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Prevention of Medical Device-Related Pressure Injuries: A Quality Improvement Project

Monika Grzelczak
Sacred Heart University, grzelczakm@mail.sacredheart.edu

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Monika Grzelczak, RN, BSN

A DNP Project Submitted in Partial Fulfillment of the Requirements for

the Degree of Doctor of Nursing Practice

Rosemary Johnson, DNP, APRN, ANP-BC CDR, USPHS, Ret.: Project Faculty Advisor

Sarah Sanders, MSN, RN, NE-BC: Practice Mentor

Sacred Heart University Davis & Henley College of Nursing

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Approval

This is to certify that the DNP Project Final Report by Monika Grzelczak

has been approved by the DNP Project Team on December 22, 2023

for the Doctor of Nursing Practice degree

DNP Project Faculty Advisor: Rosemary Johnson, DNP, APRN, ANP-BC CDR, USPHS, Ret.

Practice Mentor: Sarah Sanders, MSN, RN, NE-BC

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Table to Contents

Abstract

Significance and Background: Hospital-acquired pressure injuries (HAPI) continued to rise, costing the healthcare system about $ 11 billion annually. Medical device-related pressure injuries (MDRPI) account for about 10% of HAPI. They are also noted to be on the rise, especially in the Intensive Care Units (ICU), where multiple medical devices are placed on patients for monitoring and treatment. An intervention to reverse those unfavorable trends is needed. Evidence supports poster education to improve rates of MDRPI.

Purpose: This quality improvement project was conducted to eliminate incidents of MDRPI in the ICU and improve nurses' perception of the importance of preventing MDRPI.

Methods: A poster depicting all medical devices used in the ICU and corresponding protective equipment was created and hung in each patient room. The poster education for nurses was provided during a staff meeting and for two weeks during morning and evening huddles. Additional one-on-one education was provided as needed. The data was collected monthly between September 1 and November 30, 2022. The nurses' perception of the importance of the prevention of MDRPI was evaluated via pre- and post-implementation surveys.

Outcome: Over the twelve-week implementation period, only one MDRPI occurred, reflecting a major improvement compared to pre-implementation data. Also, comparing the pre- and post-survey results shows staff better understands the importance of preventing MDRPI. There was a 31.8% increase in responders who strongly agreed with the statement that pressure injury (PI) risk assessment should be regularly carried out. There was a 38.1% increase in nurses who strongly disagreed with the statement that PI prevention is a lower priority, and a 13.6% increase in responders who strongly disagreed with the statement that PI prevention is time-

consuming to carry out. Lastly, there was an 18.2% decrease in responders who strongly disagree to disagree with the statement that they do not need to be concerned with PI in their practice.

Discussion: A poster illustrating all medical device and corresponding protective equipment, along with clinical staff education on PI prevention, lead to a decrease in MDRPI. It also led to an improved in nurses' perception of their role in MDRPI prevention. This intervention and best-practice for MDRPI prevention in the ICU should continue. Nursing education and refresher education on MDRPI should continue regularly.

Keywords: medical device-related pressure injuries, MDRPI, MDRPI prevention, poster board education, nurse education, intensive care, ICU.

Prevention on medical device-related pressure injuries: A quality improvement project

Problem Identification, Development of Clinical Question, and Evidence Review

Background and Significance of the Problem

Approximately 22 years ago, it was estimated that 44 000 to 98 000 people died in hospitals each year from preventable errors (*To Err is Human,* 1999). To force hospitals to provide better-quality care, the Centers for Medicare and Medicaid Services has financially incentivized hospitals to reduce hospital-acquired events, such as infections or injuries, by denying reimbursement for these occurrences (Cohen et al., 2018). In 2019, the Agency for Healthcare Research and Quality (AHRQ) revealed a dramatic decrease in hospital-acquired events starting from adverse drug events, catheter-associated urinary tract infections, central line-associated bloodstream infections, falls, Clostridium difficile infections, to deep venous thrombosis (Cooper et al., 2020). However, only hospital-acquired pressure injuries (HAPI) did not improve. As a matter of fact, HAPI occurrences grew by 6%, costing the healthcare system about $ 11 billion annually (Cooper et al., 2020).

Medical device-related pressure injuries (MDRPI) account for about 10% of HAPI. They are noted to be on the rise, especially in the Intensive Care Units (ICU), where multiple medical devices are placed on patients for monitoring and treatment (Cooper et al., 2020; Tayyib et al., 2021). As a result, hospital protocols and policies must address the rise in the MDRPI. Using an evidence-based approach, this quality improvement (QI) project aims to establish a nurse-driven MDRPI prevention protocol that will help reduce HAPI.

Description of Local Problem

At a local Community Hospital in CT, the MDRPIs are on the rise. In the fiscal year 2021, there were 11 medical device-related pressure injuries (internal data, 2022). This data

shows a twofold rate increase compared to 2019; 5 in 2019 versus 11 in 2021. Further, the results for the first seven months of the fiscal year 2022 showed six occurrences of MDRPI. In conclusion, action to reverse this trend is necessary.

It should be noted that the fiscal year 2020 was excluded from the data provided. It was decided to do so due to the onset of the Covid -19 pandemic in early 2020. The surge of Covid -19 infections and the speed of patients decompensating overwhelmed the hospitals throughout the country, forcing healthcare providers to concentrate on saving lives and not looking at issues that became secondary (Polancich et al., 2021).

Organizational Priority

Seeing the results of MDRPI from the fiscal year 2021, it became apparent that drastic actions were needed to prevent skin breakdowns from medical devices used in intensive care units (ICU). The following administrators: Sarah Sanders, MSN, RN, NE-BC, ICU and emergency department (ED) director, and Michelle Watson, MSN APRN FNP-BC CCRN, the ICU and IMCU manager, have made it a priority to reduce the incidents of MDRPI. The goal was to reduce the rate of HAPI to less than 1.7 (internal data) per 1,000 patient hours in ICU, which equals a 25% decrease compared to the year 2021. This was an incentivized goal, meaning if met at the end of the year, the nurses would be eligible for the unit-based financial bonus, which would be paid in December 2022 as a bonus check.

PICO Question

The PICO format (Melnyk et al., 2019) guided the evidence search to reduce MDRPI in the ICU. The PICO question used for this QI project was: In healthcare providers in the ICU (P) does the use of a poster illustrating medical devices and appropriate preventive dressing (I)

compared to current practice (C) reduce the rates of medical device-related pressure injuries (MDRPI) (O)?

Evidence Search

External Evidence

A search of the following databases was conducted in CINAHL, Cochrane Database of Systematic Reviews, and Medline with full text. Key words searched included poster board education, intensive care, ICU, critical care, poster education, visual nurse education, medical device related pressure injuries, MDRPI, MDRPI prevention (refer to Appendix B for detailed results of the databases searched). Searches were limited to peer-reviewed articles published in the English language between 2015-2022. The Rapid Critical Appraisal Tools by Melnyk & Fineout-Overholt, 2019 were used to appraise each of the keeper articles (refer to Appendix C for rapid critical appraisal form).

Internal Evidence

The data collected by Quality Improvement Department at the Hospital showed that over years there was an increase in pressure injuries caused by medical devices. This data was already discussed in a previous section and for further details refer to Appendix A for yearly data of MDRPI. Earlier implemented interventions/strategies to reduce rates, such as four-eye assessment and bedside report were ineffective and lacked sustainability over time. Further, the existing protocols were written for the prevention of pressure ulcers caused by prolonged bed rest (sacral, heels, hips). These protocols included turning and positioning, applying foam dressing to the sacral area, and raising heels off the bed. However, none of these preventative practices addressed the problem of MDRPI.

Further, other healthcare agencies monitor the rates of HAPIs and offer recommendations on prevention. For instance, the Joint Commission (2018) provides strategies to reduce MDRPI. Its recommendation is very broad and advises padding the skin as one of the ways to promote skin integrity when medical devices are in use. In addition, the National Pressure Injury Advisory Panel also promotes cushioning and skin protection with dressings in high-risk areas (n.d.) such as the bridge of the nose, cheeks, wrists, behind ears, under neck collars (National Pressure Injury Advisory Panel, n.d.). The National Pressure Injury Advisory Panel (n.d.) provides interprofessional leadership to improve patient outcomes in pressure injury prevention and management through education, public policy, and research.

Evidence Appraisal, Summary, and Recommendations

Eleven articles met the inclusion criteria and support using posters, education, and protective measures to prevent MDRPI. Four articles discuss MDRPI prevention and seven concentrate on poster education. Seven of these articles are quality improvement projects (Lauderbau et al., 2019; Arndel et al., 2021; Tayyib et al., 2021Yousef et al., 2020; Case, 2017; Herzog et al., 2019; Bakhhsh et al., 2019), two of the articles are literature review (Ilic et al., 2013; Gueterres da Silva Gelatto et al., 2019), one article is cross-sectional study (Cooper et al., 2020), and one case-control study (refer to Appendix E for level of evidence review table).

Articles that support the prevention of MDRPI by poster board education were searched; however, no results were displayed. Also, poster education in the ICU displayed no results. Overall, a limited number of articles talked about education using a poster (a total of seven discussed below). Interestingly, two of the seven articles (Ilic et al., 2013; Newsom et al., 2021) discussed poster education also mentioned limited literature on the topic.

Four articles discussed the prevention of MDRPI in ICU. They talked about using Hydrocolloid dressing or other padded dressings to prevent MDRPI (Guterres da Silva Gletto et al., 2019; Copper et al., 2020; Tayyib et al., 2021; Arundel et al., 2021). Three out of the four articles (Tayyib et al., 2021; Cooper et al., 2020; Guterres da Silva Galetto et al., 2019) vaguely discussed the use of multiple interventions together (e.g., repositioning of the device, skin care, moisture control, the proper size of devices, skin padding with dressings). Over twelve weeks period the interventions showed excellent results in preventing pressure injuries caused by medical devices by resulting in >90% reduction in HAPI. In addition, two articles (Tayyib et al., 2021; Cooper et al. 2020) discussed the prevention of all pressure injuries, including bedsores, by incorporating MDRPI and stressed the importance of vigilantly assessing the skin under devices at least every 12 hours. The authors also advise that every time a patient is repositioned, a healthcare provider should ensure no direct contact between the skin and the device. Besides, only Cooper et al. (2021) emphasized the importance of regular medical device repositioning every two hours. Two articles (Cooper et al., 2021; Guterres da Silva Galetto et al., 2019) provided specific recommendations (such as skin care, repositioning of devices, moisture control, the proper size of devices, and skin padding with dressings) for preventing MDRPI. In their discussion, Arundel et al. (2021) concentrated on respiratory devices (CPAP and BiPAP) and the wounds caused by them. They acknowledge that due to fragile skin on the bridge of the nose and the need for the medical device to fit snuggly, MDRPI from these devices are more likely to progress to stage 3 and stage 4. Their study revealed that the use of protective dressings and educating nurses on repositioning devices, inspecting skin under devices more than twice daily, and choosing the correct size of devices lead to a 75% reduction in HAPI and none escalating to stage 2 or greater pressure injury (refer to Appendix F for evidence synthesis table).

The evidence review also revealed that education can be an effective method of improving healthcare outcomes. Interestingly, the literature search for the education of ICU nurses with the aid of a poster presented no results; therefore, the search had to be broadened to include poster education in healthcare. As a result, there were seven articles related specifically to poster education in healthcare. Five (Bakhsh et al., 2019; Case, 2017; Herzog et al., 2019; Lauderbaugh et al., 2019; Yousef et al., 2020) of these articles are QI projects, one is a case-control study (Newsome et al., 2021), and one is a literature review (Ilic et al., 2013). All but one (Newsome et al., 2021) relates to the education of nurses. Newsome and colleagues discussed the education of pharmacology students with the aid of posters.

Education with posters provides a visual reminder of the intervention and is the primary focus of the articles above. For instance, Lauderbaugh and colleagues (2019) talked about the prevention of ventilator-associated pneumonia (VAP) in neonatal ICU with 28.57% of improved oral care compliance with the use of a poster as an education method. The poster was created and presented at mandatory staff meetings. Yousef et al. (2020) reported doubled hand hygiene compliance and positive change in nurses' attitudes after educating nurses on the importance of hand hygiene and strategically placing posters reminding nurses about hand washing on each floor (e.g., in front of the nurses' breakroom). Bakhsh and colleagues (2019) discussed the effectiveness of poster education as a visual reminder in minimizing prophylactic Ondansetron use with opioids in the Emergency Department with a 15% decrease in the antinausea medication as prophylactics to opioid use. Case (2017) discussed the successful education of nurses regarding standardized orders for stroke patients and evidence-based clinical practice guidelines. One of Case's (2017) educational interventions for the project included the creation of a poster linking quotes from the current American Heart Association and American Stroke Association

guidelines for the early management of patients with acute ischemic stroke, standardizing orders selected from the hospital's stroke order sets, and bedside interventions. The poster was presented to nurses during their pre-shift huddle, highlighting the concepts depicted in the poster. In addition, the poster was left in the nurses' breakroom, and a copy of it was emailed to them. In summary, the use of posters presenting medical devices used in the ICU and the appropriate protective equipment should prove to be an effective intervention for this QI project.

Project Plan

Project Goals

1. To eliminate incidents of MDRPI at the Community Hospital ICU in the months of July – September 2022.
2. To improve ICU nurses' perception on the importance of prevention of MDRPI in the months of July – September 2022.

Context

The only Intensive Care Unit (ICU) at the Community Hospital in CT where the QI project took place, is a 20-bed unit. Participants of the project are nurses (49) and respiratory therapists (RT) (24) working in the ICU.

Project Team Members and Roles

Sarah Sanders, MSN, RN, NE-BC, the Director of Critical Care Services and Emergency Department, is the practice mentor. Sandra Acheus, RN (ICU educator) will offer educational guidance throughout the project. Genelle Garcia, RN (wound specialist) will provide her expertise and knowledge regarding wound prevention and preventive dressing application. Jennifer Potokin, RT will be a go-to person regarding wounds caused by respiratory devices.

Rosemary Johnson, DNP, APRN, ANP-BC, is the project faculty advisor who offers her expertise in quality improvement (QI) and guides this writer through the process of this QI project.

Since registered nurses are patients' primary caregivers and are responsible for performing skin assessments on their patients, they were considered team members. The store-room clerks' role was significant in providing a stock of preventive dressings and keeping it in the storeroom for easy access.

The primary investigator (PI) and this writer was responsible for preparing the poster, educating nurses on its content, and distributing it in each patient's room in the ICU. The PI will also collect and analyze study data.

Key Stakeholders and Buy-ins

Due to the increase in MDRPI incidents, the stakeholders were already invested in correcting the problem. The nursing management was interested in improving data because the reduction in MDRPI will decrease the financial burden retained by the hospital from HAPI. The wound team is also committed to improving the incidents of MDRPI. Their expertise and contribution are essential to updating the pressure injury policy as well as its successful implementation. Nursing staff was expected to be more hesitant to the change; therefore, efforts were placed on persuading nurses about the importance of reducing HAPI and reminded of the end of year bonus if the hospital reached its HAPI reduction goal. According to Narkiewicz (2017), to see a reduction in hospital-acquired conditions, nurses need to be included in the decision-making and implementation of the pay-for-performance program.

Framework

The Institute for Healthcare Improvement (IHI) Model for Improvement has been utilized for this QI project. This model has been widely used in healthcare to improve quality, safety, and outcomes inpatient care. The model includes two parts. First, it is centered around answering three questions: a) what we are trying to accomplish, (the purpose/aim), b) how we know that the change is an improvement, (feedback), and c) what change can be made that will address the purpose of the project (change idea) (Armstrong et al., 2020). Second, the model uses plan-do-study-act (PDSA) cycles to explore the rapid cycles of change (Armstrong et al., 2020). Both parts of the IHI model for improvement are addressed in this project plan (IHI, 2022).

Plan Phase

Based on the literature review, a MDRPI prevention poster was created. The poster provided visual depictions of what protective measures used to prevent MDRPI (refer to Appendix G for the poster of medical devices and corresponding protective equipment). The poster would be hung on the inside door of the supply cabinet in every patient's room. The education on the poster would be provided by the PI during the July staff meeting, for one week during shift change huddles (morning and evening). An email with a copy of the poster along with an explanation of it would be sent to staff. The PI and a night shift project champ would round the unit during their shifts to reiterate the poster's purpose, ensuring nurses know where to find it and to answer any questions.

Do-Study -Act Phases

The first goal of this project was to evaluate over a 12-week period (July 1st – September 30th, 2022) the rates of MDRPI. The PI would be onsite twice a week to audit charts evaluating staff adherence to the proper use of protective devices based on the implemented poster (nurses are to chart under "Skin assessment intervention" what protective measures were taken for each

used medical device). Random assessments of patients' protective dressings would occur from July 1st – September 30th. This would provide reassurance and encouragement for staff to use proper skin protection. Staff who comply with recommendations would be praised. Staff who were not compliant would be encouraged to do so via friendly face to face interactions and email reminding them of the importance of preventing/reducing MDRPI. The number of acquired MDRPI would be obtained bi-weekly from the Director of Department of Quality Improvement. The results would be analyzed and presented to staff bi-weekly via during nursing huddles, staff meeting, and email. Assessments and changes to the prevention protocol would be made if there were any cases of MDRPI during the evaluation period.

Two weeks before and at four- and 12-weeks post-implementation of the MDRPI prevention poster, the nursing perception survey (refer to Appendix I for detailed survey) would be given to nurses. This survey (the 2nd project goal) would aid in assessing nurses' understanding and beliefs about the prevention of skin breakdown from medical devices. The surveys would be created via Monkey Survey with a QR code to allow access to the survey and sent via email. A printed copy of the QR code to the survey would be posted at the nursing station and in each nursing pod. This would provide quick access to the survey and promote completion. The nurses would have 2 weeks to complete survey at each surveying period. They would be reminded to complete the survey during huddles. To validate the surveyed person but keep identity of the responder anonymous (questions 1-11 asks demographic questions on the pre-survey). Question 12-22 were the questions used to evaluate nurses' perception on the prevention of MDRPI. The surveys' results would be sent to practice mentor, Sarah Sanders, then handed over to this PI for analysis.

Understanding the Process

To successfully implement change, it is necessary to have the ICU staff, and all the parties ready for change. Table 1 depicts the understating of the process, which includes the readiness to change, evidence of teamwork, and culture quality.

Table 1

The understanding of the process

Step	Yes/No	Data
Step 1. Define agreed upon project	Yes	The management verbalized the need for improvement.
Step 2. Customer focus	Yes	The patient and the organization will benefit from the implementation of the project.
Step 3. Eliminate blame	Yes	The poster needs to be developed and approved by the team leader and team members
Step 4. Rely on data	Yes	Report from Quality Improvement Department
Step 5. Team approach	Yes	The team will include all ICU RNs, ICU RTs, ICU, store-room clerks, wound clinician.
Step 6. Identify all levels of employees	Yes	The team will include all ICU RNs, ICU RTs, ICU, store-room clerks, wound clinician.
Step 7. Economic support	Yes	There will be financial support needed for the printing and laminating the poster. The hanging and the use of the poster will be done during regular work hours.
Step 8. Celebrate success 1.	Yes	Successful completion of the project will be announced at the staff meeting and via mail.
Step 9. Celebrate success 2. (Has the buy-in for the celebration of success been obtained?)	Yes	The managemental approval for providing breakfast to celebrate success has been obtained.

Possible Barriers to Implementation

During the plan phase of this project, the Covid-19 pandemic was at its height. There was a risk of another burst of infectious cases which could have led to another increase in Covid-19 hospitalization in the ICU. In such case, the QI project's implementation may have been postponed.

Another possible barrier to implementing the project was the nursing staff's potential lack of interest. On some occasions, ICU nurses verbalized dissatisfaction with administration for the "constant nagging" to do better in preventing skin breakdowns. In addition, the nurses verbalized their discontent and fatigue when given any additional information about skin breakdown prevention. Therefore, the nurses would be the major focus of teaching the MDRPI poster, its use, and its effectiveness in preventing MDRPI.

Sustainability

Having a standardized, comprehensive visual lists (in the form of a poster, refer to Appendix G) with all medical devices and protective measures is a crucial step to sustainability. For easy access for nurses, this poster would be in each patient room on the inner door of the medical supplies' cabinet. As a result, whenever nurses reached for supplies (e.g., syringe, gauze, etc..) they would see the poster.

Another step in creating sustainability would be by using the poster in training new ICU hires on MDRPI prevention. The poster would be utilized by ICU nurse educator and ICU nursing preceptors during orientation to the unit. Wound clinicians would also use it during new staff orientation. The poster would also be used each year during ICU competency days to reiterate the importance of its use as an easy guide in preventing MDRPI.

At the end of the project, acknowledgment by celebrations and public recognition would also be utilized as a step to pursue integration and sustainment. To recognize all parties involved in the QI project, there would be a celebratory breakfast at the end of the QI project. During this event, a poster board summarizing the results of the project would be presented and the primary investigator (PI) would answer all questions.

Lastly, presenting real-time results and feed-back (via PDSA cycles) would be another way to sustain use. Using rapids cycles of the PDSA cycle would help the PI demonstrates areas of gains and areas that need improvement. This would also provide transparency and visibility of project outcomes, encourages shared accountability among colleagues, and allows the interprofessional team to set future goals based on outcomes (Cullen et al., 2018).

Dissemination

An executive summary and a PowerPoint presentation of the findings from this QI project would be shared to the ICU staff and to other departments at the hospital. The results of the QI project would also be sent to the ICU medical director for distribution among medical staff (including medical and family medicine residents). Both dissemination activities would emphasize the collaborative efforts of all ICU clinical staff (e.g., nursing, respiratory therapy, and the medical team) in reducing and/or preventing MDRPI.

If the QI project was successful in the ICU, the posters listing all medical devices with appropriate protective measures/dressings would be utilized in other units in the hospital. A discussion about this QI project would occur during the Quality Improvement board meeting for directors and managers of other units. This would ensure standardized care and a hospital-wide protocol for preventing MDRPI throughout the hospital. At this point, the wound prevention policy would be updated using posters to promote standardized care of medical devices in units and departments.

Lastly, an abstract of this QI project would be submitted to a local and/or national organization (e.g., Connecticut Nurses Association) or peer-reviewed journal (e.g., Journal for Critical Care, Critical Care Nurse, and AACN Advanced Critical Care) for global dissemination. The PI would like to present project findings outside of the local hospital network.

Estimated Timeline

The estimated timeline is presented in Table 2.

Table 2

Estimated Timeline for Doctor of Nursing Practice Project Roadmap

Doctor of Nursing Practice Project Roadmap		
Component	**Definition**	**Date Done**
Phase 1: Problem Identification and Evidence Review		
Clinical Inquiry including background and significance of problem	Describe local problem and its significance. Include data to frame local problem.	03/15/21
Organizational priority	Summarize information that supports topic/problem is an organizational priority.	03/15/21
Searchable Question	Write a focused, searchable question using an established method (e.g. PICO).	07/10/21
Evidence search	External evidence • Summarize search strategy (e.g. databases, keywords, filters/limits, criteria for article selection, tools for critical appraisal). Include practice-based evidence (e.g. evidence-based solutions that experts/other health systems have implemented to address practice problem).	12/10/21
	Internal evidence • Summarize applicable unit/community/department/hospital/organizational level data or data required for national entities (e.g. CMS, NDNQI, AHRQ).	06/30/21
	Perform needs assessment if applicable.	N/A
Evidence appraisal, summary, and recommendations	Organize evidence that answers focused clinical question in a clear concise format (e.g. table or matrix).	01/15/22
	Appraise literature for quality and applicability of evidence using established method (e.g., Johns Hopkins Nursing EBP Research Evidence Appraisal Tool, Joanna Briggs Institute Critical Appraisal Tools, Fuld Institute for EBP critical appraisal tools etc.).	01/15/22

	State recommendations(s) and link to evidence strength and quality and risk/benefits.	01/15/21
Phase 2: Project Planning		
Project goals	State intended, realistic outcomes of project using established method (e.g. SMART criteria).	07/31/21
Framework	Select framework/model to guide implementation (e.g. EBP model, QI framework, Change model).	07/31/21
Context	Describe project setting and participants or population, or other elements that are central to where the change will occur.	07/31/21
Key stakeholders	Identify agencies, departments, units, individuals needed to complete the project and/or affected by project, and strategies to gain buy-in.	07/31/21
Practice change/intervention	Provided detailed description of practice change or intervention (e.g. new or revised policy).	10/20/21
Evaluation	Summarize plan for evaluating the effectiveness of the practice change. Identify applicable process and outcome data to be collected/tracked and tools to do this. Identify the methods for analyzing/interpreting the data (e.g. control, run or Pareto charts).	
Possible barriers to implementation	Identify possible barriers and implementation strategies to mitigate these barriers.	10/30/21
Sustainment	Identify strategies to sustain the change.	12/01/21
Timeline	Create a realistic timeline for project completion.	12/01/21
Resources	Identify all resources (e.g. indirect and direct) needed to complete the project.	07/31/21
Ethical merit	Identify and obtain the required review and approval needed for implementation (e.g. institution, community agency, IRB).	08/15/21
Phase 3: Implementation		
Implement project	Carry out the project using selected implementation framework/model.	July-September 2022
	Track any deviations/changes from the project plan.	July-September2022
Phase 4: Evaluation		
Results/Interpretation	Using an established method (e.g. run or control charts) display data and interpret project outcomes.	Fall 2022

	Report evaluation of the effectiveness of the practice change, including extent the practice change was implemented (process outcome) and extent to which the desired outcome(s) were achieved.	Fall 2022
Return on investment	Identify the final resources that were used to implement the project. Calculate and report the return on investment.	Fall 2022
Phase 5: Dissemination		
Traditional	Disseminate to the project setting in a manner meaningful to them (e.g. executive report, poster, presentation at a meeting, poster with QR code to access details of project, etc.)	Fall/Winter 2022
	Disseminate in the format required by the academic institution (e.g. poster, public presentation) and	Spring 2024
	Prepare final project write-up using established reporting guidelines (e.g. EPQA, SQUIRE) and academic institution requirements.	Spring 2024
Non-traditional	Develop a website to display project, use personal or program social media (e.g. Twitter, Facebook) to share project information.	Spring 2024

Resources

Table 3 describes the anticipated cost for the project implementation and evaluation. The full-time equivalent (FTE) for a nurse employee at the hospital was 37.5 hours x 52 weeks (total of 1,950 hours/year). Therefore, the PI would spend approximately 5% of FTE (24 hours per month x 4 months) managing the entire project. This time would include hours spent making and presenting the poster to the ICU clinical team, placing the poster in patients' rooms on the unit, collecting the nursing survey and MDRPI during the data collection period, analyzing project data, and presenting findings to ICU clinical team. Additional costs for this project are depicted in Table 3.

Table 3

Anticipated cost for the QI project implementation and evaluations.

	Direct cost
Primary Investigator 5% pf average annual salary $100,000	$5,000
Posters - color printed and laminated 24”x18”, 22 count x $2.50	$55
Survey QR code printed 10 prints x 3 separate rounds of surveys (10 x $0.17/sheet) x3	$5.10
Walmart 5x7 Scotch tape x1	$2.88
Celebratory breakfast	$200
Total estimated cost	$5,262.98

Ethical merit

This was a QI project. There was no experimentation or risk of harm to patients. The use of medical device protective measures was part of the normal care in the ICU. Additionally, no protected personal data would be collected on patients in the ICU. This project did not require IRB approval. However, to ensure the QI project met the community hospital’s patient safety requirements, the project proposal was submitted to the hospital’s IRB and approved. Sacred Heart University required IRB submission. The project was considered IRB-exempt and approved on July 5, 2022 (refer to Appendix H).

Project Implementation

On June 5, 2022, the link with the pre-survey was emailed to all ICU nurses. The same day, the QR code was printed and posted at the nursing station and in each nursing pod. Nurses had two weeks to complete the survey. Seeing nurses’ resistance to filling out the initial survey, the second survey (four weeks after implementation of MDRPI prevention protocol) was abandoned. To ensure compliance with the post-intervention survey, it was provided to staff via

a HealthStream module. As result, the completion of the last survey was made mandatory. Nurses had three weeks for its completion.

The MDRPI prevention posters were hung on the inside door of the supply cabinet in every patient's room on July 20th, 2022. An email with a copy of the poster was sent the same day to all ICU clinical team. On the same day, during the evening huddle, nurses were educated about the poster. Additional educational sessions occurred during the nursing morning and evening huddles for another 2 weeks (between July 20 thru August 3, 2022). The PI attended the huddles on the days she worked and presented the poster, explaining its purpose, content, use, and location. Each huddle session lasted about three to five minutes and a total of 12 MDRPI educational sessions was given during the nursing huddles. The PI also presented the MDRPI prevention poster at the monthly staff meeting on July 27, 2022. On the days the PI worked, the PI also engaged in informal educational practices by approaching the nurses the PI worked with during the shift. The PI showed the nurses where the posters were located, reinforced their purpose, and answered any questions. Lastly, the night shift champ also provided informal education and reinforcement on using the MDRPI poster on the days the PI was not working.

Deviations to Implementation

One deviation from the original project plan was the extension of the educational session for MDRPI prevention poster from one week to two weeks. The PI works 3 days a week. The PI quickly realized this was not enough time to educate all the nurses who worked in the ICU. Therefore, a total of 6 days of teaching (12 sessions) was completed by the PI.

A second deviation to implementation included the collection of MDRPI data. Data was collected every four weeks and not every two weeks as originally planned. During the implementation phase, there was a new director assigned to the Quality Improvement

Department (QID). The new director was not able to provide data on a bi-weekly basis. As a result, results on MDRPI were received directly from Sarah Sanders, the ICU director monthly instead.

A third deviation to the original plan was a change in the nursing perception survey. As mentioned previously, the 4th week survey was dropped from plan due to nurses' resistance to complete pre-survey, and the final survey was made mandatory to ensure all nurses completed it.

Lastly, the original implementation phase was scheduled to start from July to September 2022. This date was pushed to September 2022 to November 2022 due to a high patient census/hospitalization during the original planned dates of implementation.

Evaluation

Process Measurement

Study data was recorded using a Numbers and then converted into Microsoft Office to easily create charts. To report the incidents of MDRPI during the study period, the PI used actual number of incidents (refer to Table 1 in Appendix J).

The nursing perception survey results were reported in percentage (refer to Table 1 for results of nursing survey in Appendix K). The survey utilized a Likert scale grading because Likert rating best corresponds with how the surveyed group feels about a statement or a question (refer to Appendix I for nursing perception survey). While there was a total of 22 questions on the survey, only 11 questions focused on nurses' perception. For the analysis of nursing perception, the PI focused on questions: *12* (All patients are at risk for developing pressure injuries?), *13* (Pressure ulcer prevention is time-consuming for me to carry out?), *15* (I do not need to concern myself with pressure injury prevention in my practice?), *21* (In comparison with other areas of care, pressure ulcer prevention is a low priority for me?), and *22* (Pressure ulcer

risk assessment should be regularly carried out on all patients during their stay in hospital?) because these questions assess nurses' perception as it relates directly to pressure injuries.

As the pre-survey was optional and the post-survey was made mandatory, there were 22 pre-survey and 34 post-survey responses. The PI used survey *Question 3* (Please list the last two digits of your cell phone number) to match responses from the pre-and post-survey responders. Unfortunately, survey *Question 4* (What is your home unit?) did not include the RT department. As a result, the RTs could not mark their department, which made the PI assume they chose the ICU as the department they worked on. The PI cannot distinguish how many RTs and nurses completed the survey. Questions 1-11 were excluded from the evaluation because these were demographic questions used to validate the survey and to comply with the Hospital's IRB requirements. Finally, a visual depiction of outcome measures for the pre- and post-surveys used bar charts and is presented in Appendix L.

Outcome Measurement

During the data collection period of September – November 2022, the ICU encountered one case of MDRPI. The pressure injury was related to a pulse oximetry measuring device placed on the patient's nares. It occurred on a severely sick 72-year-old patient whose perfusion was poor. The patient was also on 3 pressors (at maximum dosage each) and continuous veno-venous hemoperfusion. As a result, the patient's pulse oximetry sensor would not read when placed on common areas (e.g., earlobe, finger, forehead, or toe). The evaluation of the patient's documentation showed all necessary MDRPI preventive measures were in place. The MDRPI occurred because of thinner skin on the nose and the patient's hemodynamically compromised state (Guterres et al., 2019).

As mentioned earlier, *Questions 12, 13, 15, 21, and 22* were analyzed because they directly correlate to nurses' perceptions medical device related pressure injuries. Overall, comparing the pre-and post-surveys shows staff better understands the importance of preventing MDRPI. Questions 12, 13, 15, 21, and 22 show a significant improvement in nursing perception of the importance in reducing MDRPI. *Question 12* (All patients are at potential risk for developing pressure ulcer?) showed a 9% increase in responders who strongly agree and a 5% increase in responders who agree with the statement. There are no responders who disagree, strongly disagree, or indecisive. There was a 22.7 % increase in responders who disagree with *Question 13* (Pressure ulcer prevention is time-consuming for me to carry out?). There was a 13.6% increase in responders who strongly disagree with the statement, making a significant shift from strongly agree and agree answers in the pre-survey scores. In *Question 15* (I do not need to concern myself with pressure ulcer prevention?), there was a 22.7% increase in disagree. However, there was an 18.2% decrease in strongly disagree answers. This indicated an unwanted shift in nurses' perception. *Question 21* (In comparison with other areas of care, pressure ulcer prevention is a low priority for me?) showed a significant shift in answer responses from strongly agree, agree, and neither agree nor disagree in pre-survey to strongly disagree with a 31.8% increase in response and neither agree nor disagree with 9.2% decrease responses in the post-survey. There was a 48.6% decrease in disagree answers post-survey, but those most likely went toward strongly disagree answers. Lastly, the most impressive response shift *was Question 22* (Pressure ulcer risk assessment should be regularly carried out on all patients during their stay in hospital?). Seventy-seven percent of post-survey responders strongly agree with the statement compared to 45.5% in pre-survey. The rest of the post-survey responders (22.7%) agree with the statement, meaning that no one is either undecisive or

disagrees with the question post-intervention, compared with 50% of responders who agreed and 4.5% who were undecisive pre-intervention.

Despite the positive results on the nursing perception survey (2nd project goal), the ICU did not meet the annual and 1st project goal to reduce of MDRPI in fiscal year 2022. This was due to the one case of MDRPI during the project phase. Rationale for the pressure injury already discussed and methods to reduce this type of pressure injury to the nares have been made. Of note, the goal was met in fiscal year 2023 after the QI project had ended. Therefore, MDRPI prevention protocol was effective and the nurses were awarded a bonus check in December 2023.

Return of Investment

The MDRPI prevention protocol did lead to a decrease in MDRPI and greatly benefited the hospital financially. However, the greatest benefits are for the hospitalized patients. Preventing medical device-related pressure injuries reduces hospital stay and recovery, pain, risk of infection and possible disfigurement, and possible demise of patient during hospitalization (The Joint Commission, 2018). In the end, patients and their families are happy with fewer complications during the hospital stay. This should lead to higher patient-family satisfactions scores and increase hospital prestige among the surrounding community. The hospital might generate new clients and patients leading to increase revenue for the hospital and employees. Lastly, an increase in prestige may attract new employees (e.g., nurses, physicians, and other healthcare providers) to work at this hospital.

Barriers Encountered During Implementation

As mentioned earlier, the PI found it challenging to receive data from the QID director. Eventually, the pressure injury data was distributed to unit directors monthly, and the number of

MDRPI was obtained from ICU Director, Sarah Sanders. It would have been beneficial and easier if the PI was included in the emails with the above information.

It was extremely difficult to have nurses complete the pre-survey. The PI reminded nurses frequently to complete the survey. Due to this challenge, the post-survey was made mandatory, and nurses had to complete a HealthStream MDRPI module that provided post-survey. Despite making the post-survey mandatory, not all staff members completed the survey on time.

During the implementation phase, the ICU nursing educator changed position. A new nurse educator took on the role for the ICU and this person was not as involved in the QI project as the previous one. As mentioned previously, a new person took over the QID director position. The PI was not notified of these position changes and had a significant impact on the QI project implementation.

Finally, the retrieval of the pre-and post-survey results proved was also challenging. Initially, it was planned for the ICU director to receive results, but this was incorrect. Even though the survey questions were created by the PI and the ICU nursing educator, the link to the survey was made by a third party, hospital employee who had an account and direct access to Monkey Survey. During the implementation phase, that person left the organization and the new employee did not have access to the survey results right away. Subsequently, it took weeks for the PI to receive the survey results and affected the data analysis phase of this project.

Dissemination

A PowerPoint presentation of the QI project finds will be given to ICU staff and opened to any department/ colleagues the hospital. The results of the QI project will also be sent to the ICU medical director for distribution among medical staff (including medical and family

medicine residents). Both dissemination activities will emphasize the collaborative efforts of all ICU clinical staff (e.g., nursing, respiratory therapy, and the medical team) in reducing and/or preventing MDRPI.

The MDRPI posters listing all medical devices with appropriate protective measures/dressings will be used in other hospital units. A discussion about this will occur during the Quality Improvement board meeting for directors and managers of other units. This will ensure standardized care and a hospital-wide protocol for preventing MDRPI. At this point, the wound prevention policy will be updated using posters to promote standardized care of medical devices in units and departments.

In May of 2024, the PI will present at Nurses' week a poster presentation. During Nurses' week, staff will have a chance to learn details about the project, ask questions, hopefully peak an interest, and feel inspired to lead QI projects on their units.

The PI will also present the QI project colleagues, classmates, and faculty at Sacred Heart University and the final written manuscript of this QI project will be listed in Sacred Heart University's repository.

Lastly, an abstract of this QI project will be submitted to local and national organizations. The plan is to submit an abstract request to the Connecticut Nurse Practitioner Association annual conference for a poster presentation. The last plan will be to submit a manuscript for publication in a peer-reviewed journal (e.g., Critical Care Nursing).

Implications of Project Results to Organization and Practice Community

The intervention (MDRPI prevention) of this QI project has important implications for the hospital and clinical staff in the ICU. First, it improves the quality of patient care in ICU, which will have an impact on improving patient satisfaction and nursing morale. Additionally,

the reduction in MDRPI will decrease the financial burden retained by the hospital from HAPI. As mentioned previously, improved patient outcomes will increase hospital prestige among local community and help generate new clients and patients. This will ultimately improve hospital revenue and maintain solvency.

Key Lessons Learned

There were several key lessons learned throughout this project. The first key lesson learned was the PI needs to improve planning and organization skills. The PI spent most of time retrieving and documenting data. Having a anticipating and planning for possible barriers will reduce inefficiency during future QI projects. The second lesson learned was that the PI should have created her own Monkey Survey account. This would have prevented retrieving data from someone else and delay in project completion. The last lesson learned was the PI understands the importance of flexibly and compromise and now has competency in carrying out a quality improvement project. To understand that flexibility is essential; the PI appreciates other people's hard work with their QI projects.

Sustainability Plan

The MDRPI poster will be used each year during ICU competency days to provide refresher education preventing pressure injuries. ICU nurses will utilize the poster when precepting and training new employees hired. The wound nurses will also be using the MDRPI poster during their orientation week of new employees.

Lastly, the end of year bonus (employee financial incentive) and sharing trends/outcomes will be another way to sustain the MDRPI prevention poster/protocol. By routine and consistent reporting of trends and outcomes, the directors of the unit can report areas of gains and/or illustrated areas that need improvement. This provides transparency and visibility of results,

encourages shared accountability among colleagues, and allows the interprofessional team to set future goals based on results (Cullen et al., 2018)

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Appendix A

Stamford Hospital MDRPI data FY 2019-2022

ICU MDRPI Incidence

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	**Total**
FY 19	1	0	3	0	0	0	0	0	0	0	0	1	**5**
FY 21	0	0	0	0	6	0	1	0	3	0	1	0	**11**
FY 22	0	0	1	0	1	0	0	3	1*				**6**

*data available as of mid-June 2022

Appendix B

Results of databases search

Table 1
CINAHL Complete Terms and Search Results

Search Terms	Number of articles	Number of title and abstract reviewed	Number of full text articles reviewed	Number of articles selected
Poster board education AND Intensive care or icu or critical care	24	24	11	2
Poster nurs* education AND intensive care unit or icu or critical care	13	13	4	3
Poster Education AND MDRPI prevention	0			
Visual nurse education AND medical device-related pressure injuries	0			
Medical device related pressure injuries AND prevention or intervention or treatment or program	38	38	21	7

Table 2
Cochrane Database of Systematic Review Terms and Search Results

Search Terms	Number of articles	Number of title and abstract reviewed	Number of full text articles reviewed	Number of articles selected
Poster board education AND Intensive care or	0			

icu or critical care				
Poster nurs* education AND intensive care unit or icu or critical care	0			
Poster Education AND MDRPI prevention	0			
Visual nurse education AND medical related pressure injuries	0			
Medical device related pressure injuries AND prevention or intervention or treatment or program	0			

Table 3

Medline with full text Terms and Search Results

Search Terms	Number of articles	Number of title and abstract reviewed	Number of full text articles reviewed	Number of articles selected
Poster board education AND Intensive care or icu or critical care	13	13	3	0
Poster nurs* education AND intensive care unit or icu or critical care	13	13	4	3 (the same results as in CINAHL search)
Poster Education AND MDRPI prevention	0			
Visual nurse education AND medical related pressure injuries	0			

Medical device related pressure injuries AND prevention or intervention or treatment or program	38	29	3	7 (duplicate from CINAHL search)

Appendix C

Evidence Review

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**
Article 1									
Lauderbaugh et al. (2019). Reducing ventilator associated pneumonia in the	N/A	QI project	Sample: closed, multidisciplinary out born NICU with a total of 33 bed	N/A	Pre- and post-intervention observational study	Not reported	Poster education: - Oral hygiene improved from 70% to 92%	Level VI	Strengths: improvement of NICU VAP rates Conclusion that continuous staff education and reeducation is needed for the effectiveness of interventions. Weaknesses: the VAP case increased again and the staff needed reeducation

NICU through oral care education: A quality improvement project.									
Article 2									
Arndel et al., (2021). Reducing the incidence of medical device-related pressure injuries from use of CPAP/BiPAP masks.	Lean methodology and PDSA cycle for process improvement	QI project	**Inclusion criteria:** all ICU patients requiring non-invasive ventilation mask (NIVM) with blanchable and non-blanchable redness to the bridge of the nose **Exclusion criteria:** patients who did	IV1= thin foam dressing (Molnlyke Mepilex Lite, Peachtree Corners, Georgia) applied to where signs of blanchable or non-blanchable erythema noted at time of assessment. IV2= education	Daily chart audits were completed by the charge nurses for 3 key process improvement indicators: an active physician order for the use of CPAP/BiPAP, a complete	Baseline data was compared with post intervention data. Statistical data not provided.	75% reduction injuries in actual injuries with a zero escalation to state 2 or greater injuries.	Level VI	Strengths: decrease in PI Weaknesses: lack of statistical data;

			not require CPAP/BiPAP for treatment in ICU	of nurses on new standard of work	d baseline facial assessment and the performance, and correct documentation of every 4-hour facial askin assessments while patient was on CPAP/BiPAP				
Article 3									
Tayyib et al. (2021 The effectiveness of the SKINCARE bundle in preventi	N/A	A prospective, single-arm, open-label clinical design/QI project	Sample: 2 adult CCUs and one pediatric unit. 223 patients. **Inclusion criteria**: patients with expected	N/A	Data were collected using a patient checklist and clinical data. Braden Scale Risk	Descriptive statistics and statistical correlation methods were performed using SPSS (version	Statistically significant difference in the total number of PIs that developed before (13.4%) and after (0.89%) bundle implementation. X2=27.09	Level VI	<u>Strengths:</u> the use of care bundle shows 90% likelihood prevention of MDRPIs <u>Weakness</u>: Incidents were reported based on referral cases, some data collected retrospectively from nursing documentation

ng medical-device related pressure injuries in critical care units: A clinical trial			length of stay in ICUs of more than 24 hours. **Exclusion criteria:** Medically contraindicated removal, repositioning, or change of medical service, or refusal of SKINCARE bundle interventions.		assessment and skin assessment tool.	25, Chicago, IL) The Poisson regression model was used to compare the incidence differences between groups with 95% confidence intervals and these differences for before and after groups wre analyzed using the X2 test of independence.			
Article 4									

Guterrres da Silva Galetto et al. (2019). Medical device-related pressure injuries: An integrative literature review	N/A	Integrative literature review	Sample size consisted of 9 studies **Inclusion criteria**: original study (research) or case study, quantitative or qualitative approach, published electronically in full, in an indexed journal, in the form of an article, in Portuguese, English or Spanich, from 2010-2015.	Databases searched: Cumulative Index to Nursing and Allied Health Literature (CINAHL); U.S. National Library of Medicine (PubMed); Wiley InterScience; Scopus; and Web of Science (WOS). Terms used: Pressure ulcer" AND "medical devices"	Steps proposed by Ganong: selection of research question; definition of the inclusion and exclusion criteria of the studies and selection of the sample, representation of the selected studies in table format, considering characteristics in common; critical	PRISMA recommendation (for identification and selection of studies).	Increased number of studies published in 2015 indicating an increased awareness of the problem. Most damage was from respiratory devices: NIV masks, ETTs. Prevention: specific recommendations provided for the use of NIV mask, tracheostomy, ETT, and bladder catheters – periodic skin assessment, reportioning of devices and use of dressings to reduce shear fore.	Level VI	<u>Strengths:</u> great summary of all 9 articles in Chart 1 which included year of publication, number of patients, objectives, main results, and level of study; all studies found were published in international journals; Clear and easily readable charts, including Chart3 which provided general recommendations for prevention and treatment of MDRPI. 6 were quantity and 3 were quality studies. Identification of the risk devices for PI and their location. <u>Weakness:</u> lack of stronger level of evidence (I, II, III).

			Exclusion criteria: review articles, experience reports, letters, editorials, theses, dissertations, monographs, books, works not related to the scope or the study or that did not answer the quiding questions of this review and the duplicate production in the researched databases.		analysis of findings; interpretation of results; and report clearly evidence found.				

Article 5									
Cooper et al. (2020). Prevention and treatment of device-related hospital-acquired pressure injuries	N/A	Cross-sectional study Searched CINAHL and MEDLINE. Key words: hospital-acquired pressure injury, pressure ulcers, medical devices, and critical care patients. Included evidence form the	Sample: from 8 articles - 117 988 patients in 1115 facilities both acute and long-term settings. Inclusion and exclusion criteria not mentioned.	IV 1 = risk factors for hospital-acquired PI	NPIAP PI staging system	N/A	MDRPI have shown to develop faster than non-MDRPI across care settings. Patients are prone to developing MDRPI in all care settings: ICU, medical/surgical/progressive/step-down.	Level V	Strengths: Tables very clear to read and understand; Table 1 with great summary of each study that discusses type of studies found, results of each study, and level of evidence. Results are clearly presented. Weaknesses: lack of specific data results

		past 10 years.							
Article 6									
Yousef et al. (2020). Impact of implementation of a modified World Health Organization	N/A	QI	Sample: 84 nurses	**Interventions: modified version of the WHO multimodal strategy** Making soap dispensers easily available; training	Pretest-posttest quasiexperimental study	Pre-coded data were entered into the Statistical Package of Social Science version 21.0	- Hand hygiene compliance significantly improved after the interventions (one of	Level VI	Strengths: the process of each intervention is clearly explained; the study showed multidisciplinary effort in conducting the project: ID nurses who did all the teaching, maintenance team who distributed and mounted the Purell dispensers. Weakness: we don't know how many ICU nurses

multimodal Hand Hygiene strategy in a university teaching hospital				and education of nurses (including 1-on-1 and on-the-job trainings); putting visual reminders of hand hygiene in the form of posters, all placed in strategic area; development of institutional safety climate "hand hygiene champions"			them included nurses' education [visual cues]) from 28% to 58%. - The knowledge/attitude improved (P< .001) - Use of alcohol hand hub increased from 9.5% to 75%.		participated in this study. Night shift nurses were not educated on new interventions, they did not participate in offered educational classes.
Article 7									

Case, C. A. (2017). Promoting evidence-based practice at a primary stroke center	Leadership Behaviors Supportive of EBP Institutionalization	QI	Sample: RN staff nurses from 4 units	Creation of a poster using the educational poster template created for this project Completion of a supplemental binder containing the complete AHA/ASA Guidelines 90-second oral poster presentations to RNs during their pre-shift huddle Availability of the poster and binder remained in the unit	Pre- and post-intervention online surveys	First, a baseline measurement of perceived confidence was completed in the preintervention survey. After the intervention, the self-perceived confidence score was again measured, resulting in a comparison of the mean confidence scores before and after the intervention. A 5-	Nurses reported a significant increase in perceived confidence in ability to explain how to standardize stroke order sets No significant change was shown in overall self-reported confidence ratings	Level VI	<u>Strength:</u> Interventions and evaluation are clearly/well explained. <u>Weakness:</u> unclear how many nurses took part in this study; 20 nurses were allowed to take pre-survey at the time of post-survey. Low post-intervention participation.

				break room for 1 week for RN viewing. After the pilot unit, a pdf of the poster was also delivered via an email attachment to all RNs on the participating unit.		point Linkert scale was used to measure answers, with "strongly disagree" corresponding to 1 point and increasing incrementally to "strongly agree" corresponding to 5 points.			
Article 8									
Herzog et al. (2019). Translating clinical experience into action: Developing an	N/A	QI	Sample: 12 ED nurses, including nurse manger and nurse educator.	N/A	Not mentioned	Not mentioned	The project showed lack of nursing confidence assessing for intimate partner violence.	Level VI	Strength: the project showed awareness of the problem. It is acknowledged that the project needs to be evaluated for its success. Weakness: the article is written in "I" noun. This project is vaguely described. There is no mention on how the opinions were collected.

educational protocol to improve intimate partner violence screening by Emergency Department nurses.									
Article 9									
Bakhhshet al. (2019). Medical and nursing staff education reduces use of prophylactic Ondansetron with	N/A	QI	Sample: ED medical and nursing staff	An emailed link to a 2-minute animated video Posters at strategic locations in the department Brief presentations during nursing	Outcome measure is discussed as project's primary outcome.	The pharmacy did a retrospective chart review pre- and post-intervention.	A significant decrease in the proportion of patients administered prophylactic ondansetron in patients who were given IV opioids in ED.	Level VI	<u>Strength:</u> this article talks in detail about the results of the project (relation of opioid and ondansetron use in ED). A lot of data is provided. Acknowledgement that adequate in-service training can be time consuming and challenging. <u>Weakness:</u> the study talks about total of 300 in sample group (patients); however medical and nursing staff

opioids in the Emergency Department.				shift change report 1-1 discussions					were the subject of education. No record made to document how many staff members were reached out to for teaching. There is no discussion/details on the process of education
Article 10									
Ilic et al. (2013). What is the evidence that poster presentations are effective in promoting knowledge	N/A	Integrative literature review	Sample: 15 out of 51 studies met the inclusion criteria. 6 of the studies evaluated the poster format as a standalone intervention and 6	Electronic search of various electronic databases (MEDLINE< Allied and Complementary Medicine, PsycINFO, ERIC, and Cochrane Database of	Effectiveness of poster presentation on knowledge transfer as determined by changes in knowledge transfer, attitudes	Not mentioned The articles were hand-picked by the to authors.	Studies that reported on the effectiveness of the poster presentation as a standalone intervention were unanimous in their conclusions that the poster was not effective at facilitating	Level VI	<u>Strength:</u> Great summary table of all articles that med the inclusion criteria. In discussion portion, the information gap about a communication format in healthcare is eloquently discussed (there're multi <u>Weakness:</u> the authors talk about a state of the art review of literature, but it seems conventional.

transfer? A state of the art review.			integrated the poster a part of a multi-modal educational intervention; one study trialed a different version of the poster presentation and two studies reported on user experience and opinions of poster presentations.	Systematic Review) were performed for studies published until 2012. Table 1 discusses all terms and search strategy	and behaviors in health professionals and/or consumers. Studies the used any form of information provision via the poster medium		knowledge transfer. Studies that incorporated the poster presentation as part of an integrated or multi-modal educational intervention achieved improvements for the most part in knowledge and behavior.		
Article 11									
Newsome et al. (2021). Use of digital vs	N/A	Case-control study	Sample size: There were 280 P1 and 290 P3	Student baseline experience and perception of tablets	Pre- and post-activity surveys that included	Investigators used descriptive statistics, the	Over 95% of students perceived that the poster activity enhanced their	Level IV	<u>Strength:</u> The process of the interventions are described very well Short and straight to the point information.

printed posters for teaching and learning in pharmacy education.			graduate pharmacy students enrolled on the study during the two-year study period. The pre- and post-surveys were completed by 543 graduate pharmacy students in the P1 academic year and 553 graduate pharmacy students in P3 academic year.	and posters. Students' perception of poster format.	multiple-choice and four-point Linkert-scale items and were administered using SurveyMonkey.	Wilcoxon signed rank test, and the Pearson chi-square test to compare the pre- and post-survey answered using a significance level of $p < .05$. Data analysis was conducted using the Statistical Package for the Social Sciences.	poster creation, literature evaluation, and communication skills, while also providing their learning of pharmacy-related topics. There was a significant increase on the post-activity survey in the number of students who proffered the digital poster format, with students indicating the digital format was straightforward (87.3%), enhanced their presentation (77.2%), and promoted learning (70.5%).		<u>Weakness:</u> I would prefer data to be presented in a form of bar charts (but that is a personal preference).

Appendix E

Level of Evidence Review

	Level I Systematic review or meta-analysis of RCTs	***Level II*** RCT	***Level III*** Controlled Trial without randomization	***Level IV*** Case-control and Cohort Study	***Level V*** Systematic review or Meta-synthesis of descriptive or qualitative studies	***Level VI*** Descriptive or Qualitative Study, Clinical Practice Guideline, Literature Review, QI, or EBP Project	***Level VII*** Expert Opinion
1						X	
2						X	
3						X	
4						X	
5					X		
6						X	
7						X	
8						X	
9						X	
10						X	
11				X			

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Appendix F

Synthesis table

	Pressure Injuries (PI)	Use of protective dressing	Nurse poster education
1	NR	NR	↑
2	NR	NR	↑
3	↓	√	NR
4	NA	NA	Inconclusive
5	NA	NA	↑
6	NA	NA	↑
			↑ (when used with other educational modalities)
7	NA	NA	↑
8	NA	NA	↑
9	↓	√	NA
10	↓	√	NA
11	↓	√	NA

* PI – Pressure Injury, NR – Not Reported, NA – Not Applicable

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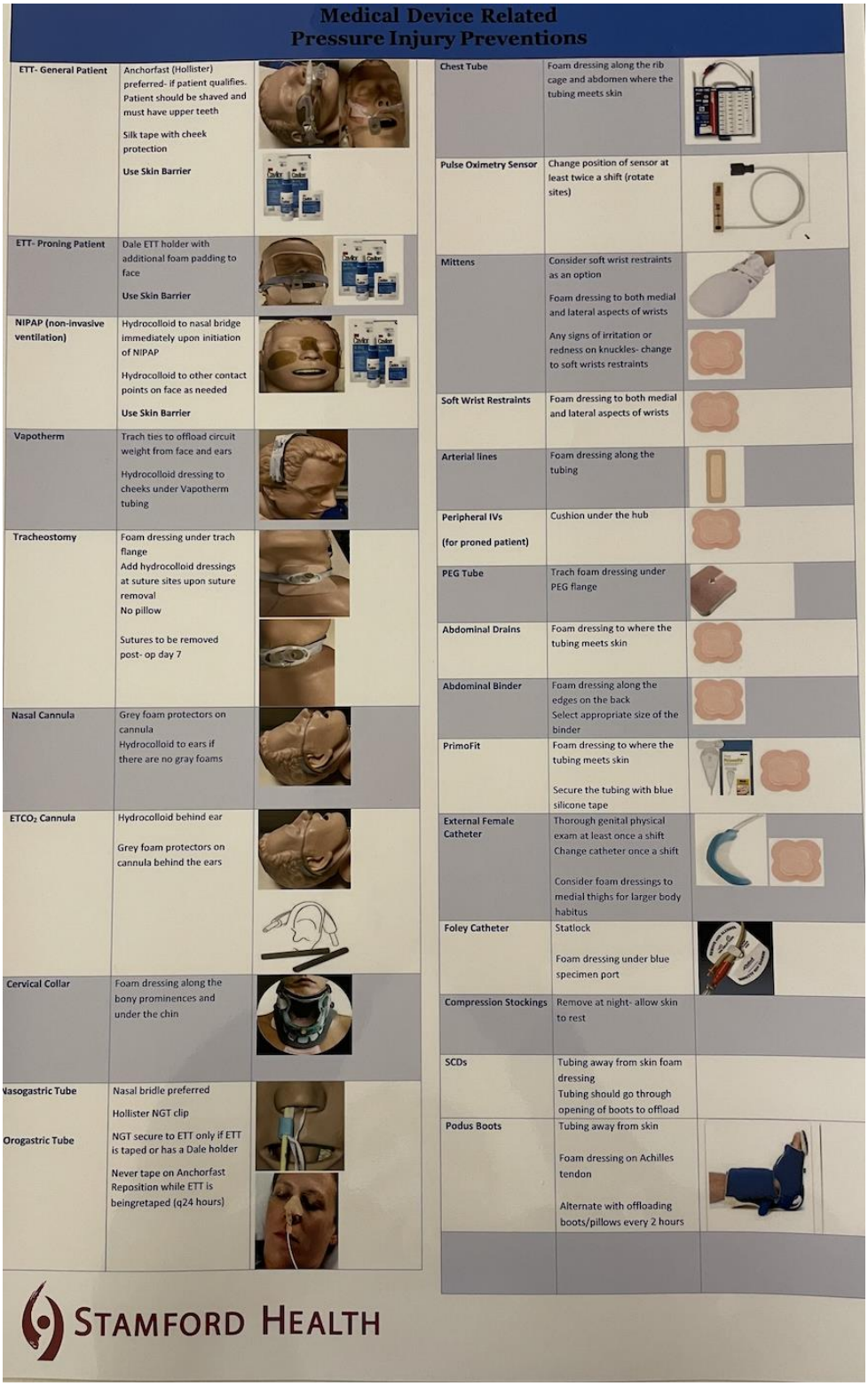
Appendix G

The poster presenting measures that should be taken to prevent MDRPI in ICU



Appendix G

Sacred Heart University IRB Exemption Letter

Taber, Prof. Christopher B.

To: Grzelczak, Monika

Tue 7/5/2022 12:09 PM

Cc: Londo, Madeline C.; Alp, Feride F. 'Funda'

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, USAW2, EP-C, PES
Director, Exercise and Sport Science M.S. Program
Associate Professor
College of Health Professions
Sacred Heart University
(203) 396-6342

Appendix I

Pre- Survey: RN Perception on Device Related Pressure Injury Prevention

Consent Statement: Thank you for participating in this research study designed to evaluate the effectiveness of bundled interventions to prevent Medical Device Related Pressure Injuries (MDRPI) in Intensive Care Unit (ICU) and Intermediate Care Unit (IMCU). This study is being conducted by Sarah Sanders, MSN, RN, NE-BC. This consent form asks you to allow the researchers to record, view, and use your responses to gain a better understanding of the topic. The purpose of this research study is to evaluate the effectiveness of bundled interventions to prevent MDRPI in Intensive Care Unit (ICU) and Intermediate Care Unit (IMCU), apply ARCC Evidence based practice model to implement the evidence-based practices to prevent MDRPI, and assess ICU and IMCU staff perception towards preventive strategies that will lead to reduction in MDRPI. If you agree to participate, you will be asked about your perception towards preventive strategies that will lead to reduction in MDRPI among patients admitted in ICU and IMCU. This should take no more than 5 minutes of your time. You will not be compensated for participation and there will be no costs to you for participating in this research. Participation in this study is completely voluntary and will pose minimal risk. If you decide not to participate, there will not be any negative consequences. Please be aware that if you decide to participate, you may choose not to answer any specific question and can withdraw from the survey at any time. This is not a treatment protocol, and the alternative is not to participate in this research. If you have any questions, concerns, or complaints about the research or research subjects' rights, or whom to contact in the event of a research-related injury, you may contact one of the research investigators, Sarah Sanders. The Western Institutional Review Board® (WIRB®) has reviewed this clinical study and is composed of doctors, community

representatives and others. The purpose of this group is to protect the interest of human subjects participating in clinical studies. This group is an impartial third party not directly involved with the study. If you have any comments, questions or complaints regarding study participation or your rights as an investigational study subject, you should contact: Western Institutional Review Board® (WIRB®) 1019 39th Avenue SE Suite 120 Puyallup, Washington 98374-2115 Telephone: 1-800-562-4789 or 360-252-2500 E-mail: Help@wirb.com Study data will be collected using the online survey software vendor, SurveyMonkey, which is a company that provides cloud-based survey development services on a secure website that is password protected. It is estimated that the survey will take 5 minutes to complete. Please print a copy of this information to keep for your records. By submitting this form, you are indicating that you have read the description of the study and agree to participate in the described research. You are also signifying that you have signed and dated this consent form as of the date that you are submitting the form. Your submission also signifies signature and dating of the form by the person obtaining the consent as of the date that you are submitting the form. If you are a unit coordinator, dietary staff, pharmacists, and any other staff members who are not involved in the direct skin care of ICU and IMCU patients, this survey does not pertain to you. Thank you for your time and interest.

Question Number	Question	Answer
1	I satisfy the above conditions	Yes No
2	Please list the day of the month of your birth	
3	Please list the last 2 digits of you cell phone number	
4	What is your home unit?	ICU IMCU

5	What is your role in the Healthcare Team	Registered Nurse Clinical Coordinator
6	What is your age?	20-29 years 30-39 years 40-49 years 50-59 Ears >60 years
7	What is your gender?	Male Female Transgender Female Transgender Male Gender Variant/Non-conforming Other Choose not to disclose
8	What is your race/ethnicity?	African American or Black Caucasian or White Latino/Hispanic Asian Other: Specify _____
9	What is your highest level of education?	Bachelor's Degree Associates in Nursing BSN MSN DNP
10	How many years of experience in healthcare settings do you have?	0-5 6-10 11-15 16-20 >20
11	Number of years at Stamford Hospital ICU, IMCU, or both?	<6 months 6 months – 1 year 1-3 years 4-5 years 6-10 years >10 years

12	All patients are at potential risk for developing pressure ulcers	Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree
13	Pressure ulcer prevention is time consuming for me to carry out	Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree
14	In my opinion, patients tend not to get as many pressure ulcers nowadays	Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree
15	I do not need to concern myself with pressure ulcers prevention in my practice	Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree
16	Continuous assessment of patients will give an accurate account of their pressure ulcer risk	Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree
17	Pressure ulcer treatment is a greater priority than pressure ulcer prevention	Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree
18	Most pressure ulcers can be avoided	Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree
19	I am less interested in pressure ulcer prevention than other aspects of care	Strongly agree Agree

		Neither agree nor disagree Disagree Strongly disagree
20	My clinical judgment is better than any pressure ulcer risk assessment tool available to me	Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree
21	In comparison with other areas of care, pressure ulcer prevention is a low priority for me	Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree
22	Pressure ulcer risk assessment should be regularly carried out on all patients during their stay in hospital	Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree

Appendix J

Table 1

MDRPI results during September – November 2022 implementation phase

	Lips	**Nose**	**Cheeks**	**Ears**	**Clavicle**	**Anterior Neck**	**Fingers**	**Wrists**	**Penis**	**Thighs/Labia**
Week 1-4	0	0	0	0	0	0	0	0	0	0
Week 5-8	0	0	0	0	0	0	0	0	0	0
Week 9-12	0	1	0	0	0	0	0	0	0	0

Appendix K

Table 1
Nursing Survey Results

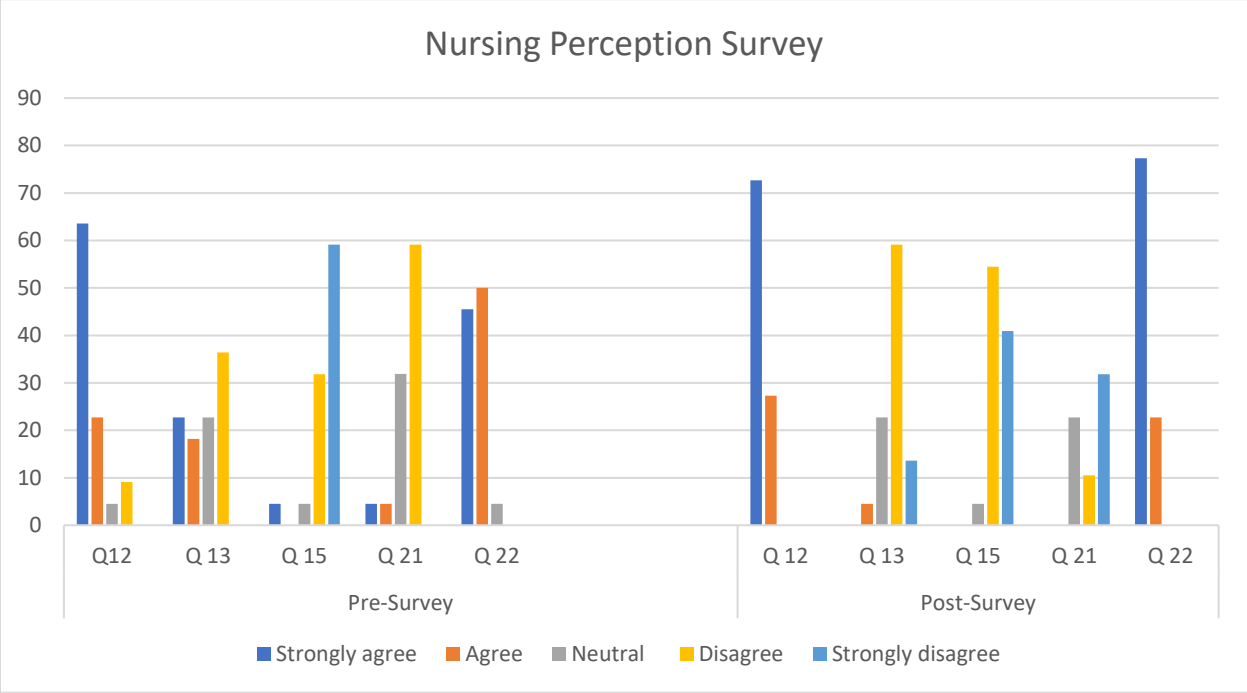
Questions*	**Answers**	**Baseline** ***f*** **(%)** **n = 22**	***Week 12*** ***f*** **(%)** **n = 22**
Question 12	*Strongly Agree*	*14 (63.6)*	*16 (72.7)*
All patients are at potential risk	*Agree*	*5 (22.7)*	*6 (27.3)*
for developing pressure ulcers	*Neither Agree Nor Disagree*	*1 (4.5)*	*0*
	Disagree	*2 (9.1)*	*0*
	Strongly Disagree	*0*	*0*
Question 13	*Strongly Agree*	*5 (22.7)*	*0*
Pressure ulcer prevention is time-	*Agree*	*4 (18.2)*	*1 (4.5)*
consuming for me to carry out	*Neither Agree Nor Disagree*	*5 (22.7)*	*5 (22.7)*
	Disagree	*8 (36.4)*	*13 (59.1)*
	Strongly Disagree	*0*	*3 (13.6)*
Question 14	*Strongly Agree*	*1 (4.5)*	*0*
In my opinion, patients tend not	*Agree*	*3 (13.6)*	*0*
to get as many pressure ulcers	*Neither Agree Nor Disagree*	*8 (36.4)*	*8 (36.4)*
nowadays	*Disagree*	*5 (22.7)*	*11 (50.0)*
	Strongly Disagree	*3 (13.6)*	*3 (13.6)*
Question 15	*Strongly Agree*	*1 (4.5)*	*0*
I do not need to concern myself	*Agree*	*0*	*0*
with pressure ulcers prevention in	*Neither Agree Nor Disagree*	*1 (4.5)*	*1 (4.5)*
my practice	*Disagree*	*7 (31.8)*	*12 (54.5)*
	Strongly Disagree	*13 (59.1)*	*9 (40.9)*
Question 16	*Strongly Agree*	*8 (36.4)*	*5 (22.7)*
Continuous assessment of	*Agree*	*10 (45.5)*	*17 (77.3)*
patients will give an accurate	*Neither Agree Nor Disagree*	*3 (13.6)*	*0*
account of their pressure ulcer	*Disagree*	*1 (4.5)*	*0*
risk	*Strongly Disagree*	*0*	*0*
Question 17	*Strongly Agree*	*0*	*0*
Pressure ulcer treatment is a	*Agree*	*1 (4.5)*	*0*
greater priority than pressure	*Neither Agree Nor Disagree*	*5 (22.7)*	*3 (13.6)*
ulcer prevention	*Disagree*	*8 (36.4)*	*9 (40.9)*
	Strongly Disagree	*8 (36.4)*	*10 (45.5)*
Question 18	*Strongly Agree*	*2 (9.1)*	*7 (31.8)*
Most pressure ulcers can be	*Agree*	*11 (50.0)*	*13 (59.1)*
avoided	*Neither Agree Nor Disagree*	*7 (31.8)*	*2 (9.1)*
	Disagree	*2 (9.1)*	*0*
	Strongly Disagree	*0*	*0*
Question 19	*Strongly Agree*	*2 (9.1)*	*0*
	Agree	*6 (27.3)*	*0*

I am less interested in pressure ulcer prevention than other aspects of care	*Neither Agree Nor Disagree*	*7 (31.9)*	*6 (27.3)*
	Disagree	*6 (27.3)*	*12 (54.5)*
	Strongly Disagree	*1 (4.5)*	*4 (18.2)*
Question 20 *My clinical judgment is better than any pressure ulcer risk assessment tool available to me*	*Strongly Agree*	*2 (9.1)*	*0*
	Agree	*5 (22.7)*	*1(4.5)*
	Neither Agree Nor Disagree	*8 (36.4)*	*11 (50.0)*
	Disagree	*7 (31.9)*	*7 (31.9)*
	Strongly Disagree	*0*	*3 (13.6)*
Question 21 *In comparison with other areas of care, pressure ulcer prevention is a low priority for me*	*Strongly Agree*	*1 (4.5)*	*0*
	Agree	*1 (4.5)*	*0*
	Neither Agree Nor Disagree	*7 (31.9)*	*5 (22.7)*
	Disagree	*13 (59.1)*	*10 (10.5)*
	Strongly Disagree	*0*	*7 (31.8)*
Question 22 *Pressure ulcer risk assessment should be regularly carried out on all patients during their stay in hospital*	*Strongly Agree*	*10 (45.5)*	*17 (77.3)*
	Agree	*11 (50.0)*	*5 (22.7)*
	Neither Agree Nor Disagree	*1 (4.5)*	*0*
	Disagree	*0*	*0*
	Strongly Disagree	*0*	*0*

***n**=total number of nurses who completed survey; **f**=number of answers; **%**=percentage of nursing responses (**f/n** x 100)*

Appendix L

Nursing Perception Survey Chart (questions 12, 13, 15, 21, 22)



Appendix M

Executive Summary

Hospital-acquired pressure injuries (HAPI) continued to rise, costing the healthcare system about $ 11 billion annually. Medical device-related pressure injuries (MDRPI) account for about 10% of HAPI. The rates of MDRPI were on the rise in a community hospital's Intensive Care Unit (ICU). An intervention to reverse this unfavorable trend was required. The evidence review supported the use of posters and clinical staff education to reduce MDRPI.

A quality improvement project was conducted between September to November 2022 to reduce the incidents of MDRPI in the ICU. This project also included measuring nursing perception on the importance of preventing MDRPI via Likert scale survey.

This QI project used the IHI's Model of Improvement to guide the project development and implementation. A poster depicting all the medical devices used in the ICU along with all corresponding protective equipment was made in color and placed in patient's room. Nurses were educated on purpose and where to find poster. A survey of nurses' perception of MDRPI prevention was done prior to use of poster and educational classes on July 5, 2022, and at the end of evaluation period on December 10, 2022. The incidence of MDRPI was collected monthly.

There was one incident of MDRPI during the 12-week data collection period. This was a reduction in incidence compared to pre-implementation rates of MDRPI. Comparing the pre-and post-nursing survey, the results showed an overall improvement in nurses' perception of MDRPI prevention. On post survey, there was a 31.8% increase in responders who strongly agreed with the statement that pressure injury (PI) risk assessment should be regularly carried out. There was also a 38.1% increase in nurses who strongly disagreed with the statement that PI prevention was

low priority. Lastly, there was a 13.6% increase in responders who strongly disagreed that PI prevention was time-consuming to carry out.

The MDRPI prevention protocol led to one incident of PI during the QI project, but occurred in a patient that was hemodynamically compromised and resulted in PI to the nares. Protective measures to prevent similar MDRPI have been made. As a result, the MDRPI prevention protocol will not only benefit the hospital financial, but most importantly the patients. Preventing MDRPI reduces hospital stay and recovery time for patients as well as pain, risk of infection, and possible disfigurement. Ultimately, patients and their families will be happier with having fewer complications during their hospitalization. This should lead to higher patient satisfaction scores and increase hospital prestige among the surrounding community. In summary, implementing the MDRPI prevention poster and educating nursing staff regularly will further decrease the incidents of MDRPI.