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Implementation of the Process Improvement Toolkit for Hospital Acquired Pressure Injuries

Christina Bearden
University of Missouri-St. Louis, ccbearden2016@gmail.com

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Christina C. Bearden

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Advisory Committee

Elizabeth Segura, DNP

Chairperson

Charity Galgani, DNP, APRN, WHNP-BC

Julie Brooks, MSN

Abstract

Problem: Approximately 2.5 million people within the United States receiving inpatient medical care will develop a pressure injury each year (Padula & Demarmente, 2018). Pressure injuries (PI) are a multifactorial complication that can often be avoided with general prophylactic measures. Despite this, inpatient settings around the United States continue to see a rise in PIs.

Method: The quality improvement initiative utilized a descriptive, observational design. The turn team toolkit was implemented and monitored over a two-month period. Patient descriptors and quantitative data were collected through a retrospective chart review. The primary data collected was on pressure injury rates and staff compliance to turning frequency.

Results: Following implementation of this quality improvement effort, a total of 122 patients were included in the study. The pre-implementation phase had a total of three PIs and the post-implementation had zero acquired PIs. A Fishers exact test was utilized and found a p-value of 0.066 indicating no statistical significance. Staff compliance with patient turning increased from 37.20% to 50.7%. A two-tailed Mann-Whitney test was run proving statistical significance between the compliance and implementation phase.

Implications: Further research should be conducted to expand the sample size and occurrence of pressure injury to determine if the toolkit provides a statistical significance between variables. Pressure injury prophylaxis continues to be crucial to patient comfort and avoidance of unnecessary hospital complications.

Hospital Acquired Pressure Injuries in the Adult Population

Approximately 2.5 million people within the United States receiving inpatient medical care will develop a pressure injury each year (Padula & Demarmente, 2018). Pressure injuries (PI) are the breakdown of the skin attributed to the excessive load of duration exceeding the tolerance of the tissue (Edsberg et al., 2022). PIs are a multifactorial complication but are most often avoidable with the proper prophylactic measures (Tervo-Heikkinen, 2021). The injury itself can be attributed to lack of routine repositioning, linen layers under the patient, lack of pressure redistribution tools, incontinence, and poor nutrition. According to Kim et al. (2022), not only will the hospital acquired pressure injuries (HAPIs) double the cost and length of stay, but they can also contribute to more than a 5-fold increase in mortality rate.

Life after recovery from a HAPI can lead to decreased feelings of self-confidence, impaired healing and mobility, pain, infection, and mortality from complications (Tervo-Heikkinen, 2021). A study conducted by Padula and Delarmente (2019), found up to 60,000 deaths annually were attributed to pressure injuries from acute care stays. This is nearly the same rate of deaths as there are drug overdoses and even more deaths than influenza or suicide each year. The Centers for Medicare and Medicaid Services (CMS) have labeled HAPIs as “never events” and restructured their financial coverage and incentives to hospitals with high rates of PIs (Miller et al., 2019). Never events are events that should be avoidable in almost all cases and are not a part of the expected adverse reactions of a hospital stay. Consequently, hospitals have taken the full burden of the HAPIs and have been known to pay from $500 to $70,000 per episode (Padula & Delarmente, 2018). Nationwide Medicare has reported the cost of PIs to be up to $22

billion. Research has been conducted on reducing the frequency of PI in the hospital through standard guidelines. Most results show a significant impact with certain consistent interventions in decreasing the rate of pressure injuries.

Numerous studies, which will be further discussed below, have been conducted on various redistribution tools, costs of HAPI, risk factors, and strategies to decrease the risk of occurrence. The purpose of this project is to implement a turn team toolkit on an inpatient telemetry unit. The aim is to reduce HAPI rates on an inpatient telemetry unit by 10% within 2 months. A process improvement toolkit will be utilized to alter the charting to present time with a mobile computer and changing the time of turning to even hours to avoid fall outs during shift change. Additionally, the repositioning wedges will be utilized in all turn eligible patients. The framework for this project will be the Institute for Healthcare Improvement (IHI) model for change. A plan-do-study-act (PDSA) cycle will be implemented to improve outcomes. The primary outcome measure will be the rate of HAPI post implementation. Secondary outcomes will consist of employee compliance with the methods for improvement. The question for the study is: In adult patients ages 18 years to the end of life admitted to an inpatient telemetry unit, after implementation of the turn team process improvement toolkit:

1. What is the rate of HAPI before and after the toolkit implementation?
2. What is staff compliance to documentation before and after the toolkit implementation?

Review of Literature

To identify information and solutions to these ongoing HAPI concerns, a literature search was conducted. The databases include CINAHL plus with full text, Consumer Health complete- EBSCO host, MEDLINE, and CINAHL. The following search terms were used: *hospital acquired pressure injury, HAPI, pressure injury prevention, pressure ulcer prevention, inpatient repositioning, schedule* turn*, team based turning, team-based repositioning, two hour turn*, adult inpatient, and Braden scale*. Boolean operators AND and OR were used. Initial publication generated by these search terms without inclusion and exclusion criteria were 972. The search was then modified to include studies published within the last 5 years, population focus of individuals 19 and older, studies utilizing best practice, and published in the English language. Exclusion criteria consist of studies older than five years, published in a language apart from English, pediatric populations, and outpatient facilities. With the inclusion and exclusion applied, 187 results were yielded. From these results, 10 publications were selected for this literature review.

Medical facilities have invested in screening tools to identify individuals at risk of developing a PI. A commonly used tool is the Braden Scale which scores a patient based on their sensory perception, moisture, activity, mobility, nutrition, and friction/shear risk (Tervo-Heikkinen et al., 2021). The Braden scale allows healthcare professionals to determine whether someone is at a higher risk for PI. Traditionally, those with a score of 18 or under are classified as having a risk of developing HAPI. The scoring system allows for continuous evaluation of risk but is often subjective and leaves room for human error. Kim and associates (2022), sought to explore if there was a model with higher predictability that included the Braden score and other variables rather than solely

using the Braden score. The study found the following risk factors to be major identifiers of the development of a pressure injury: length of stay, preexisting conditions such as diabetes and renal failure, maximum PA CO2 value, minimum PA O2, hypertension diagnosed during stay, gastrointestinal bleeding, and cellulitis (Kim et al., 2022). Additionally, a Braden score of 14 or less is a significant risk factor for the development of injury. Further investigation of the Braden scale with incontinence and PI was performed by Koloms et al. (2022). The study is observational with a cross sectional data collection design limiting the researchers to a single timepoint. The mean age of incontinent patients is roughly 69-74 years of age with a Braden scale score of 14.7-16.7. The findings concluded incontinent patients have a higher rate of unstageable HAPI than continent patients (14.9% vs 9.6%, P=.00) and higher rate of deep tissue HAPI (27% vs 22.1%, P = .00). A Finnish study conducted by Tervo-Heikkinen and associates (2021) explored the rate of PIs and their accompanying risk factors. Ten variables were studied to determine their statistical significance on HAPI risk using Pearson's chi test ($p < .05$). The patients were then placed in risk groups using the following Braden scores: high risk (<12); moderate (13-14); and low risk (15 and over). This is contrary to the previous studies discussed where Kim et al. (2022) found a Braden of 14 to be statistically significant and Kolom et al. (2022) found a score up to 16.7 to be at risk for a pressure injury. Of the ten variables studied, five proved significant for HAPIs including advanced age, decreased mobility, underweight, lack of skin assessment on arrival, and mode of arrival being emergency care (Tervo-Heikkinen, 2021). Overall, the studies concluded the identification of at-risk patients requires both the Braden scale and clinical knowledge on other associated risk factors.

The identification of pressure injuries and prevention implementation strategies are vital to combat rising HAPI rates. Edsberg and colleagues (2022) found the following factors to have the greatest impact on HAPI prevention: repositioning, support surface use, HOB elevation, heel elevation, moisture management, minimizing linen, and nutritional support. Braden scores of 18 and under or the presence of a PI automatically qualify as at risk per Edsberg and colleagues (2022). Within this study, the population with pressure injuries has an average age of 69.91 with a mean length of stay being 10.5 days. Results varied by unit type with the highest occurrence of HAPI being stage 2 PI at 33.8% on medical-surgical and stepdown units. The second highest rate was deep tissue PI (DTPI) in critical care at 33.6%. The sample size of this research is considerably large at 296,014 patients and is therefore generalizable. Among the group of at-risk individuals without HAPIs, the staff were most compliant with skin assessments (85%), redistribution (74.6%), and moisture management (71%). The staff had a higher rate of reported compliance with individuals in the severe HAPI category than the previous group with skin assessment (96.8%), redistribution (90%), heel elevation (60%), minimizing layers (76%), moisture management (89%), and nutritional support ranging from 55% to 82% compliance. The study adherence to preventative measures has proven to be efficient in reducing HAPI rates and will improve even further with 100% compliance.

The impact HAPIs have on one's quality of life and the financial implications of these 'never events' has brought the issue to the forefront of healthcare. Never events are events that should never occur within healthcare when providing proper prevention. The burden of cost for hospitals is coming to an all-time high with an estimated range of $3.3

billion to $11 billion annually considering the changes in the Medicare reimbursement policy (Padula & Delarmente, 2018). Padula & Delarmente (2018) simulated the progression of patients from no injury up to a stage four or until the point of discharge or expiration. Costs were measured in 2016 and found to the average cost of a HAPI to be $10,708. The average length of stay was shown to increase by an average of 2.2 days compared to other hospital stays. Padula et al. (2019) studied the repeated use of Braden scale for pressure injury prevention and the cost utility involved. Probabilistic simulations were conducted to determine cost from both societal and healthcare perspectives. Overall, over 99% of the simulations were cost effective in individuals with Braden scores under 15. Both studies highlighted the importance of PI prevention from a financial perspective. Further investments should be made by medical institutions in preventative measures to decrease the risk of the development of PI and the financial burden.

Given the changes in reimbursement from Centers for Medicare and Medicaid Services (CMS), acute care facilities must be cognizant of the prevention measures in place. Consequently, an abundance of HAPI prevention tools have come to the market. A quality improvement project conducted by Holbrook et al. (2021), determined the effectiveness of using different patient cushioning and increased patient education through a pilot study. Based on their scoring system, patients were categorized into risk levels qualifying for different contouring foam cushions. Any patient identified as having a full thickness injury automatically qualified for a low air loss mattress. Those who have a score of 15 or more also qualified for a referral to occupational therapy for further positioning education. Unfortunately, the control group vs the intervention group had no difference in the development of HAPI. However, those in the group of patients

encouraged to sit in the chair with cushions reported increased comfort, reduced pain, and increased time out of the bed which is better for the overall mobility of patients. Another repositioning tool studied for the effectiveness of reducing HAPIs is the Prevalon Turn and Position System (TAP). The frequency of the turns and correct positioning of the patient were reported in both the control and intervention group. It was found that those in the experimental group were more compliant with their turns and accurate in the positioning of the patients. Furthermore, there was a 94.6% compliance in the experimental group compared to a 69% compliance in the control group (De Meyere et al., 2019). The experimental group reported one deep tissue injury and a HAPI on the heel. The control group was reported to have four incontinence associated dermatitis, three pressure injuries, and one deep tissue injury. In this study, it is evident the TAP system is effective in the prevention of HAPI. Additionally, a study conducted by Powers and colleagues (2020), found a significant difference in turn angles and ability to maintain the turn for a prolonged period with the use of an air-powered positioning system with wedges over the use of a lift device and pillows. For the most optimal outcome, patients must be turned at a 30-degree tilt with a turn frequency of every two hours per the current practice guidelines (Powers et al., 2020). Evidently, repositioning tools allow for more precise degrees or turning and uphold pressure redistribution for longer periods and have shown to decrease the risk of HAPI.

Traditionally, repositioning and implementation of interventions is the responsibility of the primary nurse to be conducted through their shift. The standard recommendation for repositioning patients is every two hours (Medline plus, 2019). This may be unattainable due to high patient to nurse ratios, acuity of patients, and

unpredictable events throughout a shift. An approach to this predicament is to take a more team-based approach to increase the accountability of all staff on the unit rather than just the primary nurse. Cyriacks & Spencer (2019) studied the use of a “turn-team”, which is a team-based approach to repositioning the at-risk patients of the unit every two hours. The study found it to be budget neutral by assigning two staff members each even hour to turn the appropriate patients. All patients with a Braden score of 18 and under were deemed appropriate for turning and staff members were assigned to conduct turns on even hours for the entire unit. This allowed all the staff to be accountable for repositioning, which increased compliance. Compliance was tracked via chart audits. Per the report, HAPIs on the unit decreased by 75% within the first six months post implementation. Unfortunately, the analysis did not include other risk factors or interventions to consider in addition to repositioning. Similar to the previous study, Kahn & Jonusas (2019) examined the effectiveness of the turn team within a 51-bed unit through a four phased approach. Their methods included a magnet system outside of the door to symbolize patients with a Braden scale 18 and under. These methods resulted in an 89% reduction in HAPI over a four-year period. Both pieces of research were heavily dependent on staff compliance to be successful. The magnet system allowed for easy identification of the appropriate patients but can often be forgotten to update resulting in missed turns. Long-term solutions must be identified to ensure staff compliance without additional staff members such as unit clerks and house supervisors sending reminders. Given staffing shortages and patient acuity continuing to increase without a decrease in nurse-to-patient ratio, “turn team” can provide relief to the nursing staff and a decrease in HAPI rates.

Implementation of projects can be difficult to execute successfully without a proper framework. The IHI Model for Change framework was chosen for the implementation of a team-based approach to skin breakdown prevention. The model will allow collection of information from employees to alter the current turn team practice and improve the standard of care through use of the Plan-Do-Study-Act (PDSA cycle). During the plan phase, the objective of determining how and why HAPI are occurring. Through anecdotal data, areas for improvement and fallouts of current practices are identified. Current practices will be altered to improve employee compliance and patient outcomes by utilizing the process improvement toolkit. The facility in which the project is taking place will change their turn times to even rather than odd hours prior to implementation of the project. Additionally, turn wedges are being used inconsistently and will change to consistent use for all patients requiring turns. A computer on wheels will be added to the turn team to ensure present time charting and monitoring for changes in the braden scale score set by the primary nurse. The practice change will be piloted and redesigned as needed to ensure the appropriate measures are chosen. From there the practice change will be sustained and data will be collected to determine the success of the change through chart review. This framework is the most sustainable method for a project of this magnitude with the focus of practice change.

Method

Design

This quality improvement initiative utilized a descriptive, observational design. A retrospective chart review was used to assess the rate of HAPI occurrence from November to January 2023 and February to April 2024.

Setting

The setting is a large suburban teaching hospital on an inpatient telemetry unit. The hospital provides telemetry services to an economically diverse clientele and sees thousands of patients per year. The telemetry unit has 32 beds with an average length of stay of about five days and sees approximately 200 patients per month.

Sample

A convenience sample of patients admitted to the telemetry unit was collected. Inclusion criteria consists of: patients ages 18 years to end of life admitted to the telemetry unit, and Braden scale scores less than 18. Exclusion criteria are patients younger than age 18, patients on comfort measures, those with wounds on admission, and patients with Braden scores 18 and over. The sample for the secondary outcome of employee compliance will be all nursing staff and patient care technicians involved in the turn team process. This staffing included the primary floor staff and the float pool or agency nurses.

Procedures

Through discussion with the leadership of the unit and the floor staff, opportunities for improvement were identified. The unit educator started using in-services to increase employee compliance of using wedges. The researcher developed a rapport with leadership by meeting frequently to identify barriers to implementation of the toolkit. A toolkit was implemented involving a computer on wheels placed onto the unit to ensure the accuracy of charting times and obtain the most up to date Braden score set by the primary nurse. The use of turning wedges was required for all patients qualifying

for the turn team. Additionally, the timing of turning were changed to even hours to avoid fall outs during the change of shift. For the secondary outcome, employee compliance, shift huddles were periodically monitored by the researcher to ensure readiness and acceptability of the project by the employees.

Data Collection & Analysis

Data was collected via retrospective chart review by the primary investigator. Data was de-identified and stored on a password protected computer owned by the primary investigator. Data collected included recorded HAPI incidence, Braden scores, frequency of turns, and patient descriptors. Descriptive statistics including age, gender, ethnicity, length of stay, BMI, and wound presence injury after admission were also identified. Two-tailed Mann-Whitney test was utilized to examine the difference between the compliance of employees and implementation phase. A Fischer's exact test was also conducted to examine the categorical data of pressure injury presence and implementation phases and whether they are independent of one another.

Approval Process

Approval for the toolkit implementation and analysis was from the Internal Review Board at the site, doctoral committee, and the human subject approval from the University of Missouri – St. Louis IRB. The benefits of this project include employee engagement and additional methods to prevent the development of hospital acquired pressure injuries. The risks of the toolkit implementation is the changing of previously implemented prevention techniques and potentially worsening the rate of HAPI. There are no ethical considerations in this quality improvement project.

Results

The total number of participants was 122 (*n* =122). The most frequently observed gender was female (*n* =72, 59.02%). The average age of participants was 78.48 (*SD* = 11.52, Min = 50.00, Max = 102.00). The most frequently observed category of race was Caucasian (*n* =103, 84.43%) followed by African American (*n* =16, 13.11%) presented in Appendix B. The average BMI was 26.92 (*SD* = 6.45). The length of stay (LOS) was an average of 5.90 days (*SD*= 3.91, Min = 1.00, Max = 23.00).

The rate of compliance and hospital acquired pressure injuries (HAPI) were monitored and collected over a two-month pre-implementation period and two-month post-implementation period. The pre-implementation period sample size consisted of 50 (*n* =50) patients, three of whom experienced a HAPI. The average staff compliance rate over this period was 37.20%. The post-implementation of the toolkit had a sample size of 72 (*n* =72) and with no HAPI reported. The mean staff compliance of the post-implementation was 50.57%.

A two-tailed Mann-Whitney two-sample rank-sum test was conducted to examine the differences in the employee compliance of turning and the implementation phase. This test was used as an alternative to the independent samples t-test due to homogeneity of the sample not being met. The difference in employee compliance with turning and the implementation phase was statistically significant (.05, $U = 2540.5$, $z = -3.86$, $p < .001$). The distribution was significantly different between the two groups as evidenced by the mean rank of the pre-implementation value of 46.69 and the post implementation value of 71.78.

A Fisher's exact test was conducted to examine whether HAPI rates and the implementation phase were independent. Each variable is nominal with two levels of yes or no for pressure injuries and two levels of implementation phase: pre and post. The Fisher's exact test was chosen over a Chi-square test due to the small sample size and greater reliability in results. The frequency of pressure injury was not significantly different from the expected amount of pressure injuries (.05, p = .066.). See Appendix C.

Discussion

The occurrence of HAPI prior to the implementation of the toolkit was three pressure injuries within a two-month period. Following implementation of the project, there were zero HAPI incidents. The original aim of the project was to reduce HAPI by 10% over the implementation period. This benchmark was exceeded as evidenced by the 100% decrease in HAPI on the unit. The average staff compliance was statistically significant, with documentation in the pre-implementation period at 37.20%, increasing to 50.57% in the post-implementation period.

Contents of the toolkits were implemented and utilized over a two-month period. The study contained many strengths such as the increase in staff compliance and decrease in pressure injuries through team-based approaches. Staff compliance with turning increased from the pre-implementation period by 13%. The compliance rate continued to grow almost every week in a positive direction over the 8-week implementation period. This may be attributed to a variety of reasons such as the staff adjusting to the new procedures, management involvement, or researcher engagement. HAPI rates were

reduced by 100% compared to the pre-implementation data. Other strengths included the support for change from leadership including the wound nurse, educator, and management ensuring the staff had the tools needed to succeed.

Limitations of the study include a small occurrence of pressure injury which may have been attributed to the inability to calculate statistical significance between HAPI and implementation phases. Other barriers to the toolkit were technological difficulties limited the portable computer use for the first couple of weeks. The wedge utilization was limited during periods of time due to inadequate supply on the unit. Therefore, higher risk patients received wedges during the times of limited supply. Besides technology and supply errors, there was an initial barrier of staff members forgetting to sign up for turn slots. Overall, each barrier is able to be overcome through minor modifications within the system.

As evidenced by the results, it is apparent that the post-implementation displayed decreased HAPI rates and increased employee compliance. To counteract the supply issues discussed above, the data from this QI project can provide an estimate of wedges needed to be stocked on the unit. With the recommendation of having the wedge supply on the unit and the portable computer, the staff will be equipped with the resources needed to success. In another effort to promote employee engagement, a recommendation to have charge nurses sign each staff member up for a time slot to ensure each time is filled was made. Other recommendations consist of weekly huddle topics reviewing staff compliance, ensuring adequate amount of supplies, and continuing education over Braden scoring. Further testing should be conducted to include a larger sample size over a longer

period of time to include identity more HAPIs on both to pre and post implementation period to support the significance of this study.

Conclusion

Prior to the tool-kit implementation, the site had a turn team concept, but patients included on it were subjective to the bedside nurse's decision and compliance was difficult to achieve. The site has improved their turn processes using the toolkit to better identify those at risk of skin-breakdown (Braden score 18 and under). The floor staff is now better equipped to identify and intervene with those at risk through a more structured turn process. Future recommendations encourage the continued use of the toolkit. However, proper adherence to the toolkit and use of tools are encouraged. Future study should focus on obtaining a larger pre and post implementation time with a larger sample size to review the statistical significance of the toolkit in relation to the HAPI rate.

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Appendix A

Braden Scale Scoring

SENSORY PERCEPTION Ability to respond meaningfully to pressure-related discomfort	**1. COMPLETELY LIMITED** – Unresponsive (does not moan, flinch, or grasp) to painful stimuli, due to diminished level of consciousness or sedation, **OR** limited ability to feel pain over most of body surface.	**2. VERY LIMITED** – Responds only to painful stimuli. Cannot communicate discomfort except by moaning or restlessness, **OR** has a sensory impairment which limits the ability to feel pain or discomfort over ½ of body.	**3. SLIGHTLY LIMITED** – Responds to verbal commands but cannot always communicate discomfort or need to be turned, **OR** has some sensory impairment which limits ability to feel pain or discomfort in 1 or 2 extremities.	4. **NO IMPAIRMENT** – Responds to verbal commands. Has no sensory deficit which would limit ability to feel or voice pain or discomfort.
MOISTURE Degree to which skin is exposed to moisture	1. **CONSTANTLY MOIST**– Skin is kept moist almost constantly by perspiration, urine, etc. Dampness is detected every time patient is moved or turned.	2. **OFTEN MOIST** – Skin is often but not always moist. Linen must be changed at least once a shift.	3. **OCCASIONALLY MOIST** – Skin is occasionally moist, requiring an extra linen change approximately once a day.	4. **RARELY MOIST** – Skin is usually dry; linen only requires changing at routine intervals.
ACTIVITY Degree of physical activity	1. **BEDFAST** – Confined to bed.	2. **CHAIRFAST** – Ability to walk severely limited or nonexistent. Cannot bear own weight and/or must be assisted into chair or wheelchair.	3. **WALKS OCCASIONALLY** – Walks occasionally during day, but for very short distances, with or without assistance. Spends majority of each shift in bed or chair.	4. **WALKS FREQUENTLY**– Walks outside the room at least twice a day and inside room at least once every 2 hours during waking hours.
MOBILITY Ability to change and control body position	1. **COMPLETELY IMMOBILE** – Does not make even slight changes in body or extremity position without assistance.	2. **VERY LIMITED** – Makes occasional slight changes in body or extremity position but unable to make frequent or significant changes independently.	3. **SLIGHTLY LIMITED** – Makes frequent though slight changes in body or extremity position independently.	4. **NO LIMITATIONS** – Makes major and frequent changes in position without assistance.
NUTRITION Usual food intake pattern [1]NPO: Nothing by mouth. [2]IV: Intravenously. [3]TPN: Total parenteral nutrition.	**1. VERY POOR** – Never eats a complete meal. Rarely eats more than 1/3 of any food offered. Eats 2 servings or less of protein (meat or dairy products) per day. Takes fluids poorly. Does not take a liquid dietary supplement, **OR** is NPO[1] and/or maintained on clear liquids or IV[2] for more than 5 days.	**2. PROBABLY INADEQUATE** – Rarely eats a complete meal and generally eats only about ½ of any food offered. Protein intake includes only 3 servings of meat or dairy products per day. Occasionally will take a dietary supplement **OR** receives less than optimum amount of liquid diet or tube feeding.	**3. ADEQUATE** – Eats over half of most meals. Eats a total of 4 servings of protein (meat, dairy products) each day. Occasionally refuses a meal, but will usually take a supplement if offered, **OR** is on a tube feeding or TPN[3] regimen, which probably meets most of nutritional needs.	4. **EXCELLENT** – Eats most of every meal. Never refuses a meal. Usually eats a total of 4 or more servings of meat and dairy products. Occasionally eats between meals. Does not require supplementation.
FRICTION AND SHEAR	1. **PROBLEM**- Requires moderate to maximum assistance in moving. Complete lifting without sliding against sheets is impossible. Frequently slides down in bed or chair, requiring frequent repositioning with maximum assistance. Spasticity, contractures, or agitation leads to almost constant friction.	2. **POTENTIAL PROBLEM**– Moves feebly or requires minimum assistance. During a move, skin probably slides to some extent against sheets, chair, restraints, or other devices. Maintains relatively good position in chair or bed most of the time but occasionally slides down.	3. **NO APPARENT PROBLEM** – Moves in bed and in chair independently and has sufficient muscle strength to lift up completely during move. Maintains good position in bed or chair at all times.	

Adapted from Indiana Department of Health (2021)

Appendix B

Table B1

Frequency Table for Nominal Variables

Variable	*n*	*%*
Ethnicity		
Caucasian	57	79.17
African American	12	16.67
Other	3	4.17
Missing	0	0.00
Gender		
Male	30	41.67
Female	42	58.33
Missing	0	0.00

Note. Due to rounding errors, percentages may not equal 100%.

Table B2

Summary Statistics Table for Interval and Ratio Variables

Variable	*M*	*SD*	*n*	SE_M	Min	Max	Skewness	Kurtosis
Age	78.31	10.95	72	1.29	50.00	98.00	-0.55	-0.26
BMI	27.59	6.54	70	0.78	16.63	46.00	0.76	0.35
LOS	5.54	3.40	72	0.40	1.00	15.00	0.64	-0.10

Note. '-' indicates the statistic is undefined due to constant data or an insufficient sample size.

Appendix C

Table C1

Two-Tailed Mann-Whitney Test for Compliance by Implementation Phase

	Post-Implementation		Pre-Implementation				
Variable	Mean Rank	*n*	Mean Rank	*n*	*U*	*z*	*p*
Compliance	71.78	72	46.69	50	2,540.50	-3.86	< .001

Table C2

Observed and Expected Frequencies

	Pressure Injury Rate		
Implementation Phase	No	Yes	*p*
Post-Implementation	72[70.23]	0[1.77]	.066
Pre-Implementation	47[48.77]	3[1.23]	

Note. Values formatted as Observed[Expected].

Figure C1

Pressure Injury rate by Implementation Phase