telehealth platform and make home visits and will be practiced on the adult patient population (all patients over the age of 18 years of age). Most of the adult patient population are of darker skin tones of either Hispanic or African American race, however it is not limited to those races and all patients are served. The change that will be examined will be how the providers assess skin in darker skin tones, which will be measured by documentation in the patient's EMR and compared to the prior three-month period.

### **Intervention/Practice Change**

- Propose practice change with key stakeholders (please see below) to update skin assessment practices.
- Educate providers on darker skin tone assessment practices such as to assess/monitor for ashen gray, darker brown, and violet/blue hues, and will use pictures to show how erythema may present in darker pigmented skin.
- After education, patient's charts will be audited to collect data and analyze over a two-month period to see whether there is an increase, decrease, or no change in documenting skin discoloration as compared to standard practice in the prior three-month period.
- Implement a survey after the education is complete to assess whether the teaching and education was thought to be helpful or enhance nurses' current practice.

### **Key Stakeholders**

The key stakeholders for this project include the medical director who is a MD, the founder of the practice and project manager; all the providers who provide care to the patients through the telehealth platform; and patients.

### **Measures and Analysis**

- A PowerPoint presentation was given to the providers to teach about darker skin toned patients. The PowerPoint provided some education on common skin problems such as melasma, eczema, melanoma, and PIs. The PowerPoint also provided teaching points and pictures to show examples of what to look for when performing a skin assessment.
- Measurement tools. Measurement will be through the EMR's charts. The implemented tool is the education/teaching of using visual cues to look for ashen gray tones, darker brown tones, and purple/blue hues on darker skinned patients. Providers will document as a comment under the skin section if damaged skin is visualized – the comment will include words such as ash gray/gray, dark brown, purple/blue.
- Data collection plan. Patient's EMR's were audited. When auditing the patient's charts, the skin sections of the EMRs are specifically looked at. The data will be collected over a three-month period, which will be compared to data from October, November, and December of 2022.
- Data analysis will be by comparing results from October-December 2022 to results collected in January – April 2023.

### **Timeline**

The proposal was written in July-August 2022, and the proposal presentation to key stakeholders at a telehealth practice located in Manhattan will be presented in December 2022. After the proposal presentation, based on feedback from key stakeholders, changes will be made in December 2022. Later that same month in December 2022 the proposal will be submitted to the Institutional Review Boards (IRB) of this author's university located in Connecticut for review. The project will also be discussed with the medical director of the telehealth medical group for approval. Once approval is granted, providers will be educated on how darker skin tones present skin injuries. This will be done in December 2022. Data collection will be done in January through the April of 2023. The collection of data will be by going through patient's EMR systems. Data analysis will take place during March through April of 2023. The final proposal to share results to stakeholders will take place no later than April 10<sup>th</sup>, 2023. An executive summary will be filed with the telehealth medical group in June 2023.

### **Resources**

Resources include time for teaching, data collection, implementation, and analysis. Part of the implementation included \$20 Starbucks gift cards. The time for teaching was done in a week and the data collection was done on a biweekly basis, implementation was done whenever patients were seen. The data collection and analysis took the most time for this author.

### **Review for Ethical Considerations**

- Quality Improvement project- will be reviewed by this student's university's IRB. (Please refer to Appendix E for approval email).
- Table 1 indicates the Quality Improvement Project criteria has been met.
  - An answer of yes to all the items in 1-10 and no to all the items in 11-I4 supports the criteria for a Quality Improvement Project.



Table 1

*Differentiating Quality Improvement and Research Activities Tool*

Question	Yes	No
1. Is the project designed to bring about immediate improvement in patient care?	X	
2. Is the purpose of the project to bring new knowledge to daily practice?	X	
3. Is the project designed to sustain the improvement?	X	
4. Is the purpose to measure the effect of a process change on delivery of care?	X	
5. Are findings specific to this hospital?	X	
6. Are all patients who participate in the project expected to benefit?	X	
7. Is the intervention at least as safe as routine care?	X	
8. Will all participants receive at least usual care?	X	
9. Do you intend to gather just enough data to learn and complete the cycle?	X	
10. Do you intend to limit the time for data collection in order to accelerate the rate of improvement?	X	
11. Is the project intended to test a novel hypothesis or replicate one?		X
12. Does the project involve withholding any usual care?		X
13. Does the project involve testing interventions/practices that are not usual or standard of care?		X
14. Will any of the 18 identifiers according to the HIPAA Privacy Rule be included?		X

Adapted from Foster, J. (2013). Differentiating quality improvement and research activities.

Clinical Nurse Specialist, 27(1), 10–3. <https://doi.org/10.1097/NUR.0b013e3182776db5>

### **Project Implementation**

The implementation phase for this DNP project began in January 2023. Once approval from this student's university's IRB was granted a teaching PowerPoint was made. The PowerPoint included basic background information and brief education on common skin problems such as eczema, melasma, melanoma, and skin injuries such as Pressure Injuries (PI). The PowerPoint also included pictures found in dermatological literature. Tips on how to better assess skin and how to document the findings in the patient's charts were also included in the teachings. The teachings were done to a total of six people – four providers and two nurses. At

the end of the teachings, providers and nurses were asked to use the following words if they were applicable to their patients when charting their physical examination under the skin section in the charts: gray, ashen gray, purple, blue, and darker brown. All teachings were completed by the third week of January 2023, and data collection began in the last week of January.

This author audited patient's charts that were seen in October 2022, November 2022, and December 2022, specifically looking at the skin section of the charts. A total of 103 charts were audited pre-education. In the 103 patient charts that were audited, all 103 charts had minimal information in the skin section. Fifty-four of those patients charts had no documentation in the skin sections, where the remaining 49 charts had the description of either "no skin lesions," "redness," "wound," and "healed." After the teachings, this author then audited and reviewed the patient's charts from January 29<sup>th</sup>, 2023 through April 16<sup>th</sup>, 2023 after teaching on common skin problems such as eczema, melasma, melanoma, and skin injuries such as Pressure Injuries (PI).

### **Barriers to Implementation**

During the implementation phase there were several barriers to consider that could have been encountered that limited the number of patients who could potentially participate in the project. Some patients were seen as telehealth visits and therefore proper skin assessments could not be performed. For the patients that were seen in person, specifically in the patient's home, not all providers may have performed a thorough skin assessment which may be due to lack of time, comfortability, as well as not wanting to. Some providers may not have changed their skin assessment methods despite teaching efforts due to being accustomed to their own practices.

Furthermore, it was quickly found during the implementation phase that providers were not being specific to where the discoloration was noted (if any was noted). Providers were asked

to specify where the discoloration was being noted in the third and fourth week. It was also found that providers when assessing skin often write their findings in the clinical notes section of the charts, instead of charting these findings in the objective physical assessment section. This could be due largely to being accustomed to their current methods. The nurses utilized the skin section more when charting than the MDs. The term “ashy/ashen gray” was the most commonly used words in the description, however it was not specified if it was used to describe areas of dry skin or if it was indicative of a different skin concern.

### **Data Collection**

Data collection was performed by this author. A total of 90 charts were audited during 01/29/23 to 04/16/23. The PDSA cycle was used three times for this quality improvement project. The first time the PDSA cycle ran, there was a lack of documentation in the charts, and it was found that the many of the providers were documenting their findings in either the disposition or in the clinical notes section of the charts rather than under the skin section of the charts. The above finding was addressed by informing the Medical Director and having that communicated to the other providers and nurses. The second time the PDSA cycle ran, it was found that when discoloration was documented it was not specific to where the discoloration was found in the skin section of the charts. Rather, the documentation again was mostly in the clinical notes section. Again, the above issue was addressed by informing the providers and nurses personally, where if the provider was unavailable, it was asked that the Medical Director address the above to them. Lastly, in the third PDSA cycle, the above two issues were again noted however in less frequency, and there was greater overall improvement in the above. However, it was found that many of the skin sections of the charts were also left blank. This

author addressed the above issues to the providers and nurses as well as again to the Medical Director to try to minimize leaving the skin sections blank.

The issues that were found were lack of documentation, documentation was not in the appropriate section, lack of specification to where the discoloration was found, and lack of specificity to skin issue. Each time one of the issues were encountered, the auditor approached the providers individually to make adjustments and provided guidance if needed, if the providers or nurses were unavailable, it was asked that the Medical Director address the above issues.

Based on the chart review, there was an increase in documentation in the skin section, however 43 of those charts continued to have no documentation in the skin sections. Out of the 47 charts with documentation; 15 of the patients charts out of the 47 had ashy gray in the description, which was the most common description used. Eleven charts used darker brown in the description, 9 of the charts used gray, 2 patient charts used purple in their description, and 10 charts used redness in the descriptions.

## **Evaluation**

### **Process Measurement**

Data was recorded and analyzed using a table in Microsoft Word and Microsoft Excel. Graphs were created using Microsoft Excel, and percentages were calculated by hand. The percentages that were calculated were of the audited charts. Three things were calculated, the first was to see if there was an increase in skin documentation pre-education and post-education. The second round of calculations was to see whether there was an increase in descriptors of words ashen gray, gray, darker brown, purple, and or blue post-education in all audited documented charts (includes charts with documentation and no documentation in the skin

sections). Lastly, the third round of calculations were to see what percentage of audited charts with documentation in the skin sections used the above descriptors.

### **Outcome Measurements**

There was an overall increase in documentation in the skin sections of the charts. In all audited charts there was a 47/90 (41.11%) increase, and a 37/47 (78.72%) increase in the use of words such as ashen gray, gray, darker brown, and purple in all documented charts. Post education, redness accounted for 10/47 (21.28%) of the charts with documentation, and 10/90 (11.11%) of all the audited charts.

### **Results**

The patients are all adult patients over 18 years of age. There was an increase in documentation and an increase in descriptions used when assessing skin. Prior to the education, there were no words of gray, ashy gray, darker brown, purple or blue used when assessing skin. The most common area where the discolorations were noted were over bony prominences and on the lower extremities. The elbows, sacral area, knees, calves, ankles, and feet were the areas where the discoloration was noted.

As stated earlier, the percentages are as follows: ashen/ashy gray 15/47 (31.91%), darker brown 11/47 (23.4%), gray 9/47 (19.15%), purple 2/47 (4.26%), and redness 10/47 (21.28%) – (the above numbers are of charts with documentation. The percentages are as follows for all the audited charts: 15/90 (16.67%) ashen/ashy gray; 11/90 (12.22%) darker brown; 9/90 (10%) gray; 2/90 (2.22%) purple; 10/90 (11.11%) redness, which resulted in a 47/90 (41.11%) increase using the above descriptors in all audited charts.

Post-education there was a 4.65% increase in education in the skin sections – pre-education 54/103 (52.43%) of the charts had no documentation, and post-education 43/90

(47.78%) of the charts had no documentation in the skin section. This shows almost a 5% increase in overall documentation in the physical assessment of the skin section.

When it comes to the documentation, there was still many charts where the skin section was left blank. In the future, during the teaching it would be helpful to stress the importance when documenting the physical assessment that the skin section of the chart not be left blank, if there are no changes or concerns selecting without discoloration as an option rather than to leave the section blank. As the blank can be interpreted as either no discoloration, or that the assessment was not done. Furthermore, it would have been helpful and made the results more meaningful if this author documented the number of charts that used the terms redness and without discoloration pre-education to be able to compare to post-education.

It is unclear whether the increase in knowledge has helped with reducing the risk of compromised skin and disease severity due to the lack of follow-up, and it was unclear whether the patients were followed up which represents a limitation in this project. Having said that, in the future for follow up purposes, in order to track a diseases severity this project may be beneficial to implement in an inpatient setting.

Overall, there was an increase in documentation and the use of descriptors that are more applicable for darker skin tones. A survey was given to the providers and nurses to assess whether they felt there was an increase in knowledge when assessing darker skin tones. The questions in the survey asked whether he/she felt the teachings increased their knowledge on darker skin tones; whether they felt that the teachings are useful and applicable in their scope of practice; and whether they felt this enhanced their overall knowledge of skin. All who participated in the survey – 4 providers and 2 nurses felt there was an overall increase and enhancement in their knowledge. (Please refer to Appendix F).

## **Return on Investment**

The purpose of this quality improvement project was to increase knowledge on how to assess darker skin tones to appropriately detect early skin compromise. Before the teachings, no charts used the words ashen/ashy gray, gray, darker brown, purple, or blue in any of the charts. By using the descriptors listed above, the number of skin injuries will likely decrease, and appropriate treatment methods can be implemented faster by being able to identify compromised skin faster. However there still needs to be more knowledge on this subject as the next steps is to be able to appropriately identify how each skin condition will appear when discolored. In the future, hopefully there will be more literature and visual references that are attainable on this subject and chart's will hopefully integrate words such as gray, ashen gray, darker brown, blue/violet/purple into their chart system so the above descriptors can be options when assessing skin.

The next steps for this project will be to continue teaching others which can be done by this author continuing to teach other providers, and by also appointing skin champions. Skin champions would be individuals who are either providers (MDs, NPs, PAs), and or nurses to become educated and familiar with the subject at hand and to teach others.

## **Key Lessons Learned**

In the future, it may be helpful to have the teaching PowerPoint incorporate a slide with pictures of where the documentation should go to resolve any discrepancies with charting questions. This may be helpful as many providers were not utilizing the skin sections and were documenting in the Clinical Notes section of the EMR. Having said that, it may be helpful for this author to assess what and where is easier for the providers to chart their skin assessment, so it can be addressed at the beginning. It may also be helpful to recommend not to leave the skin

section blank as it may be misinterpreted as either no skin concerns or that an assessment was not performed.

### **Sustainment**

Recommendations to sustain this projects finding are to expand on this knowledge and continue teaching providers and nurses on this topic, as well as incorporating a checklist or a narrative system into charting system. Appointing skin champions who are interested in this subject will help sustain the project. Having these skin champions audit the charts every three months to examine that the skin assessment is being completed can further sustain this project. Furthermore, providers and or nurses who are interested may continue applying these teachings to their various organizations and delegate champions to audit charts and continue teachings.

### **Phase 5: Dissemination**

A presentation in the form of a poster will be presented to Sacred Heart University in the Spring of 2023. That same presentation will be submitted to a conference. If this project is successful, possible publication in the Journal for the Dermatological Nursing Association will be considered.



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<https://pubmed.ncbi.nlm.nih.gov/25785778/>

## Appendix A

Table 1 Search Terms and Search Results by CINAHL Database

*CINAHL Complete Search Terms and Search Results*

Search Terms	Number of hits	Number of articles reviewed	Duplicates	Number of articles selected
Dark skin	266			
Dark skin and assessment	45	3		2
Dark skin and assessment and pressure injuries	12	1		1
Darker skin tone and assessment	11	1		
Darker skin tone and pressure injury	4	2		1
Darker skin tones and assessment and pressure injury	3	1		
Darker skin tone and assessment and barrier	0			
Darker skin tone and pressure injury and prevention	2			

Table 2

*Search Terms and Search Results by MEDLINE Database*

Search Terms	Number of hits	Number of articles reviewed	Duplicates	Number of articles selected
Dark skin	1129			
Dark skin and assessment	124			
Dark skin and assessment and pressure injuries	5	2		1
Darker skin tone and assessment	12			
Darker skin tone and pressure injury	3	2		
Darker skin tones and assessment and pressure injury	2	2		2
Darker skin tone and assessment and barrier	0			
Darker skin tone and pressure injury and prevention	0			

Table 3

*Search Terms and Search Results by COCHRANE Database*

Search Terms	Number of hits	Number of articles reviewed	Duplicates	Number of articles selected
Dark skin	0			
Dark skin and assessment	0			
Dark skin and assessment and pressure injuries	0			
Darker skin tone and assessment	0			
Darker skin tone and pressure injury	0			
Darker skin tones and assessment and pressure injury	0			
Darker skin tone and assessment and barrier	0			

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Darker skin tone and pressure injury and prevention 0

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## Appendix B

### Evidence Summary Table

Citation	Conceptual Framework	Design/ Method	Sample/ Setting	Major Variables Studied and Their Definitions	Outcome Measurement	Data Analysis	Findings	Level of Evidence/ Quality	Quality of Evidence: Critical Worth to Practice
Author Year Title County Funding	Theoretical basis for study		Number Characteristics Exclusion criteria Attrition	Independent variables IV1 = IV2 = Dependent variables	What scales used - reliability info (alphas)	What stats used	Statistical findings or qualitative findings	Level =	Strengths Limitations Risk or harm if implemented Feasibility of use in your practice
<b>Article 1</b>									
Okonkwo, H., Bryant, R, Milne, J., Molyneaux, D., Sanders, J., Cunningham G, Brangman S, Eardley W, Chan GK, Mayer B, Waldo M, Ju B. A blinded clinical study using a subepidermal moisture biocapacitance measurement device for early detection of pressure injuries. Wound Repair Regen. 2020 May;28(3):364-374. doi: 10.1111/wrr.12790. Epub 2020 Jan 21. PMID: 31965682 ; PMCID: PMC7217158.	N/A	Multisite, blinded, prospective, longitudinal clinical study	Sample; n= 189; 46.7% males, and 53.3% females. United States subjects = 147, United Kingdom subjects = 42. It was conducted in 12 facilities – 6 acute care in U.S.; 3 post-acute care in U.S., 3 acute care in U.K.  Characteristics: <b>Inclusion criteria:</b> Stage I, DTI, Stage II or Unstageable. Data from patients' heels and sacrum. Patents were all	N/A  All participants received prevention and interventions that were consistent with the facility's Standard of Care practices.  Control group – wound care specialists	US National Pressure Ulcer Advisory Panel/European Pressure Ulcer Advisory Panel/Pacific Pressure Injury Alliance (NPUAP/EPUAP/PPPIA)— global 2014 Clinical Practice Guideline	Sensitivity 87.5% (95% CI: 74.8% - 95.3%).  Specificity 32.9% (95% CI: 28.3% - 37.8%).  Of the study 26.7% developed a PI.  Stage I – 66.7%  DTI – 23%  Remaining were of Stage II or Unstageable.	The study's aim was to evaluate the sensitivity and specificity of SEM (subepidermal moisture) device for early detection of PIs against using the standard practices – considered as the Gold Standard (STA – skin and tissue assessment).	Level III	Study shows that using patient's current skin condition and the condition of their underlying tissue as a useful indicator to detect early signs of pressure damage. Therefore, routine skin and tissue assessment practices should be used to identify and for treatment purposes in PUs. However, the nurses' clinical judgment may be inadequate/in limited capacity to assess PU risk – suffered from "high interexaminer variability." Found that clinical judgment sensitivity to be 50.6%, and specificity of 60.1%. Correct identification of Stage I PU observed in 60% among 1452 nurses.

			<p>55 years or older and could be followed for at least 6 consecutive days (up to 21 days), had a Braden risk score of greater than 15, Water low scale greater or equal to 10, or Norton scale greater or equal to 18, poor nutrition, limited mobility, recently undergone a medical procedure that requires immobilization (example: surgery).</p> <p><b>Exclusion criteria:</b> Had existing PIs, broken skin at either the sacrum or heel, existing MASD or IAD (incontinence-associated dermatitis), biomechanical or had any other</p>						<p>No risk or harm. All patients received interventions and prevention practices.</p>
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			limitations that would prevent from being able to use protocol assessments.						
<b>Article 2</b>									
Harms, S., Bliss, D. Z., Garrard, J., Cunanan, K., Savik, K., Gurvich, O., Mueller, C., Wyman, J. F., Eberly, L., & Virnig, B. (2014). Prevalence of Pressure Ulcers by Race and Ethnicity for Older Adults Admitted to Nursing Homes. <i>Journal of Gerontology</i> , 69(3), 20–26.	N/A	Cross sectional observational design.	Sample; 111,640 nursing home patients. Records of 2000-2002.  <b>Inclusion criteria:</b> adult patients > than or equal to 65 years of age, who were Caucasian, African American, Hispanic, Asian, and or Native American descents of both genders. All new admissions to the NH (nursing home) that were all Medicare/Medicaid certified.  <b>Exclusion criteria:</b> patients less than 64 years of age and who were not new	N/A	Census Division.	Stage I PUs: African-Americans 7% (624) Hispanic 7% (135) Asians 10% (194) Caucasians 8% (8086)  Stage II PUs African-Americans 20% (1367) Hispanic 16% (302) Asians 15% (281) Caucasians 12% (11734)  Stage III: African-Americans 7% (673) Hispanic 6% (121) Asians 4% (69) Caucasians 3% (3126)  Stage IV: African-Americans 8% (719) Hispanic 5% (95) Asians 4% (75)	African-Americans had the highest incidence of PUs at Stages 2-4, followed by Hispanics, and then lowest number was seen in Caucasians. African-Americans and Hispanics  Suggestion of increased effort to assess for Stage I PUs, especially to Black NH admissions which needs to be supported by increased education to staff and organizational policies.	Level V	Strengths include covering a broad range of races.  Results showed prevalence of PUs highest amongst Blacks, followed by Hispanics, than Whites. PI admissions was 1.7x greater in Blacks than Whites.  No harm.  Limitations; does not give much insight on how to/potential ways to improve.

			admissions.			Caucasians 3% (2651)			
<b>Article 3</b>									
Sullivan R. A 5-year retrospective study of descriptors associated with identification of stage I and suspected deep tissue pressure ulcers in persons with darkly pigmented skin. Wounds. 2014 Dec;26(12):351-9. PMID: 25785778.	N/A	5-year Restrospective review.	Sample ; 96 subjects . 274 stage I or DTIs PUs in an acute care facility.  Characteristics: <b>Inclusion criteria</b> : African American, Asian, Hispanic, American Indian, Alaskan Native, Native Hawaiian, Pacific Islander , WOCN consult, March 2008- March 2013. <b>Exclusion criteria</b> : N/A.	N/A	National Pressure Ulcer Advisory Panel (NPUAP).			Level III	
<b>Article 4</b>									
Al Aboud, A. M., & Manna , B. t (2022). Wound Pressure Injury Manage	N/A	Expert Opinion.	N/A	N/A	Braden scale, Norton scale	N/A	N/A	Level VII	Strengths: Educational information about pressure injuries and provided great foundational knowledge.



ment.In <i>StatPearls</i> . StatPearls Publishing.									Provided educational informational and recommendations for providers.  Weakness: was not specific to races or situations.  No harm.
<b>Article 5</b>									
Oozageer Gunowa, N., Hutchinson, M., Brooke, J., & Jackson, D. (2018). Pressure injuries in people with darker skin tones: A literature review. <i>Journal of Clinical Nursing</i> (John Wiley & Sons, Inc.), 27(17-18), 3266-3275.	N/A	Literature review.	Comprehensive electronic databases were searched. The searches came from PubMed, Cumulative Index for Nursing and Allied Health Literature, Cochrane and British Nursing Index (BNI). The results were from between 1990-July 2016.  The search gave 11 relevant articles.  Inclusion: risk of sustaining a PIs based	N/A				Level I	Darker skin tones overall are more likely to develop PIs at a higher stage. There is no clear indication as to why, however believes that it may be associated with current practices being less effective for those with darker skin tones.  Supports the notion that there is an increased risk for darker skin tones to develop PIs at a higher stage than their Caucasian counterparts.

			on skin tones, identification of pressure injuries amongst people with dark skin tones, pressure injuries and place of care and socio-economic impact on pressure injuries development.						
<b>Article 6</b>									
Oozageer Gunowa, N., Brooke, J., Hutchinson, M., & Jackson, D. (2020). Embedding skin tone diversity into undergraduate nurse education: Through the lens of pressure injury. <i>Journal of Clinical Nursing</i> , 29(21-	N/A	Multiple method collective study. STROBE checklist was also used in this study.	Used documentary and observational data that was collected from 2017 to 2018 from five Higher Institutions in England.  Characteristics: <b>Inclusion criteria</b> : African American, Asian, Hispanic,	N/A	National Pressure Ulcer Advisory Panel (NPUAP).	N/A	Found that all teachings and documentations regarding PIs were favorable toward Caucasians. Teachings and learning activities that were on darker skin tones were all "brief, separate and superficial information."	Level V	The study elicits the existing gap in skin tones, and therefore the need for formal education and in clinical settings by staff and preceptors in addressing skin tone diversity.  No harm.

22), 4358- 4367.			American Indian, Alaska n Native, Native Hawaii an, Pacific Islander ; WOCN consult, March 2008- March 2013. <b>Exclusion criteria</b> : N/A.						
<b>Article 7</b>									
Sangha, A. M. (2021). Dermatological Conditions in SKIN OF COLOR -: Managing Atopic Dermatitis. <i>The Journal of clinical and aesthetic dermatology</i> , 14(3 Suppl 1), S20– S22.	N/A	Expert opinion	Characteristics:  <b>Inclusion criteria</b> : African Americans.  <b>Exclusion criteria</b> : N/A.	N/A				Level VII	Speaks to the differing appearances of AD in Caucasians versus African- Americans. Offers practical solutions for the treatment in AD. Images were also included of actual patients which made it great for reinforcement and for teaching purposes.

N/A= Not Applicable

## References

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Sullivan, R. (2014). A 5-year retrospective study of descriptors associated with identification of stage I and suspected deep tissue pressure ulcers in persons with darkly pigmented skin. *Wounds : a compendium of clinical research and practice*, 26(12), 351–359.  
<https://pubmed.ncbi.nlm.nih.gov/25785778/>

## Appendix C

### Levels of Evidence Synthesis Table: PICO Question #1

PICO Question: In darker pigmented skin toned patients (P) does the use of visual inspection using educational techniques taught to the nurses about dark and light skin assessment (I) compared to standard practices of using visual inspection to look for (blanchable) redness (C) reduce the risk of developing compromised skin (O)?

X (copy symbol as needed)	1	2	3	4	5	6	7
<b>Level I: Systematic review or meta-analysis</b>					X		
<b>Level II: Randomized controlled trial</b>							
<b>Level III: Controlled trial without randomization</b>	X		X				
<b>Level IV: Case-control or cohort study</b>							
<b>Level V: Systematic review of qualitative or descriptive studies</b>		X				X	
<b>Level VI: Qualitative or descriptive study, CPG, Lit Review, QI or EBP project</b>							
<b>Level VII: Expert opinion</b>				X			X

#### **LEGEND**

1= Okonkwo, H. et al., 2020 2= Harms, S. et al, 2014. 3= Sullivan, R., 2014. 4= Al Aboud et al., 2022. 5= Oozageer Gunowa, N et al., 2018. 6= Oozageer Gunowa, N et al., 2020. 7= Sangha., A.M., 2021.

## Appendix D

### Outcomes Synthesis Table

PICO Question: In darker pigmented skin toned patients (P) does the use of visual inspection using educational techniques taught to the nurses about dark and light skin assessment (I) compared to standard practices of using visual inspection to look for (blanchable) redness (C) reduce the risk of developing compromised skin (O)?

↑, ↓, —, NE, NR, ✓ (select symbol and copy as needed)	1	2	3	4	5	6	7
<b>Lack of knowledge/education about darker skin tones</b>	✓		✓		NR		✓
<b>Needs more knowledge/education</b>	✓		✓		✓		✓
<b>Evidence that Darker Skin Toned patients have a higher incidence of PUs</b>	NE		✓		NE		NE/NR
<b>Evidence that Darker Skin Toned patients are being diagnosed with PUs at later stages.</b>	✓		✓		NE		NE/NR
<b>Lack of knowledgeable staff</b>	✓		✓		NE		✓
<b>Lack of research</b>	✓		✓		NE		✓
<b>Lack of available space</b>	NE		NE		NE		NE

#### **SYMBOL KEY**

NE = Not Examined, NR = Not Reported, ✓ = applicable or present

## Appendix E

IRB #230123A – Exempt Status Request

Monday 1/23/2023 11:51 AM

Dear Applicant,  
Thank you for your submission to the IRB requesting exempt review. Based on the application submitted, the IRB is pleased to approve your submission and we wish you great success in your research.

Sincerely,  
Christopher Taber  
Chair, IRB

Christopher B. Taber, PhD, CSCS\*D, USAW3, EP-C, PES  
Director, Exercise and Sport Science M.S. Program  
Associate Professor  
College of Health Professions  
Sacred Heart University  
(203) 396-6342



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## Appendix F

### Education Points for Teaching

- Dermatological skin conditions do not present the same in all skin tones.
- In darker pigmented skin, erythema is not as evident.
- Erythema in darker skin tones will appear as either:
  - Ashen gray
  - Darker brown
  - Violaceous hue - purple/blue
- TIP: Use good lighting (e.g. flashlight if needed, however avoid fluorescent lights as it can cause a blue tone against darker skin tones).
- When documenting under the skin section to write a comment that includes words such as gray, ashen gray, purple, blue, darker brown in their documentation if compromised skin is visualized.

## Appendix G

### Post Education and Teaching Survey

1. After the teachings, do you feel an overall increase in knowledge regarding skin?  
(All 6 participants of this survey answered "YES").
2. After the teachings, do you feel there was an overall increase in knowledge regarding darker skin tones?  
(All 6 participants of this survey answered "YES").
3. Do you feel that these teachings were useful and applicable to your work?  
(All 6 participants of this survey answered "YES").
4. Questions, comments, concerns? What could help or further enhance your knowledge about darker skin tones?  
(All 6 participants of this survey answered left this part blank).

THANK YOU!