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Evaluation of an Evidence-Based, Quality Improvement Program: Improving Hospital Acquired Pressure Injuries using the Subepidermal Moisture Scanner

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Abstract

Hospital-acquired pressure injuries (HAPIs) are a significant concern, affecting millions of patients in the United States annually, and are a contributing factor to an extended length in hospital stays. Pressure injuries pose a considerable healthcare problem linked to substantial morbidity, mortality, and healthcare costs. Intensive Care Units (ICUs) provide care to the highest acuity patients who often experience limited mobility due to their critical illness or injury. Sedentary behavior is a primary cause of hospital-acquired pressure injuries, with a high incidence rate observed among ICU patients. Traditional methods for pressure injury prevention and detection have limitations in terms of accuracy and timeliness.

This program evaluation project aimed to investigate the effectiveness of staff education and the application of a subepidermal moisture (SEM) scanner in reducing the number of pressure injuries among hospitalized adults in an ICU. SEM scanning has emerged as a novel technology for the early detection and prevention of pressure injuries. The evaluation followed the CDC Framework for Program Evaluation, involving engagement of stakeholders, program description, evaluation design, gathering credible evidence, justifying conclusions, ensuring use, and sharing lessons learned. The evaluation was conducted in a 341-bed urban acute care hospital in the southeastern region of the United States, focusing on four ICU units comprising a total of 64 beds. The MOVE - Pressure Injury Prevention (PIP) program, which included staff education and SEM scanning, was implemented. The study excluded pediatric patients and non-acute care settings.

The comprehensive evaluation demonstrated that the implementation of staff education and SEM scanning effectively reduced the development of pressure injuries in the ICU of the acute care hospital. By educating healthcare staff on preventive strategies and utilizing the SEM

scanner to monitor subepidermal moisture levels, early signs of tissue damage were identified, enabling proactive measures to prevent pressure injuries.

The findings highlight the importance of evidence-based interventions, stakeholder involvement, and the role of staff education and SEM scanning in reducing pressure injuries. The implementation of these interventions in an ICU setting can enhance patient outcomes by identifying and addressing pressure injuries promptly.

Based on the evaluation results, it can be concluded that the implementation of the MOVE – PIP Program effectively reduces the development of pressure injuries in the ICU of an acute care hospital. The evaluation indicates that SEM scanning can contribute to more accurate and timely detection of pressure injuries, enabling proactive interventions. These findings emphasize the importance of implementing similar programs in other healthcare institutions. Further research is needed to validate its efficacy in diverse healthcare settings, determine its cost-effectiveness, and assess its impact on patient outcomes. Future studies should also explore the integration of SEM scanning into clinical practice guidelines and pressure injury prevention protocols. The SEM scanner does have some limitations including the need for a change in hospital culture and nursing compliance. In addition to staff knowledge, there is a requirement for staff to be aware of pressure injury risks in order to implement focused interventions. Sharing the lessons learned from this evaluation will facilitate improved patient care and outcomes related to pressure injuries in ICUs.

Key words: Subepidermal Moisture, Acute Care, hospital, pressure injury, or pressure ulcer, or pressure sore, or bedsore, or bed sore, or decubitus

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Introduction

Approximately 2.5 million patients experience hospital-acquired pressure injuries (HAPIs) annually in the United States, leading to an average extended hospital stay of 9 days (Bruin Biometrics LLC, 2022; Gershon et.al., 2011). According to the National Pressure Injury Advisory Panel (2021), these pressure injuries contribute to nearly 60,000 deaths each year. While various factors contribute to this issue, sedentary behavior is identified as the primary cause of pressure injuries among hospitalized patients (Stutzbach et. al., 2021). Immobility in hospitalized patients is influenced by factors like staff engagement in patient mobilization, perceived time constraints for turning or ambulation, patient mobility requirements, acuity level, and emotional state. The development of pressure injuries often results from mechanical loading, causing tissue ischemia and cellular deformation (Moore et.al., 2017). In fact, pressure injuries can manifest in a matter of hours in hospitalized patients with limited mobility. Recognizing the scale of this problem enables healthcare leaders to allocate resources effectively and implement preventive strategies to mitigate the occurrence of pressure injuries.

Data related to HAPIs can empower healthcare leaders to make targeted resource allocations, ensuring a sufficient supply of pressure-relieving equipment, wound care products, and appropriate staffing levels in facilities catering to high-risk patients for pressure injuries. Informed decision making enables leaders to establish measurable goals and objectives focused on reducing both the frequency and severity of pressure injuries. Moreover, this facilitates the identification of specific units or areas within the healthcare facility that may necessitate additional resources or tailored interventions based on prevalence and mortality rates associated with pressure injuries. Administrative leaders can institute specialized wound care teams or committees dedicated to the prevention and management of pressure injuries. These teams can

collaborate with various departments including nursing, nutrition, and physical therapy, to devise comprehensive care plans and promote a multidisciplinary approach to prevention and treatment. Additionally, leaders can arrange regular meetings or forums to share best practices and disseminate the latest evidence-based guidelines for pressure injury care.

Managers can enhance organizational efficiency by first analyzing data to identified units or shifts exhibiting a higher incidence of pressure injuries. This enables the allocation of appropriate staffing levels to ensure vigilant patient monitoring and timely interventions. Additionally, they can evaluate the skill mix of the healthcare team and implement training or education programs to enhance staff proficiency in pressure injury prevention, assessment, and management.

Given the estimated 60,000 deaths linked to pressure injuries annually (NPIAP, 2021), healthcare leaders can prioritize initiatives aimed at training staff in proper pressure injury prevention techniques, implementing evidence-based protocols for patient turning and repositioning, and enhancing patient education on the significance of mobility and skin care. Furthermore, health care leaders can leverage morbidity and mortality data to pinpoint high-risk areas and make decisions for implementing quality improvement initiatives. By providing clear-cut guidelines, protocols, and educational resources, managers can ensure that staff members possess the necessary tools and knowledge to carry out evidence-based interventions. They can also cultivate a culture of accountability by overseeing staff adherence to pressure injury prevention practices and offering feedback and recognition for exceptional performance.

Background

The National Database of Nursing Quality Indicators (NDNQI) benchmarks nursing sensitive indicators, including HAPIs. A 341-bed urban acute care hospital in the southeastern

region of the United States found NDNQI data from the fourth quarter of 2021 for HAPIs to be 9.3% of surveyed in-patients, compared to a national mean of 2.98%. In the first quarter of 2022, the percentage rose to 11.48% compared to a national mean of 3.00%. Upon further examination of data spanning from August 2021 through May 2022 (encompassing 2021: Q3 & Q4 and 2022: Q1 & Q2), the overall hospital HAPI rate was determined to be 9.06%. This raised concerns, prompting the hospital to focus on data from specific clinical areas. Further investigation revealed an NDNQI unit acquired HAPI rate of 14.46% among surveyed Intensive Care Unit (ICU) patients.

In 2022, the hospital initiated a comprehensive program, known as the "Harm Reduction" program, as part of their quality improvement endeavors. The program aimed to enhance both patient and staff outcomes related to patient mobility, encompassing objectives such as increasing patient movement, reducing falls, minimizing pressure injuries, and decreasing staff injuries. To reach these goals, the hospital collaborated with the company Arjo, which offers the Diligent + Atlas Mobility Outcomes Program. Arjo, an international company, is dedicated to empowering patient movement and ensuring that care settings are safe, comfortable, and dignified for both patients and caregivers (Arjo, 2022). As a component of this broader initiative, the hospital introduced the Mobility, Outcome, Value, & Engagement (MOVE) – Pressure Injury Prevention (PIP) program and integrated a pressure injury detection tool known as the Sub-epidermal Moisture (SEM) scanner.

Purpose Statement

The objective of this project was to conduct a program evaluation of the MOVE – PIP program, which constitutes a segment of the hospital's evidence-based quality improvement initiative known as "Harm Reduction." This program evaluation involved assessing the response

to the quality improvement (QI) Problem, Intervention, Comparison, Outcome (PICO) question: Among patients in an intensive care unit (ICU), does the implementation of a SEM scanner and staff training lead to a reduction in the incidence of hospital-acquired pressure injuries compared to standard practice? The HAPI rates exceeded the national mean in the final quarter of 2021 and the initial quarter of 2022. These findings deviated from the outcome expectations of hospital leadership, prompting the implementation of an assertive and financially substantial evidence-based quality improvement program targeted at reducing HAPIs in April 2022.

Review of Literature

In recent years, there has been a growing trend in healthcare towards utilizing advanced technology, particularly machine learning, as a means of early detection and prevention of pressure ulcers (Cramer et al., 2019). This has been particularly true for predicting the incidence of pressure ulcers in intensive care units (ICUs). Leveraging advanced computational methods to enhance early detection and prevention of pressure ulcers has the potential to change the landscape of long-term patient outcomes associated with acute intensive care hospitalizations.

The SEM Scanner is a technology designed to modernize care pathways for pressure injuries. SEM Scanners can act as a tool that can be used in the early detection and prevention of pressure injuries, with the potential to reduce incidence rates (Bryant, Moore, & Myer, 2021 & Campbell et al., 2022). SEM algorithms utilize spatial variations in moisture levels beneath the skin's surface to detect potential tissue damage. Gefen and Gershon (2018) conducted an observational, prospective cohort pilot study to compare SEM measurements with other assessment methods, such as ultrasound and visual skin assessments. The results support that SEM scanning offered a reliable and objective means of assessing tissue health, enhancing the early detection of pressure ulcers, and improving patient care.

SEM algorithms demonstrate promise in providing a sensitive and specific method for diagnosing deep and early-stage pressure-induced tissue damage. The technology shows potential in enhancing clinical assessments and aiding healthcare providers in making more precise diagnostic decisions (Gefen and Gershon, 2018). Musa (2021) explored the tangible benefits of SEM scanning in real-world clinical settings. Findings indicated SEM technology had a real-world impact on patient outcomes, offering valuable guidance for healthcare professionals seeking to incorporate SEM scanning into their clinical routines. In addition, Raizman, MacNeil, & Rappl (2018) provided evidence that SEM scanning may offer advantages over traditional methods, potentially leading to improved patient outcomes and reduced incidence of pressure ulcers.

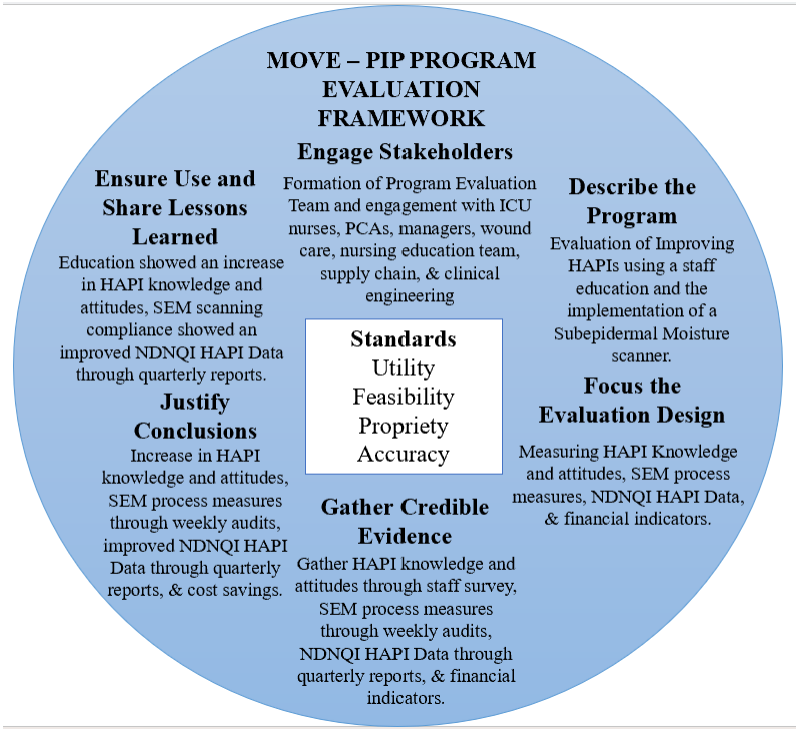
Emerging evidence strongly supports the integration of SEM scanning into clinical practice, especially ICUs, for the prevention of pressure injuries. SEM scanning technology, exemplified by the Provizio SEM Scanner developed by Bruin Biometrics LLC, has garnered attention for its potential to revolutionize pressure injury care pathways. Studies by Bryant et al. (2021) and Campbell et al. (2022) provide robust clinical profiles and feasibility pilot trials, respectively, demonstrating the effectiveness of SEM scanning in preventing pressure injuries. Additionally, research by Lustig et al. (2022) showcases a machine learning algorithm that leverages daily SEM measurements for early detection of deep tissue injuries. These findings collectively underscore the significant impact SEM scanning can have on patient outcomes, suggesting its potential to transform pressure injury prevention strategies, particularly in critical care settings.

Theoretical Model

The CDC's Framework for Program Evaluation in Public Health (CDC, 1999) guided this program evaluation project. This theoretical framework helps ensure the program evaluation delivers standards including utility, feasibility, propriety, and accuracy. In addition, the framework provides steps to guarantee an optimal evaluation process. These steps include engaging stakeholders, describing the program, focusing on the evaluation design, gathering credible evidence, justifying conclusions, ensuring use, and sharing lessons learned as outlined in Figure 1.

Figure 1.

Adapted CDC Framework for MOVE – PIP Program



While the program being evaluated for this project was not focused on public health, the CDC Framework for Program Evaluation aligned with the goals of the project.

Engaging Stakeholders

In April 2022, the MOVE – PIP Program Evaluation Team was established, and a comprehensive evaluation was conducted, including a needs assessment for the hospital and an evaluation of stakeholders. Engaging stakeholders in this program was prioritized from the onset. Both the hospital leadership team and the MOVE – PIP Program Evaluation Team took the initiative to engage in discussions with ICU nursing staff and unit managers involved in the MOVE – PIP Program. Additionally, other stakeholders addressed during this period included patient care assistants (PCAs), the nursing education team, the wound care team, supply chain, and clinical engineering. The MOVE – PIP program evaluation team convened regularly throughout the project to ensure adherence to standards and proper procedural steps. This project commenced in April 2022, with a comprehensive evaluation concluding in June and July of 2023 (Appendix A).

Needs Assessment

In April 2022, a needs assessment was conducted for the 341-bed urban acute care hospital positioned in the southeastern region of the United States. The assessment specifically focused on the four ICU units, comprising a total of 64 beds. This comprehensive evaluation included gathering crucial components, engaging key stakeholders, and completing of a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis.

Regarding key elements, comprehensive measures were implemented involving all ICU staff and patients across the four ICUs. To begin, a pre-assessment of ICU nursing knowledge concerning HAPIs, along with their treatment and prevention, was conducted through the administration of an electronic survey (Appendix B). All nurses within these four ICUs were provided with pertinent information regarding the survey and the necessary access details.

For patient data pre-assessment, the percentage of ICU HAPIs from 2020 and 2021 NDNQI data was used as a baseline. During data collection, SEM compliance was obtained through chart audits, while quarterly HAPI percentages were acquired using ongoing NDNQI data. Following the implementation of the SEM scanner, a post-assessment of ICU Nursing Knowledge related to HAPIs, treatment, and prevention was conducted using the same survey questions. Additionally, the post-percentage of ICU HAPIs was obtained from NDNQI data one year after the SEM scanner was put into operation. Prior to SEM scanner implementation, comprehensive education encompassing Safe Patient Handling, Mobility Training, and SEM knowledge was provided to all staff. The primary stakeholders identified for this project were: Hospital Chief Nursing Officer, Hospital Assistant Chief Nursing Officer, Program Manager of Nursing Excellence and Clinical Outcomes, Director of Clinical Support Services, Arjo- SEM implementation staff, and ICU management and nursing staff.

SWOT Analysis

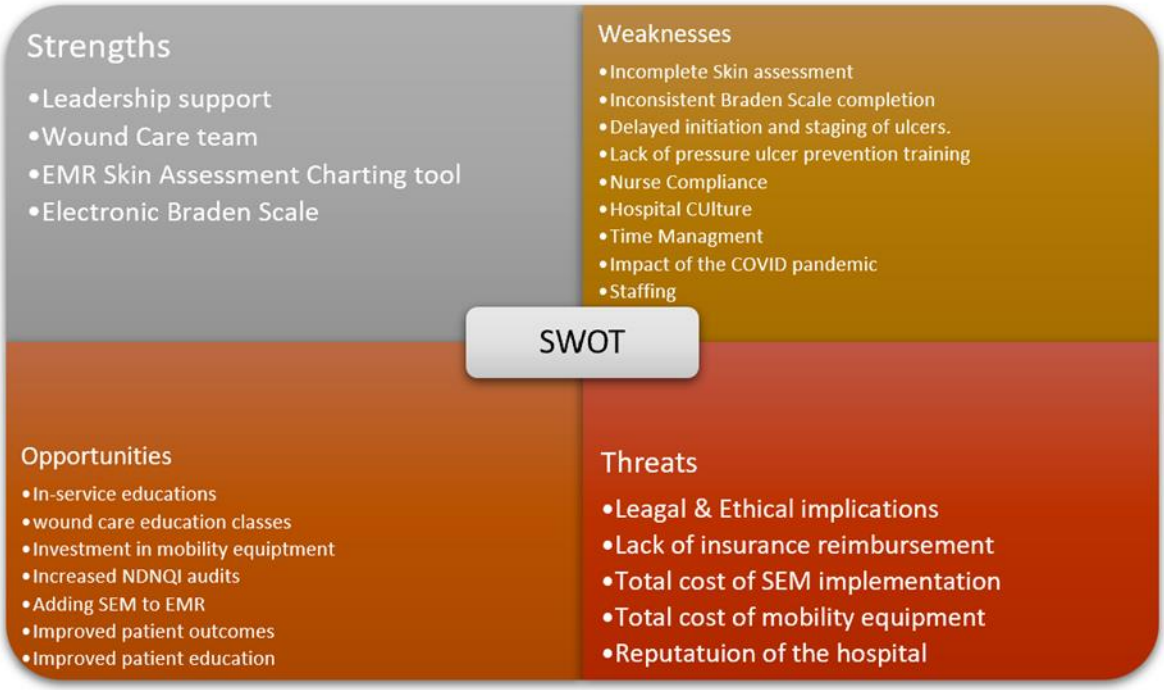
In the evaluation of this project, it was evident that there were several strengths contributing to its potential success. Strong backing and support from the hospital administrative team provided the necessary funding and ensured the project's viability. The dedicated wound care team played a crucial role by offering expertise for patient assessments, staff education, and accurate reporting of pressure injuries. Additionally, the presence of a skin assessment charting tool within the electronic health record streamlined auditing and documentation processes. The electronic Braden Scale proved to be a valuable tool for both assessing patient risk and documenting interventions, aiding in comprehensive assessments and thorough documentation (Appendix I).

In contrast, there were several weaknesses that required attention. Nurses sometimes struggled to assess patients' skin every shift, which was vital for patient care and auditing purposes. Furthermore, inconsistent completion of the Braden Scale in the electronic medical record (EMR) hindered the identification of patients' risk for immobility and subsequent HAPIs. Nursing staff's hesitation to initiate and chart pressure ulcers upon admission due to competency concerns could lead to misclassifying ulcers as hospital acquired. Moreover, the absence of a structured training program for pressure ulcer prevention contributed to a lack of knowledge among nursing staff. Compliance with additional tasks were perceived as challenging due to the increasing number of products, protocols, and procedures being introduced. The prevailing hospital culture, marked by noncompliance with directives, presented a barrier to change. Nurses also reported time management issues, feeling they lacked the time for additional tasks. Additionally, the COVID-19 pandemic shifted the focus away from patient mobility, increasing the risk of Hospital-Acquired Pressure Injury development. Staff turnover and shortages further complicated ensuring proper skin assessments and providing necessary turning assistance.

Despite these weaknesses, there were various opportunities for improvement. In-service education by company representatives could provide staff with valuable knowledge about skin protectant lotions, dressings, and support surfaces, enhancing prevention methods. Establishing a wound care class focused on HAPIs could bolster staff understanding of pressure injuries, their causes, and treatment. Investments in mobility equipment, such as lifts and slings, could empower staff to move patients with minimal assistance. Elevating the frequency of NDNQI audits to monthly could heighten awareness and commitment to HAPI prevention. Adding SEM documentation to the nurse EMR task list could help nurses remember to complete scanning and documentation, ultimately improving patient outcomes and education for patients and families.

Nonetheless, it was imperative to remain vigilant about potential threats to the project's success. The emergence of legal and ethical implications for nurses and the facility in relation to pressure ulcers was a genuine concern, especially if there was insufficient documentation. The discontinuation of insurance reimbursement by Centers for Medicare and Medicaid Services (CMS) for HAPIs posed a significant financial threat. Furthermore, the total cost to the hospital for SEM implementation and the acquisition of mobility equipment necessitated thorough financial planning. Lastly, the hospital's reputation was on the line, and the disclosure of a high rate of HAPIs to the public could have had detrimental consequences.

Figure 2. SWOT Analysis



MOVE – PIP Program Description

The MOVE – PIP initiative was comprised of two central strategies designed to reduce the incidence of HAPIs in individuals admitted to acute care healthcare facilities. The first element involved staff education, which centered on enhancing nursing proficiency and attitudes

pertaining to the pathophysiology, prevention, and treatment of HAPIs. The second facet of the program entailed the deployment of SEM scanners (see Appendix C). According to Arjo (2022), the "Provizio SEM Scanner aids clinicians in identifying heightened risk of pressure injury on specific anatomical areas of a patient's body upon admission, providing this information five days earlier than a visual skin assessment, irrespective of skin tone."

The initial element of the program involved administering the SEM scanner coach training curriculum to all designated charge nurses and SEM unit leaders in person, spanning from July 5th to July 11th, 2022. Subsequently, SEM unit champions and representatives from Arjo conducted hands-on training sessions for all ICU nursing staff from July 12th to August 12th, 2022. Running concurrently with SEM classes and bedside training, both full-time and part-time nurses, as well as PCAs, received in-person "Harm Reduction" training from August 8th, 2022, to August 19th, 2022. This curriculum was comprised of a Safe Patient Handling program, mobility tool development with hospital rollout, and HAPI Education, all facilitated by the hospital's Education Department (see Appendix E and F). Moreover, reinforcing the educational content involved the deployment of door signs, distribution of flyers, utilization of laboratory learning, and the appointment of a program champion who made weekly visits to ICU units, offering support, education, and additional bedside training (see Appendix D).

The second element of the program revolved around the utilization of SEM scanners along with disposable single-use probe covers (Bruin Biometrics LLC, 2022). The Provizio SEM scanner (Appendix C) is a non-invasive handheld device designed for measuring sub-epidermal moisture levels in the skin (as described in Arjo, 2022, Nightingale et.al., 2021, & Ross et.al., 2019). The program's established protocol mandated heel and sacrum scans for all ICU patients using the SEM scanner twice a day (once during each shift). The central clinical parameter of

interest was the calculation of the "delta" value, defined as "the disparity in SEM values between healthy tissue and an adjacent tissue region that may exhibit subsurface damage affecting local tissue fluid contents (such as microscale edema triggered by the inflammatory response)" (Ross et.al., 2019, p. 94). Nursing staff recorded the delta value in the Electronic Medical Record (EMR) and employed this figure, in conjunction with the Braden Scale and a visual skin assessment, to determine the most appropriate pressure injury prevention interventions (refer to Appendix I). In the context of SEM scanning, it was essential to educate nurses on interpreting SEM delta numbers and the corresponding interventions required (Arjo, 2022). Notably, the recommended threshold for a high delta value was ≥ 0.6, in accordance with the manufacturer's guidance (Bruin Biometrics LLC, 2022, Nightingale et.al., 2021, & Ross et.al., 2019).

Evaluation Design

Project Site & Population

The program evaluation project was conducted at an urban hospital with 341 beds, located in the southeastern region of the United States. The evaluation specifically focused on outcomes within four ICUs, with a combined bed capacity of 64. NDNQI ICU data was gathered from the 3rd and 4th quarter of 2021, as well as the 1st and 2nd quarter of 2022 (prior to MOVE – PIP implementation), and subsequently from the 3rd and 4th quarter of 2022, along with the 1st and 2nd quarter of 2023 (following MOVE – PIP implementation).

Measures

HAPI Knowledge & Attitudes. Knowledge and attitudes regarding HAPI pathophysiology, prevention, and treatment among ICU nurses were assessed using the Mobility and Pressure Injury Assessment survey (Appendix B). The survey was administered as part of the larger “Harm Reduction” program. Nurses’ knowledge related to HAPIs was calculated

based on the percent correct on questions #5, #8, #9, & #10. Nurses who scored 100% correct for the four questions were indicated as knowledgeable. Nurses' attitudes were evaluated by calculating the percentage of nurses who answered that their role was either very important or extremely important on questions #6 & question #7. A Chi-square analysis was used to assess whether there was an association between the educational program (pre/post) and nurses' knowledge and attitudes.

SEM Scanning Compliance. Evaluation of program protocol adherence was conducted through audits assessing compliance with SEM scanner utilization. These audits measured both the number of patients on the unit and the number of scans performed. The hospital leadership's objective was to achieve a scanning compliance rate of 95% for each unit.

NDNQI HAPI Data. "The NDNQI stands as the sole national nursing database offering quarterly and annual assessments of structure, process, and outcomes indicators for evaluating nursing care at the unit level" (Montalvo, 2007, para. 1). Within the NDNQI, three indicators pertaining to Pressure Ulcer Prevalence are measured: a) community-acquired, b) hospital-acquired, and c) unit-acquired (Montalvo, 2007). This program evaluation project specifically targeted hospital-acquired pressure injuries in ICU units.

Financial Indicators. The specific financial details, encompassing both costs and savings, have not been disclosed within this project. However, Padula et al. (2020) conducted a cost-effectiveness analysis employing the Markov Model. This model integrated the SEM scanner into a comprehensive prevention protocol and compared it to the prevailing standard of care for preventing HAPIs on the sacrum and heels. The analysis concluded that prevention protocols involving an SEM scanner incurred a cost of $912 per admission, whereas the standards of care amounted to $4,966.

Data Collection

HAPI Knowledge & Attitudes. Prior to implementing the standardized HAPI curriculum, baseline HAPI knowledge and attitude was collected through an electronic survey. Four questions (#5, #8, #9, & #10) from the survey were assessed to evaluate nurses' knowledge of HAPIs. Two Likert-style questions (#6 & #7) from the survey were administered to the staff to assess nurses' attitude towards HAPIs (Appendix B). The pre-assessment survey was conducted from May to July of 2022, while the post-assessment survey was administered to the staff in June and July of 2023.

SEM Scanning Compliance. Weekly rates of SEM scanning adherence were examined from August 2022 to August 2023. A run chart was generated to visually represent scanning compliance in the ICU units as outlined in Figure 3. Additionally, specific interventions aimed at enhancing adherence and the identification of barriers such as missing SEM scanners (indicated by a colored X) or changes in leadership (indicated by a colored △) were marked with timestamps on the run chart. This chart was employed to analyze patterns and shifts in scanning compliance.

NDNQI HAPIs. Baseline, pre-implementation data utilized NDNQI ICU HAPI data from the 3rd and 4th quarter of 2021 and the 1st and 2nd quarter of 2022. Post-implementation data was derived from NDNQI ICU HAPI data from the 3rd and 4th quarter of 2022 and the 1st and 2nd quarter of 2023. The NDNQI HAPI data was visually represented on a bar graph, categorizing it into two distinct periods: pre-intervention and post-intervention, with a star denoting commencement of the program as outlined in Figure 4.

Financial Indicators. The hospital did not disclose the total costs associated with the program. However, estimated cost savings were projected by calculating the reduction in HAPIs

during the evaluation period. These projections were based on Markov Model by subtracting the estimated cost of SEM scanning ($912) from the estimated standard of care costs ($4,966) per admission.

Human Subjects Protection

Patients admitted to the hospital were informed about conflicts of interest, rights, and the protection of human subjects at the time of admission. It's important to note that this project evaluation did not gather any patient-specific data. Participation in the nurse and staff surveys was voluntary and all responses were submitted in an anonymous format. Data was collected via the Web-based SurveyMonkey platform and was downloaded into Microsoft Excel. The collected data was then uploaded into the Statistical Package for the Social Sciences (SPSS 18.0) software for analysis. Program evaluation findings were presented in aggregate form. The study underwent review by the Institutional Review Board (IRB) and was deemed not to be research before data collection commenced.

Results

After gathering the data, each measure underwent careful analysis and evaluation following the project evaluation design. This included scrutinizing the data points, assessing their significance, and understanding their relevance within the broader context of the study.

HAPI Knowledge & Attitudes. At the onset of the project, the overall knowledge concerning HAPIs was determined to be at 13%. At the end of the project, the average knowledge was 57%. The aim of this measurement was to explore the intricate relationship between the educational program and participants' knowledge regarding HAPIs both before and after undergoing the educational program. A Chi-square test of independence was conducted to examine the relationship between the educational program and HAPI Knowledge (pre/post). This

test is a robust tool for determining whether there is a significant association between two categorical variables, in this case, the educational program and the level of HAPI knowledge. The analysis provided evidence that there is indeed a substantial and statistically significant connection between the educational program and the participants' understanding of HAPI. The results indicated that there was a noteworthy association between the educational program and HAPI Knowledge ($p = < .001$). Thus, we rejected the null hypothesis and confirmed our results from the analysis. The Phi coefficient is a measure of association between two categorical variables. It quantifies the strength and direction of the relationship between the variables. A Phi coefficient of 0.4696 indicates a moderate positive association. Rejecting the null hypothesis means that we have evidence to conclude that the educational program has a tangible impact on participants' knowledge of HAPIs.

Table 1. Knowledge – Questions #5, #8, #9, & #10

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	35.2913[a]	1	< .001		
Phi Coefficient	0.4696				

The project also examined nurses' attitudes towards HAPIs and their commitment to injury prevention. Initial data, gathered before the project began, indicated that 97.5% of the participating nurses held positive attitudes in this regard. After the project was completed and data was collected, it was observed that the nurses' attitude towards HAPIs was 95.7%. We conducted a Chi-square test of independence to explore the connection between HAPI Attitude Pretest and HAPI Attitude Post-test. Nevertheless, since certain anticipated cell counts fell below

5, we opted for Fisher's exact test as a more precise substitute. The findings revealed that there was no noteworthy correlation between HAPI Attitude Pretest and HAPI Attitude Post-test (p = .211 for #6 & p = .488 for #7).

Table 2. Attitude - Question #6

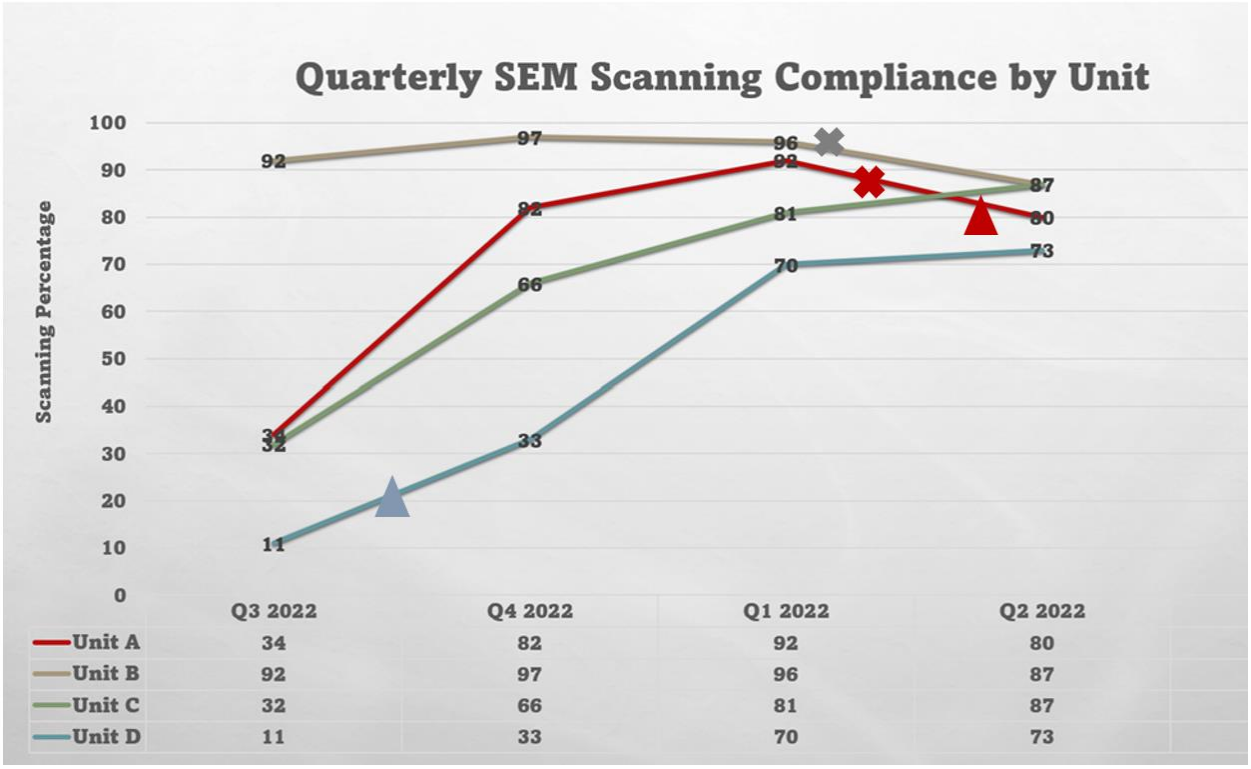
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.424[a]	1	0.233		
Fisher's Exact Test				0.274	0.211

Table 3. Attitude – Question #7

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.233a	1	0.629		
Fisher's Exact Test				0.68	0.488

SEM Scanning Compliance. At the conclusion of the 3rd Quarter in 2022, the scanning rates were as follows: Unit A at 34%, Unit B at 92%, Unit C at 32%, and Unit D at 11%. With ongoing education and attentiveness, compliance by the end of the 4th Quarter in 2022 had increased to 82% for Unit A, 97% for Unit B, 66% for Unit C, and 33% for Unit D. Compliance continued its upward trajectory in Q1 2023, with Unit A at 92%, Unit B at 96%, Unit C at 81%, and Unit D at 70%. However, at the end of this assessment in July 2023, compliance showed a slight dip. Unit A was at 80%, Unit B at 87%, Unit C at 87%, and Unit D at 73% (see Figure 3).

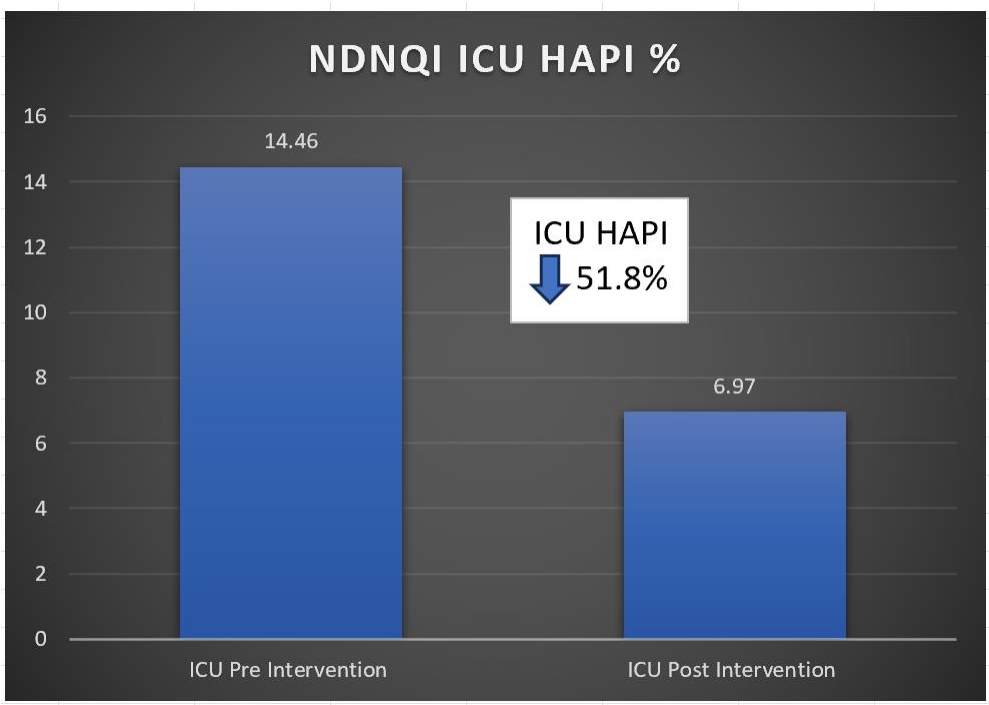
Figure 3. SEM Scanning Compliance

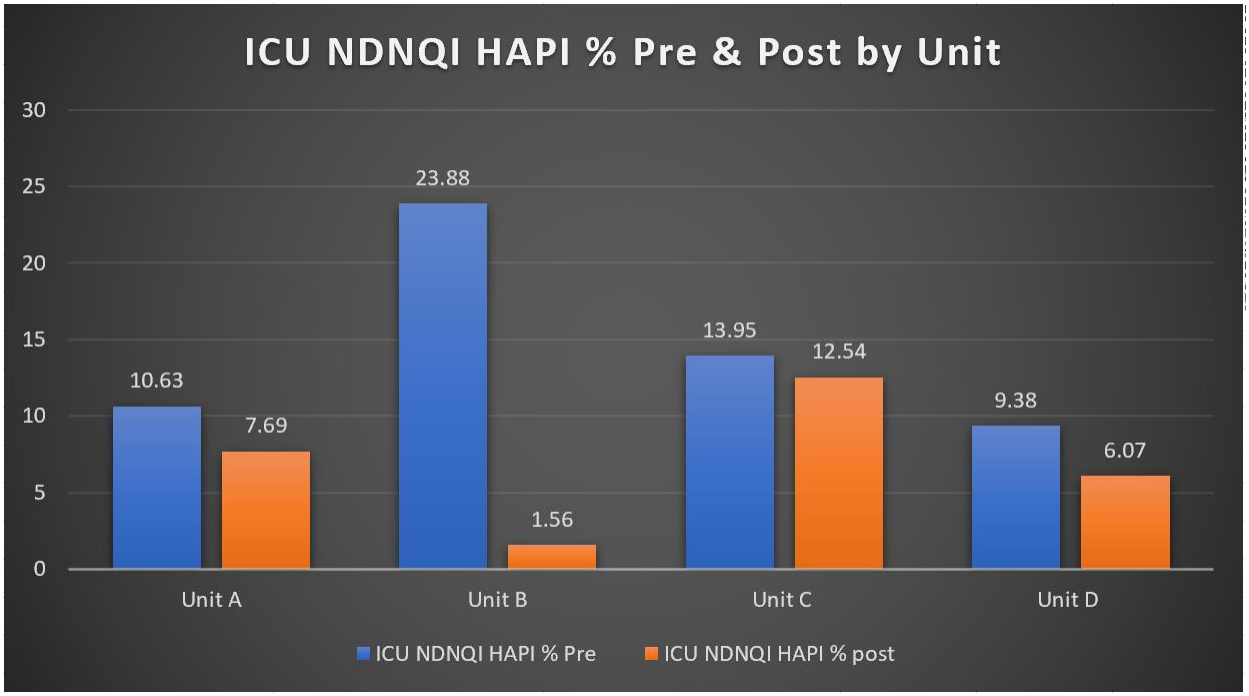


NDNQI HAPIs. An analysis was conducted to ascertain any correlation between the incidence of HAPIs and the MOVE – PIP program. To conduct this analysis, pre-intervention data was gathered from each ICU. The baseline NDNQI data for Unit A was 10.63%, Unit B was 23.88%, Unit C was 13.95%, and Unit D was 9.38%. This indicated that the NDNQI ICU HAPI data pre-implementation (3rd and 4th quarter of 2021 & 1st and 2nd quarter of 2022) was 14.46%. Post-implementation indicated a drastic reduction in ICU NDNQI HAPI rates. Unit A dropped from 10.63% to 7.69%. This indicated a 27.7% drop in HAPIs. Unit B was even more successful in its efforts with a 93.5% reduction in HAPIs, decreasing from 23.88% to 1.56%. Unit C dropped to 12.54% indicating a 10.1% reduction, and Unit D ended with a HAPI percentage of 6.07%, a 35.3% reduction. At the conclusion of the project in July of 2023, the

hospital's ICU NDNQI HAPI rate was 6.97% with a national mean of 6.26%. This indicated a 51.8% reduction in ICU HAPIs (see Figure 4).

Figure 4. NDNQI ICU HAPI measures.





Financial Indicators. At the outset, the overall ICU NDNQI data indicated a HAPI rate of 14.46%, and by the end of the project, the HAPI rate was 6.97%. Implementing a prevention protocol with the use of the SEM scanner is approximated to cost $912 per admission, whereas standard care costs $4,966 per admission. If this were applied using the Markov Model, the cost savings would be approximately $259,456 for 64 ICU admissions.

Discussion

This program evaluation was conducted to evaluate the MOVE – PIP Program. The program was multifactorial in its approach involving pressure injury prevention, staff education strengthening the staff's comprehension of pressure injuries, their underlying causes, and treatment options and the implementation of the subepidermal moisture scanners. The hospital successfully harnessed opportunities, identified in the SWOT analysis, to enhance their operations. The hospital conducted in-service education to equip the staff with valuable insights into skin products, dressings, and support surfaces, thereby improving prevention methods. Additionally, investments were made in mobility equipment like lifts and slings, enabling the staff to efficiently move patients with minimal assistance. To further fortify their commitment to HAPI prevention, the hospital increased the frequency of NDNQI audits to a monthly basis. Furthermore, the addition of SEM documentation to the nurse EMR task list served as a valuable reminder for nurses to complete scanning and documentation, ultimately leading to improved patient outcomes and better education for patients and their families (Appendix I).

HAPI Knowledge & Attitude. The results of our statistical analysis, which involved a Chi-square test of independence, provided valuable insights into the relationship between HAPI Knowledge Pretest and HAPI Knowledge Post-test. The key finding of our analysis is that there is a significant association between HAPI Knowledge Pretest and HAPI Knowledge Post-test (p

< .001). This result holds considerable importance for our study and its implications. This substantial increase highlights the efficacy of the educational program in enhancing HAPI knowledge among participants. This outcome underscores the importance and effectiveness of educational interventions like the program we implemented. It demonstrates their potential to not only increase knowledge but also to significantly contribute to increased knowledge and practices regarding HAPI prevention and patient care in healthcare settings. In essence, our findings emphasize the critical role of ongoing education and training in improving healthcare outcomes and patient safety.

Moreover, a Chi-square test of independence and Fisher's exact test, have provided valuable insights into the relationship between HAPI Attitude Pretest and HAPI Attitude Post-test. Our decision to employ Fisher's exact test, instead of the Chi-square test, was driven by the presence of expected cell counts that were less than 5, which can affect the validity of the Chi-square test in certain situations. Fisher's exact test is a more suitable choice when dealing with such low expected cell counts, as it offers increased accuracy. There was a minimal decrease in the nursing staff's attitude towards pressure injury prevention. The Fisher’s exact revealed no statistical significance in attitude. The substantial time span of a year, particularly in the post-pandemic context, may have led to staff turnover, decreasing the ability for the MOVE- PIP program to integrate a pressure injury prevention cultural change. A general shift in the hospital and unit's culture prioritizing the mechanics and logistics of processes aimed at systematically preventing HAPIs is required. Additionally, the decline in attitude scores may have been influenced by the reporting of 98% of the nurses receiving HAPI and Mobility training just two weeks before completing the pre-survey, with the post-survey administered a year later. While the majority of nurses maintained a positive attitude throughout the project, a slight reduction in

their overall attitude scores by the study's conclusion suggests the need for further analysis to understand the factors contributing to this decrease and whether it holds any practical implications for ongoing HAPI prevention efforts.

SEM Scanning Compliance. The percentage of scanning compliance using a SEM scanner was also thoroughly assessed for the different ICUs in quarter three and four of 2022, and one and two of 2023. The Subepidermal Moisture scanning was monitored and evaluated to ascertain if there was a significant relationship between scanning and early detection of pressure injuries in patients. The hospital leadership's objective was to achieve a scanning compliance rate of 95% for each unit.

In July 2023, at the end of the project assessment, compliance across units showed a slight decline compared to previous performance. One potential factor contributing to the reduction may have been the end of SEM champion rounding. These quarterly variations in scanning compliance emphasize the importance of continuous monitoring and auditing SEM scanner compliance.

Detecting pressure-induced injuries in their early stages, before visible damage emerges on the skin surface, holds paramount importance. This underscores the necessity for proactive and preventive measures, emphasizing anatomically specific interventions and timely detection (Bryant et al., 2021). The SEM Scanner is positioned as a crucial tool in this regard, capable of identifying early damage nearly five days prior to standard skin tissue assessment (Bryant et al., 2021). This early insight into deep tissue viability enables targeted interventions and allows for ongoing monitoring of the response, aligning perfectly with the goal of early pressure injury detection.

The literature strongly indicates that when used as intended, the SEM Scanner significantly enhances clinical decision-making, surpassing clinical judgment alone in assessing pressure injury risk at specific body sites (Bryant et al., 2021). This implies that the device aids in identifying areas of heightened risk, paving the way for preventive interventions before visible damage occurs. Consequently, with the integration of this tool, instances of pressure injury development were projected to decrease, subsequently reducing the need for treatment.

The acceptability of available treatments, in relation to the SEM Scanner, hinges on the individual hospital's policies. SEM Scanning demonstrated value in assessing pressure injuries within the project setting. However, it comes with both strengths and weaknesses. While the SEM Scanner offers the advantage of early detection of skin damage before visual assessment, as well as a reduction in HAPI development, it necessitates a shift in hospital culture and nursing compliance due to staff adoption requirements. Additionally, considerations for staff HAPI awareness and knowledge for targeted intervention are essential, along with managing time effectively while using the SEM Scanner.

HAPIs. The results of our analysis are both promising and noteworthy. In our quest to understand the impact of the MOVE – PIP program, we observed that HAPI data from each ICU unit decreased when compared to baseline NDNQI data. As we concluded our analysis in July 2023, the hospital's ICU NDNQI HAPI rate had reached an impressive 6.97% with a national mean of 6.28%. These results strongly suggest that the implementation of the MOVE – PIP program had a positive impact on reducing HAPI rates in our ICU units. The substantial reductions observed in several units, particularly the remarkable achievement in Unit B, underscore the effectiveness of this intervention. This data provides compelling evidence for the potential benefits of the program in preventing HAPIs and improving patient outcomes in our

hospital's ICUs. Continued monitoring will be essential to validate and sustain these positive outcomes over time.

Furthermore, it is noteworthy to mention the remarkable reduction of NDNQI HAPI rates for the overall hospital from 9.77% to a mere 0.87%, that signifies a substantial and highly commendable achievement (Appendix J). This drastic decrease highlights the hospital's unwavering commitment to patient care and safety, particularly in the prevention of Hospital-Acquired Pressure Injuries (HAPIs). Such a substantial improvement not only reflects the dedication of healthcare professionals but also points to the successful implementation of comprehensive strategies, including educational programs and evidence-based practices. This remarkable progress is a testament to the hospital's relentless pursuit of excellence in healthcare, ensuring better patient outcomes, reduced healthcare costs, and an overall enhanced quality of care for its patients.

Financial Indicators. The financial implications of adopting the SEM scanner are noteworthy. According to the study's findings, hospitals can anticipate a return on their investment within just one year. This means that the initial expenditure required to acquire and implement SEM scanners is expected to be offset by the cost savings and benefits it brings in a relatively short period. The estimated savings mentioned in the study are related to the reduced expenses associated with treating pressure injuries and their complications. This encompasses the costs of wound care, extended hospital stays, medications, and even surgical interventions. By preventing or mitigating pressure injuries, hospitals can make substantial savings in these areas, which can be a substantial financial relief.

According to Padula et al. (2020), the integration of the SEM scanner represents a financially prudent approach to pressure injury prevention, with an expected return on

investment (ROI) within a year. Estimated savings, based on the literature, this program would break even if the SEM scanner costs were less than $259,456. It suggests that if the total cost of implementing and operating the SEM scanner program falls below this threshold, the financial benefits in terms of cost savings would outweigh the expenses. In essence, the SEM scanner not only promises improved patient care and outcomes but also aligns with a hospital's financial prudence and fiscal responsibility. This technology represents a strategic investment that not only benefits patients but also supports the hospital's financial sustainability and overall mission to deliver high-quality healthcare.

Limitations

Specificity and Sensitivity

The SEM Scanner, as outlined by Bryant et al. (2021), is hailed as an invaluable tool for discerning pressure-induced tissue damage, particularly in its early, non-visible stages. It furnishes healthcare practitioners with precise anatomical information, aiding them in distinguishing between healthy and damaged tissue. The defined criteria of an SEM delta ≥0.6 signify specific skin and tissue damage, thereby amplifying diagnostic accuracy beyond what clinical judgment alone can achieve (Bryant et al., 2021). In their meticulous evaluation, Bryant et al. (2021) conducted a blinded clinical study utilizing the SEM device to spot initial signs of pressure injuries. The findings illustrated a commendable sensitivity of 87.5%, indicating its proficiency in detecting early-stage pressure-induced tissue damage. However, it is crucial to acknowledge that the device exhibited a specificity of 32.9%. This aspect implies that there is room for improvement in accurately identifying specific areas of concern, and further research or complementary assessment methods may be needed to enhance its precision. It's worth noting that this specificity percentage indicates the proportion of true negatives correctly identified by

the SEM Scanner, highlighting an area where refinement may be beneficial for more precise and reliable outcomes.

SEM Scanning

There is a notable absence of detailed information regarding cost-benefit analysis of SEM scanning in the literature. While SEM scanning shows promise in preventing pressure injuries, its true value in terms of cost-effectiveness remains uncertain. This lack of specific cost data hinders a comprehensive assessment of its economic impact. Without a robust cost-benefit analysis, it is challenging to ascertain whether the initial investment in SEM scanning technology is justified by the potential savings in pressure injury treatment costs. This gap in information underscores the need for further research to provide a comprehensive understanding of the financial implications associated with implementing SEM scanning in healthcare settings.

Additionally, it should be noted that SEM scanning is performed by the nursing staff. The precision and accuracy of the scanning may vary depending on the technique used or level of training the staff received. Moreover, the SEM delta is the number that appears on the device. The staff must identify that the delta is elevated (≥ 6) and determine the proper interventions to implement to offload the site. This project did not investigate specific interventions used when elevated delta readings were identified. Further research is needed to identify and evaluate proper implementation of pressure reducing interventions.

Patient Acceptability

The limitations of SEM scanning are influenced by the scarcity of information regarding patient acceptability. While SEM scanning holds promise as a clinical tool for pressure injury prevention, its acceptance and comfort levels among patients are not well-documented. This lack of data regarding how patients perceive, and experience SEM scanning can pose limitations in its

widespread adoption. Patient compliance plays a pivotal role in healthcare interventions, but assessing the willingness of patients to undergo SEM scanning can be difficult, especially when some patients are sedated, or unconscious and limited insights are available on this matter. Addressing this limitation through further research and patient feedback is essential to ensure that SEM scanning is well-received and integrated into routine healthcare practices.

NDNQI Measures

NDNQI serves as a valuable tool for evaluating and comparing healthcare quality, but it does come with constraints. One significant limitation lies in its provision of a one-day snapshot of HAPIs per quarter. Moreover, the development of HAPIs is a complex, multifaceted process influenced by various patient-related factors such as acuity, medication usage (including vasopressors), and the quality of bed surfaces. While an elevated SEM delta may indicate an increased risk for pressure injury occurrence, it does not provide insights into whether specific interventions were implemented or adjusted in response to a high delta score. Additionally, obstacles related to SEM scanning, like the availability of necessary supplies and shifts in leadership, can affect staff accountability, potentially introducing variability into the data. These limitations underscore the necessity for a more comprehensive, real-time approach to pressure injury prevention and management that takes into account the dynamic nature of healthcare settings and patient care.

Structural Limitations

Several additional limitations warrant elaboration in the context of this project. First, leadership changes occurred at various points during the project's execution. Leadership transitions can introduce uncertainty and potential disruptions in project management, decision-

making, and the overall direction of the initiative. These changes may have affected the project's continuity and the ability to maintain consistent strategies.

Second, supply chain issues related to disposable, one-time-use probe covers represent another constraint. Reliance on such covers is critical for maintaining hygiene and ensuring accurate data collection with SEM scanners. Supply chain disruptions, whether due to manufacturing issues, distribution challenges, or other factors, can impede the project's progress by causing delays, increased costs, or even the unavailability of necessary equipment.

Furthermore, the reliability and functionality of SEM scanners themselves posed challenges. Instances of SEM scanners breaking or going missing can disrupt data collection and introduce inconsistencies in the project's outcomes. This not only affects the accuracy of the data but also imposes additional costs and efforts in repairing or replacing these vital instruments.

Lastly, the timing of the project rollout should be considered a limitation. The success of healthcare initiatives often depends on factors like the readiness of staff, adequate training, and the alignment of various components within the healthcare system. If the project rollout was rushed or did not align with other institutional changes or priorities, it could have impacted the project's effectiveness and the ability to achieve its intended outcomes. Consequently, these limitations highlight the multifaceted nature of healthcare projects and the need for careful planning, adaptability, and contingency strategies to address unforeseen challenges.

Conclusion

Pressure injuries are a prevalent concern in healthcare, with a substantial number of patients in the United States developing HAPIs each year. These injuries not only impact patient well-being but also extend hospital stays by an average of 9 days (Bruin Biometrics LLC, 2022; Gershon et.al., 2011). ICUs face particular challenges in managing pressure injuries due to the

high acuity and limited mobility of patients. Sedentary behavior in the ICU is a primary cause of these injuries, with incidence rates ranging from 22% to 49% among ICU patients (NPIAP, 2021).

In response to this issue, the MOVE - PIP Program embarked on a program evaluation initiative, concentrating on the implementation of interventions geared towards mitigating pressure injuries in the ICU. This evaluation adhered to the CDC Framework for Program Evaluation, encompassing stakeholder engagement, program description, evaluation design, gathering of credible evidence, justifying conclusions, ensuring use, and sharing lessons learned.

Following a thorough assessment, this review asserts that the integration of staff education and SEM scanning within the ICU of an acute care hospital stands as an effective strategy in reducing the incidence of pressure injuries. By equipping healthcare personnel with preventive knowledge and utilizing the SEM scanner to monitor subepidermal moisture levels, early indications of tissue damage can be detected, this in turn allows for proactive interventions to avert pressure injuries.

This evaluation initiative underscores the significance of evidence-based interventions and active involvement of stakeholders in addressing pressure injuries in the ICU. The results offer valuable insights into the efficacy of staff education and SEM scanning, potentially leading to enhanced patient outcomes. Disseminating the lessons gleaned from this evaluation can serve to facilitate the implementation of similar programs in other healthcare institutions, ultimately elevating the standard of patient care and outcomes.

A notable decline in the occurrence of HAPIs has been observed since the inception of the MOVE – PIP Program. The overall hospital HAPI rate decreased from 9.06% to 3.77%, a reduction rate of 58%. The ICU NDNQI unit acquired HAPI rate went from 14.46% to 6.97%

among surveyed ICU patients, a 52% reduction. It is strongly advised to maintain consistent diligence in data analysis by hospital personnel to ensure the sustained efficacy of SEM scanning and a continued reduction in HAPIs. This could be facilitated by designating a dedicated staff member as the program champion. The hospital has already taken proactive steps by incorporating SEM scanner education into the onboarding process for new hires and including hands-on SEM scanning training in the annual point-of-care (POC) training. By doing so, the Leadership staff at the hospital will be well-positioned to affirm that the integration of the SEM scanner has proven effective in diminishing pressure injuries in the ICU, demonstrating its cost-effectiveness for the organization.

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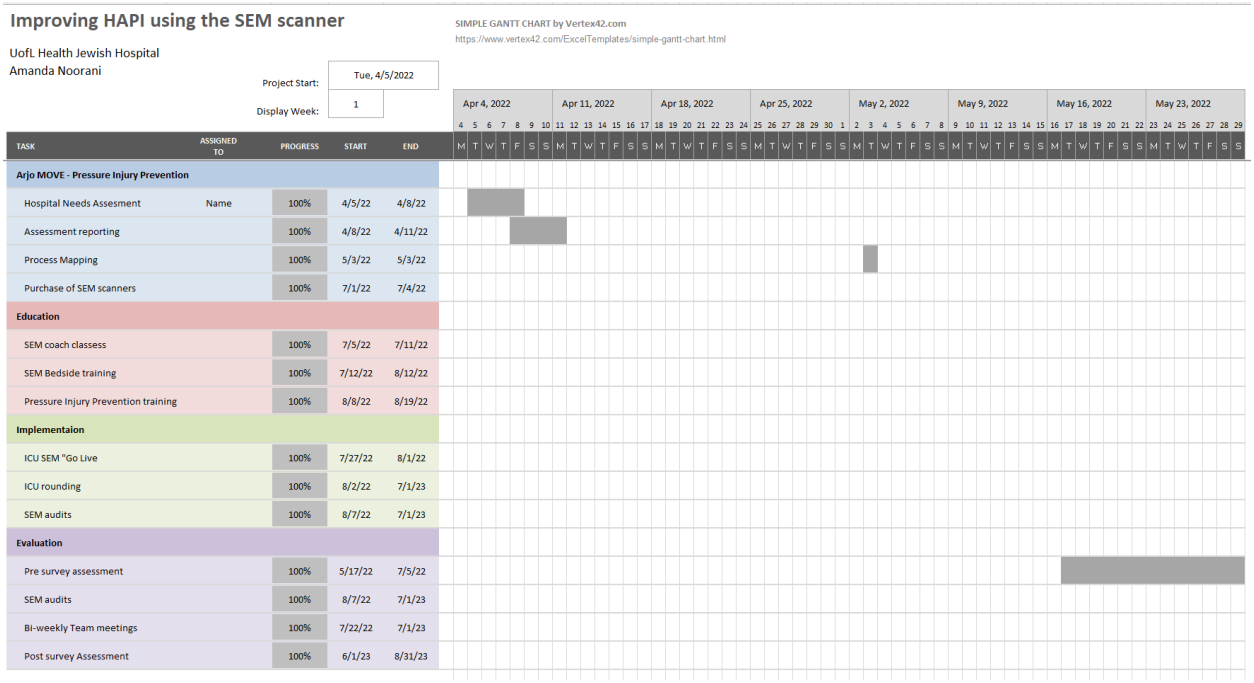
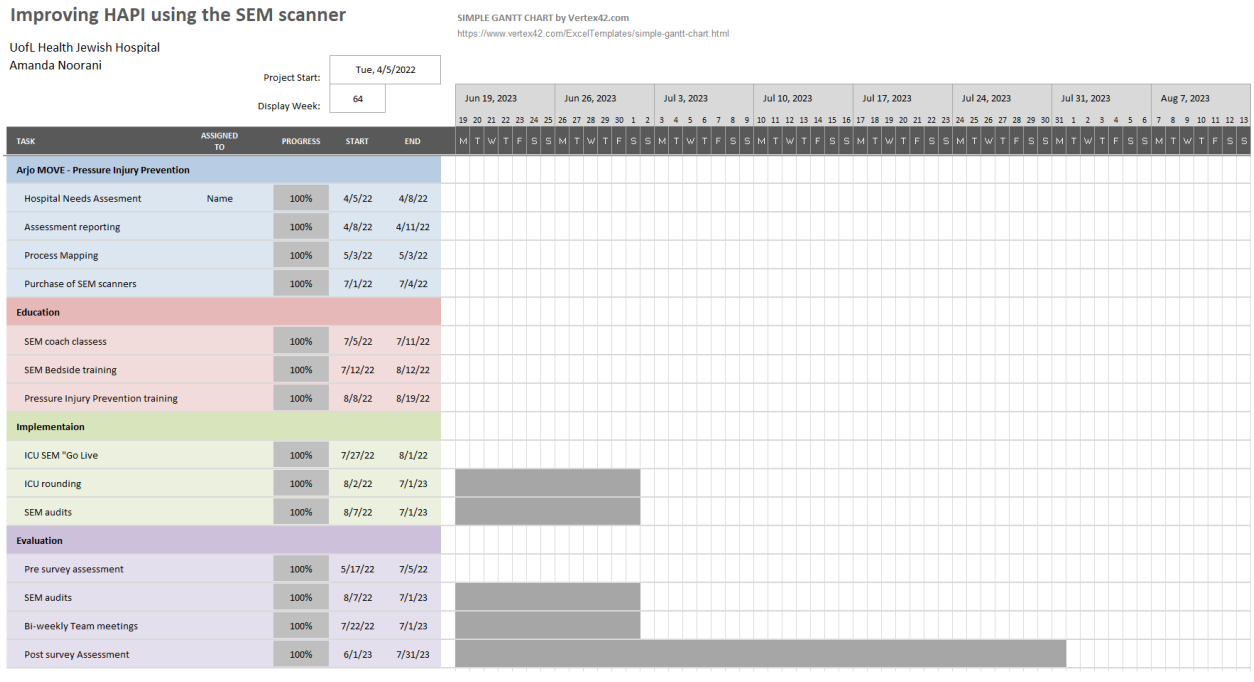
Appendix A

GANT Chart





Appendix B

Mobility and Pressure Injury Assessment survey

Mobility and PI Assessment

1. What is your job role and what area do you work?

- ○ Critical Care - Registered Nurse
- ○ Critical Care - Nurses aid, PCA, CNA, Tech
- ○ Mixed acuity/Intermediate - Registered Nurse
- ○ Mixed acuity/Intermediate - Nurses aid, PCA, CNA, tech
- ○ ER - Registered Nurse
- ○ ER - Nurses aid, PCA, CNA, Tech
- ○ Therapist
- ○ None Nursing staff
- ◉ Other (please specify)

2. Have you received Safe Patient Handling and Mobility Training?

- ○ YES
- ○ NO

3. Per the policy, when and how often should you complete a mobility and skin assessment?

- ○ Only on admission and discharge
- ○ On admission, every shift, and as needed (for Falls, BRADEN, etc.)
- ○ Only If a patient experiences a fall
- ○ Only If a patient has a high BRADEN scale

4. Does the hospital provide you with the equipment you need to mobilize your patients?

- ○ YES
- ○ NO

5. What are some complications of immobility (prolonged bedrest)?

- ☐ Increased perfusion, pressure injuries, delirium
- ☐ Pressure injuries, DVT, atelectasis
- ☐ Increased muscle tone, pressure injuries, increased peristalsis

- [ ] Pressure injuries, urinary stasis, decreased risk of DVT
- [ ] Increase Hospital Length of Stay (LOS)

6. On a scale for 1-5, 1 being least priority and 5 being the highest priority, please rate the following question:
How important do you feel your role is in mobilizing your patients (i.e., Turning, out of bed to chair, walking, using mobility equipment)?

○ (5) Extremely Important ○ (4) Very Important ○ (3) Somewhat Important ○ (2) Something I do when I have time ○ (1) Is the responsibility of the Physical Therapy Team

7. **How important do you feel your role is in Pressure injury prevention?**

○ (5) Extremely Important ○ (4) Very Important ○ (3) Somewhat Important ○ (2) Something I do when I have time ○ (1) Is the responsibility of the Wound Care Nurse/Team

8. What are the 2 most common sites if pressure injuries?

- ○ Occiput and heels
- ○ Buttocks and trochanter
- ○ Sacrum and heels
- ○ Inner lip and scapula

9. What is the first indication that a pressure injury is developing?

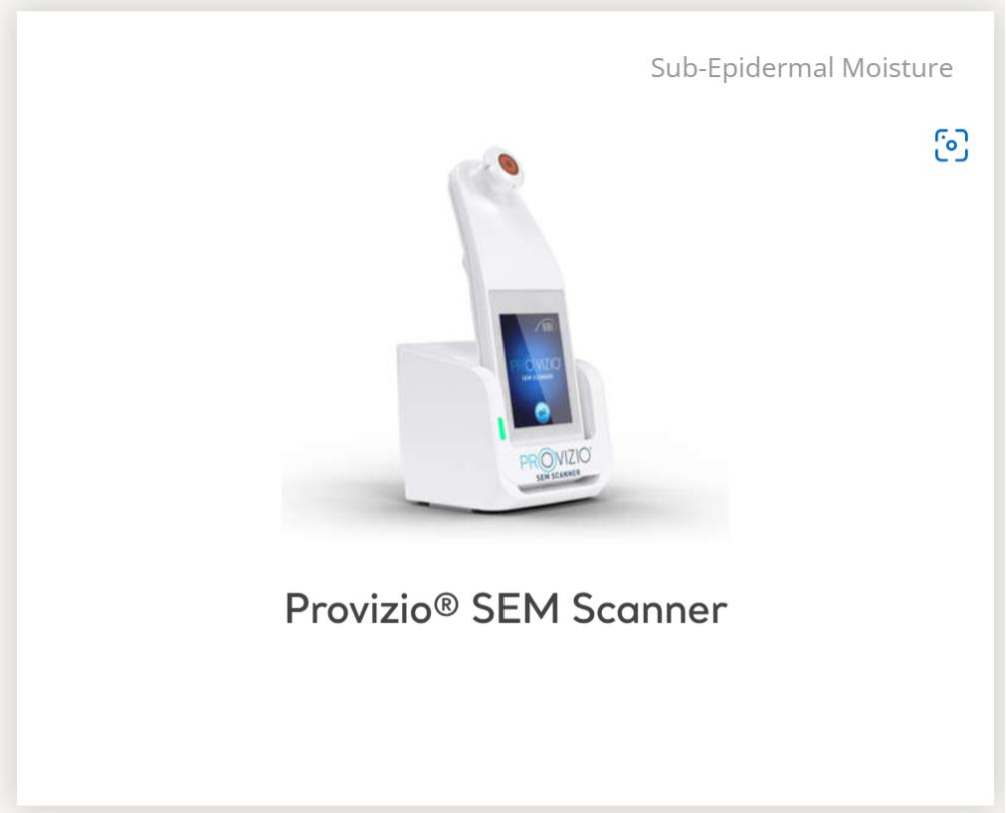
- ○ SEM Delta score over 0.6
- ○ Non-blanchable area on the skin
- ○ Blanchable area on the skin
- ○ Open or discolored area on the skin

10. True or False:
Medical device related pressure injures (MDRPI) (i.e., nasal cannulas, boots, lines, tubes, etc.) account for 30% of all hospital-acquired injuries and cost health care facilities $2 billion to $4 billion per year.

- ○ True
- ○ False

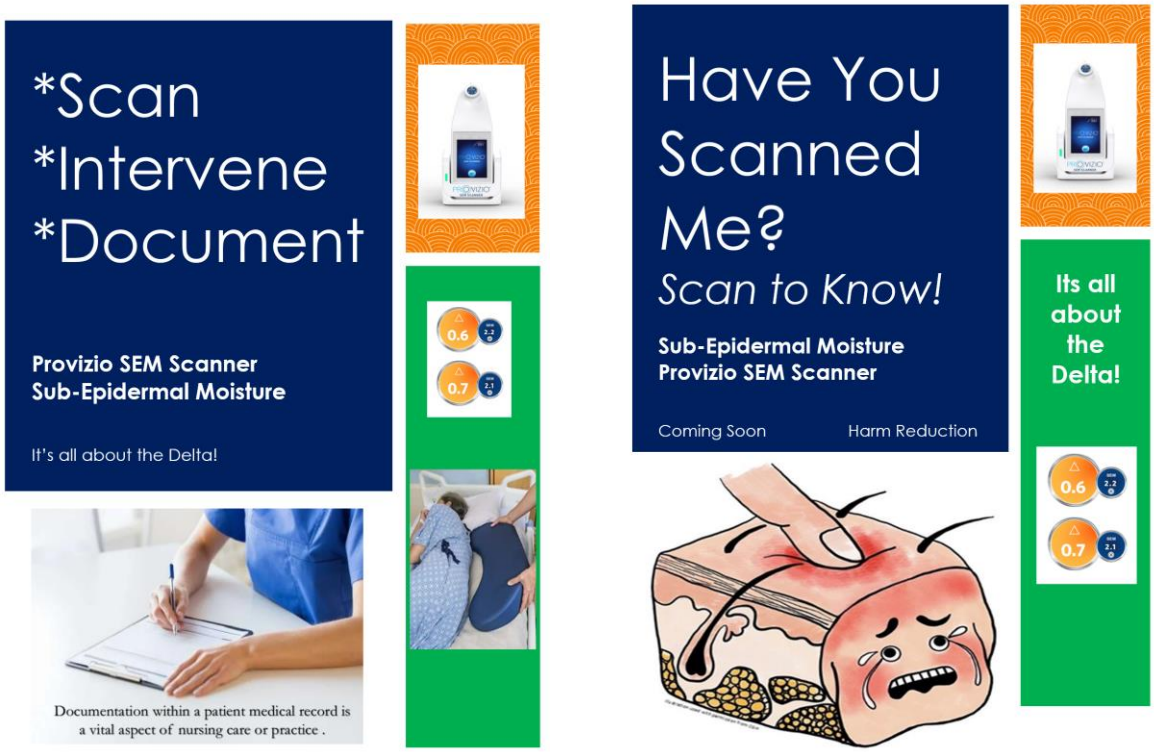
Appendix C

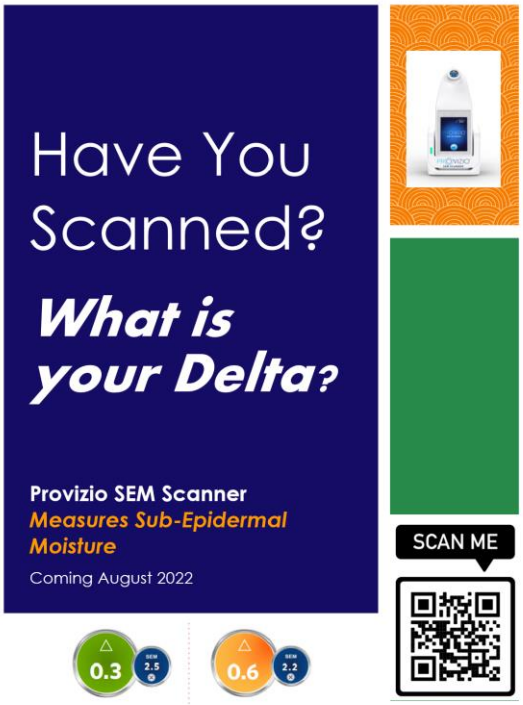
Provizio SEM Scanner



Appendix D

SEM Scanner Education





Appendix E

Safe Patient Handling Education

Safe Patient Handling Program

Mobility Screening & Activity Goals

Before mobilizing your patient at any assistance level the patient should have on a gait belt, non-slip socks and staff should remain within arms reach of the patient at ALL times.

Mobility Level: Maximum Assistance

Goal: Lying to Dangle/Sit (Non-weight bearing)

Can the patient…			Step	Extent of Activity	Mobility/Activity Goals
• **Roll from side-to-side** independently?	YES ↓	NO →	I	Lying	Passive/active ROM Turn every 2 hours
• Move from **side-lying to sitting** position unassisted, ***and*** • **Maintain seated position** while dangling legs?	YES ↓	NO →	2	Turn Self/ Activity	Upright sitting; increase strength and moves arms against gravity
• **Sit** unassisted, • **Scoot** to edge of bed, ***and*** • Place **feet on the floor**?	YES ↓	NO →	3	Sit at Edge of Bed	Increase trunk strength, moves leg against gravity and readiness to weight bear

Mobility Level: Moderate Assistance

Goal: Dangle/Sit to stand (Partial weight bearing)
Patient should be up to chair with ALL meals

Can the patient…			Step	Extent of Activity	Mobility/Activity Goals
• **Push** with feet on the floor • **Clear** their bottom off the bed (using at least one or more upper extremity and one lower extremity), ***and*** • **Pull-up or move** self to standing position?	YES ↓	NO →	4	Transfer	Stand with **moderate** assistance; readiness to weight bear; transfer to chair with assistive equipment
• Move from a **sitting to standing** position ***without assistance***?	YES ↓	NO →	5	Stand	Stand without assistance; able to bear own weight; assistive equip as needed

Mobility Level: Minimum Assistance

Goal: March-in-Place to Self-Ambulation (Partial to Full weight bearing)
Patient should be up to chair with ALL meals

Can the patient…			Step	Extent of Activity	Mobility/Activity Goals
• **March in place unassisted** without loss of balance or stumbling? **OR** • **March in place with a walker** without loss of balance or stumbling?	YES ↓	NO →	6	0 to 10+ Steps	Stand with minimal assistance; Weight bear & transfer to chair
	YES ↓	NO →	7	25+ Steps	Increase distance in ambulation & ability to perform some ADLs
	YES →		8	250+ Feet / 1+ Laps	Increase distance in ambulation & ability to perform ADLs

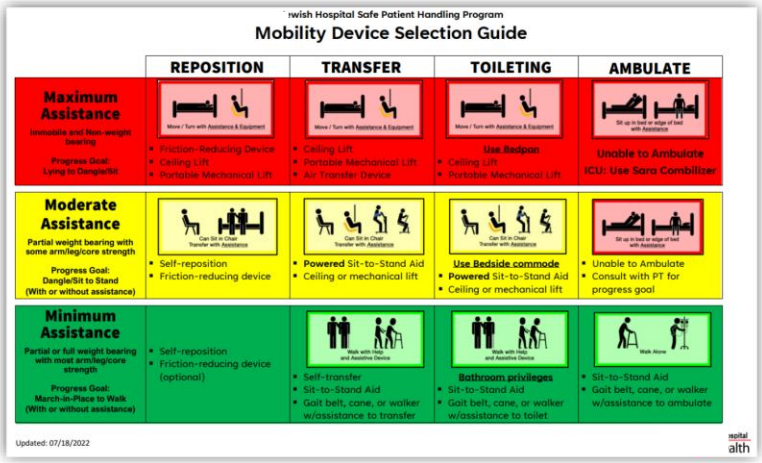
Updated: 07/09/2022

Appendix F

Mobility training Education

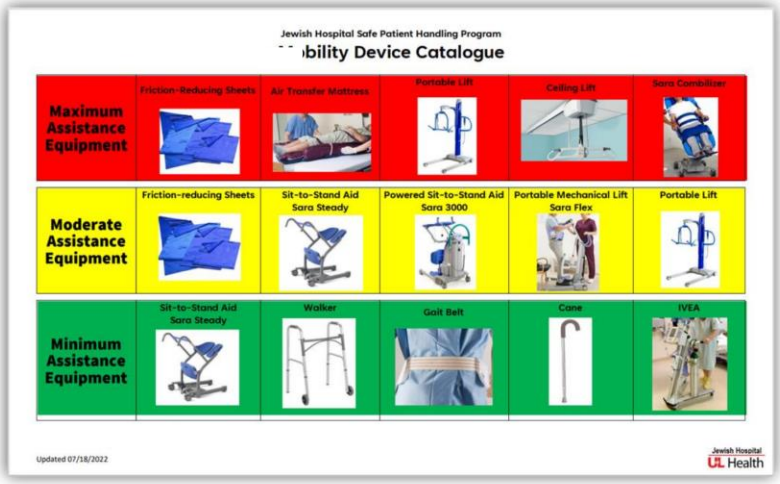
Mobility Equipment

Utilize mobility equipment according to patient's mobility level



Mobility Equipment

Utilize mobility equipment according to patient's mobility level



Appendix G

HAPI Education

The Importance of Pressure Injury Prevention

- Pressure injuries (PI) cause harm to patients
- 60,000 people die annually from pressure injury complications
- Hospital stays may be extended by 4-11 days
- Average cost is $70,000 per PI
- PI's that develop in the hospital are considered hospital acquired
- Hospital acquired PIs are reportable to CMS and include a financially liability by the organization

Reference:
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Contributing Factors For Pressure Injuries

- Diabetes
- Cardiovascular Instability
- Low Blood Pressure
- Oxygenation
- Steroid Medication
- Number of ADL Dependencies
- DNR Status
- Mechanical Ventilation
- Illness Severity
- Hip Fracture or Surgical Treatment
- Length of Stay
- Incontinence
- Immobility
- Inactivity
- Exposure to Moisture
- Friction or Shear

How To Identify Patients At Risk for Pressure Injuries

- **Braden Scale (subjective data)**
  - Use references in Cerner to help score
  - Less than 18 = risk for pressure injury
  - Less than 9 = severe risk
  - On admission and every shift
- **SEM (subepidermal moister Scanner (objective data)**
  - Can detect underlying tissue damage 5 days earlier
  - Delta score equal to or greater than 0.6 is high
  - On admission and every shift

SEM Scanner

Sacrum:
Complete six (6) Provizio SEM Scanner readings at the positions shown in the figure
Reading 1: Start at gluteal cleft and move around the sacral bone as follows.
Readings 2, 3 and 4: Are taken equally spaced over the bony prominence of the sacrum
Readings 5 and 6: Taken outside the sacral bone area

Heel:
Back of Heel: Take one (1) Provizio SEM Scanner reading on the back of the heel around the calcaneus for the assessable heel.
Outer Heel (Lateral): Take one (1) Provizio SEM Scanner reading on the lateral side of the assessable heel positioned around the calcaneus. Lateral side is the same side as the little toe (fifth toe).
Inner Heel (Medial): Take one (1) Provizio SEM Scanner reading on the medial side of the assessable heel positioned around the calcaneus. Medial side is the same side as the big toe (first toe).
Heel Pad (Sole of the Heels): Take one (1) Provizio SEM Scanner reading on the heel pad (sole of the heel) of the assessable heel pad from the back edge of the heel.

Four Eyes Skin Assessment

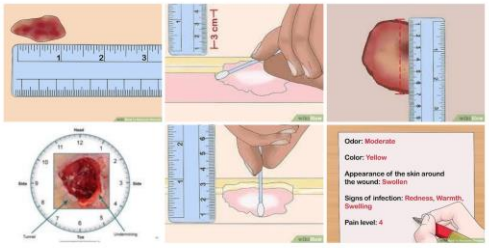
- Two staff (four eyes) complete the full head to toe skin assessment together.
- Another nurse, PCA, orientee, or student may assist.
- PCAs to help identify skin abnormalities during bathing.
- On admission and with any change in level of care.
- Assures a more consistent and accurate evaluation.
- Ensures proper documentation within 24 hours of admission.

Remember!
If not documented within 24 hours of admission, the PI is considered hospital acquired!

Wound Documentation

- Ensure picture of wound is documented (on admission or when found)
- Ensure documentation of wound (on admission, when found, and on daily assessment)
  - Stage
  - Location of pressure injury
  - Measurements
  - Exudate description including odor, type and amount
  - Wound bed description
- Ensure documentation every Wednesday (Wound Wednesday)

Measuring the Wound's Length, Width, Diameter, and Depth

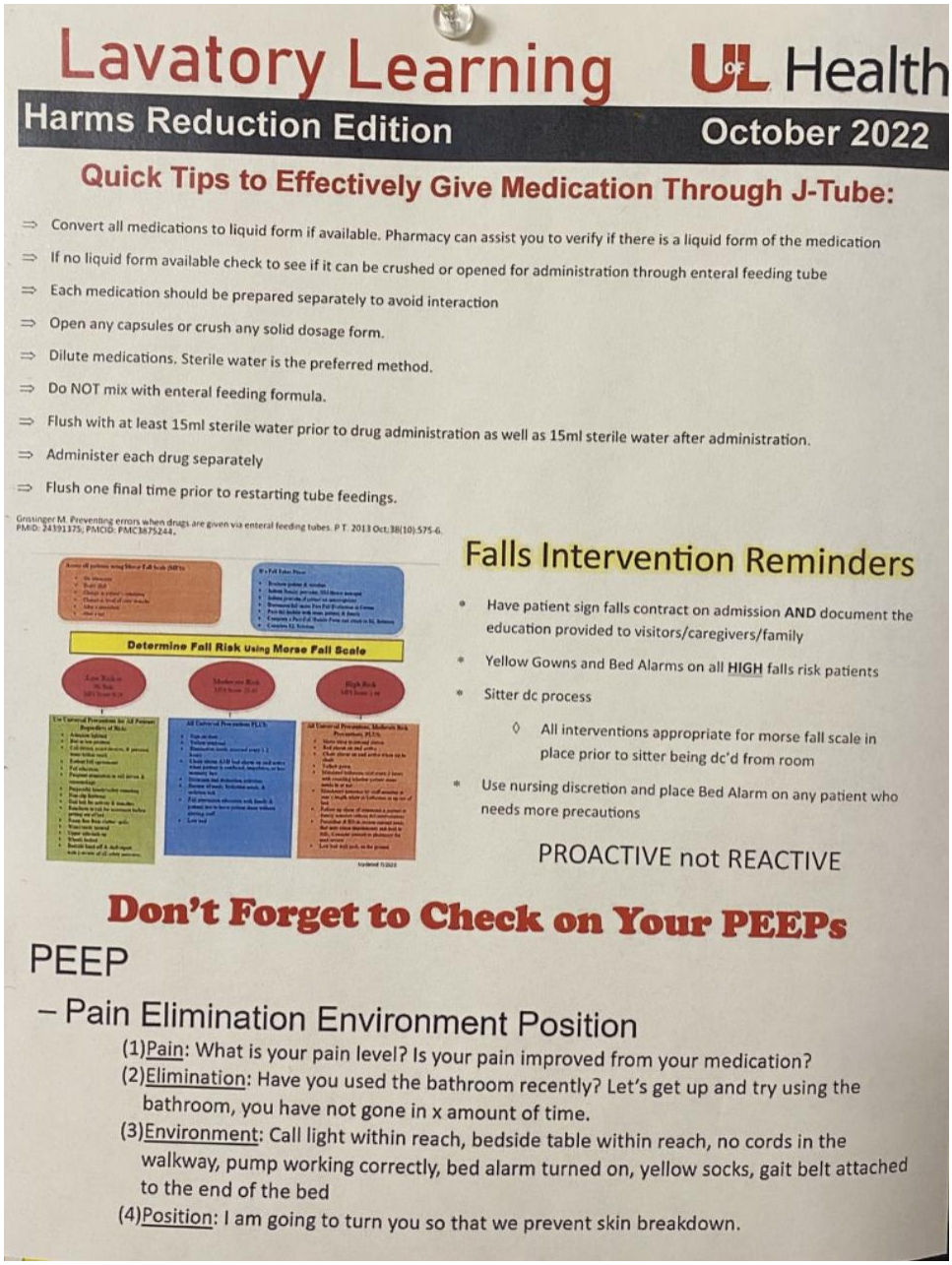


Pressure Injury Prevention

- Assess patients for risk every shift
- Identify patients at risk for pressure injury
- Implement pressure injury prevention measures
  - Turn q2 hours including pressure offloading
    - Use Z-Flo fluid positioners for ICU patients
  - Sacral Mepilex
    - Apply to all at risk patients
    - (date, time, initial, "P" or "T")
  - Heel Mepilex
    - Apply to all at risk patients
    - (date, time, initial, "P" or "T")
  - Appropriate support surface
    - Use bed decision tree to determine if specialty mattress/bed is needed
  - Increase Mobility Tool

Do not use more layers of bed linen and chux than necessary. Avoid the use of briefs.

Appendix H



Lavatory Learning

UL Health

Harms Reduction Edition

October 2022

Quick Tips to Effectively Give Medication Through J-Tube:

- ⇒ Convert all medications to liquid form if available. Pharmacy can assist you to verify if there is a liquid form of the medication
- ⇒ If no liquid form available check to see if it can be crushed or opened for administration through enteral feeding tube
- ⇒ Each medication should be prepared separately to avoid interaction
- ⇒ Open any capsules or crush any solid dosage form.
- ⇒ Dilute medications. Sterile water is the preferred method.
- ⇒ Do NOT mix with enteral feeding formula.
- ⇒ Flush with at least 15ml sterile water prior to drug administration as well as 15ml sterile water after administration.
- ⇒ Administer each drug separately
- ⇒ Flush one final time prior to restarting tube feedings.

Grossinger M. Preventing errors when drugs are given via enteral feeding tubes. P T. 2013 Oct;38(10):575-6. PMID: 24391375; PMCID: PMC3875244.

Falls Intervention Reminders

- Have patient sign falls contract on admission **AND** document the education provided to visitors/caregivers/family
- Yellow Gowns and Bed Alarms on all **HIGH** falls risk patients
- Sitter dc process
  - ◊ All interventions appropriate for morse fall scale in place prior to sitter being dc'd from room
- Use nursing discretion and place Bed Alarm on any patient who needs more precautions

PROACTIVE not REACTIVE

Don't Forget to Check on Your PEEPs

PEEP

– Pain Elimination Environment Position

(1)Pain: What is your pain level? Is your pain improved from your medication?
(2)Elimination: Have you used the bathroom recently? Let's get up and try using the bathroom, you have not gone in x amount of time.
(3)Environment: Call light within reach, bedside table within reach, no cords in the walkway, pump working correctly, bed alarm turned on, yellow socks, gait belt attached to the end of the bed
(4)Position: I am going to turn you so that we prevent skin breakdown.

ROOM # _____

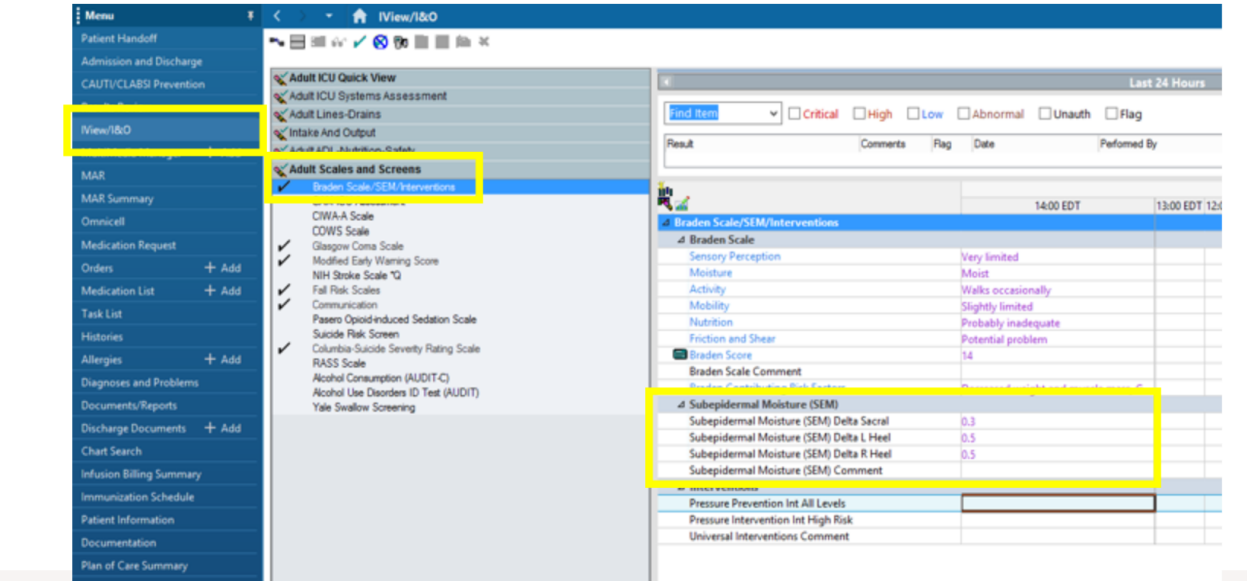
		SHIFT	
	Area	7A-7P	7P-7A
SUNDAY Date: _____ Patient Initials: _____	*Sacrum*		
	Right Heel		
	Left Heel		
	Braden Score		
MONDAY Date: _____ Patient Initials: _____	*Sacrum*		
	Right Heel		
	Left Heel		
	Braden Score		
TUESDAY Date: _____ Patient Initials: _____	*Sacrum*		
	Right Heel		
	Left Heel		
	Braden Score		
WEDNESDAY Date: _____ Patient Initials: _____	*Sacrum*		
	Right Heel		
	Left Heel		
	Braden Score		
THURSDAY Date: _____ Patient Initials: _____	*Sacrum*		
	Right Heel		
	Left Heel		
	Braden Score		
FRIDAY Date: _____ Patient Initials: _____	*Sacrum*		
	Right Heel		
	Left Heel		
	Braden Score		
SATURDAY Date: _____ Patient Initials: _____	*Sacrum*		
	Right Heel		
	Left Heel		
	Braden Score		

INTERVENTIONS
Stage I: Mepilex **Stage II**: Initial treatment universally/Consult Wound Care **Stage III**: Follow Wound Care Instructions **Stage IV**: Follow Wound Care instructions
Delta Score: 0.6 and above **Interventions:** • Q1 Turning • Heel Mepilex • Elbow Mepilex • Z-Flo • Off Loading Boots
Delta Score: 0.0—0.5 **Interventions:** • HOB 30 degrees (unless contraindicated) • Sacral Mepilex • Q2 Turning • Elevate Heels

Appendix I

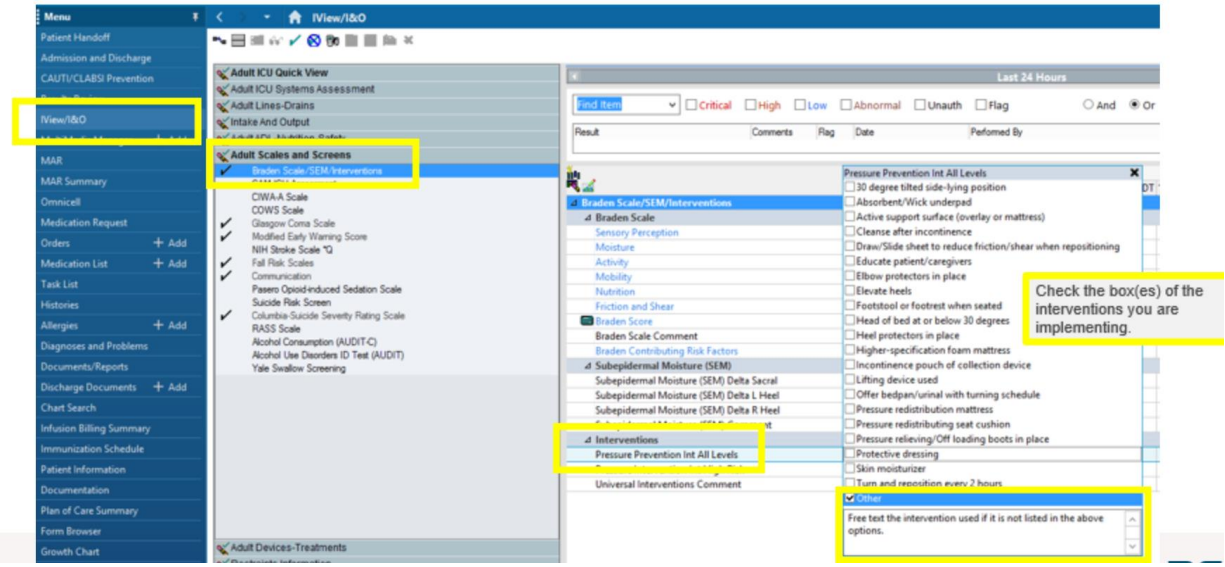
EMR Delta Documentation

Provizio SEM Scanner Scanning Protocol
DELTA DOCUMENTATION (Inpatient & ED)



EMR Intervention Documentation

Provizio SEM Scanner Scanning Protocol
INTERVENTION DOCUMENTATION (Inpatient & ED)



Identification of Interventions

Provizio SEM Scanner Scanning Protocol
INTEVENTIONS

INTERVENTIONS
Stage I: Mepilex **Stage II:** Initial treatment universally/Consult Wound Care **Stage III:** Follow Wound Care instructions **Stage IV:** Follow Wound Care instructions
Delta Score: 0.6 and above **Interventions:** • Q1 Turning • Heel Mepilex • Elbow Mepilex • Z-Flo • Off Loading Boots
Delta Score: 0.0—0.5 **Interventions:** • HOB 30 degrees (unless contraindicated) • Sacral Mepilex • Q2 Turning • Elevate Heels

Appendix J

NDNQI HAPI Data