

Implementing a Pressure Injury Prevention Bundle in Cardiac Surgical Critical Care

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Abstract

Problem and Purpose: In the adult Cardiac Surgery Intensive Care Unit (CSICU) of a large academic medical center the hospital acquired pressure injury (HAPI) rate is high. The average HAPI rate per 1,000 patient days for six months prior to implementation was 9.02. The hospital average for this time frame was two. Every six months this unit cares for an average of 574 patients. A literature database search revealed pressure injury prevention (PIP) bundles were an evidence-based intervention that lowered HAPI rate. The purpose of this quality improvement initiative is to implement a PIP bundle to reduce the number of HAPIs in the CSICU. **Methods:** Prior to implementation, strategies to prevent HAPIs were largely left up to the nurses' discretion. A Braden Score is performed every twelve hours. All patients were to be repositioned every two hours. For the new process a score less than or equal to eighteen, patients receive; every two-hour repositioning including while in the chair, a pressure relief cushion, a multi-layer sacral dressing, heel protectors, and encouraged mobility. Staff education, a one-page education handout, unit champion, email reminders, and dissemination were used to encourage process adherence. Data was collected into a password protected HIPAA compliant server with VPN access. **Results:** During implementation 176 patients were admitted. 50% of these patients received the bundle. 105 admitted patients remained on the unit at 48-hours, 57% of these patients received the bundle. On admission sacral dressings, heel protectors, and 2-hour repositioning had greater than 90% compliance. Pressure relief cushion and mobility had 74% and 68% respectively. At 48-hours sacral dressing and 2-hour repositioning had greater than 98% compliance. Mobility and pressure relief cushion improved to greater than 80% usage. **Conclusion:** The HAPI rate during implementation was 5.26. There was a rate decrease of 3.76. No purposeful evidence of change could be determined. There was increased compliance with

bundle components at 48-hours. PIP bundles are an effective standard intervention for use in the CSICU. Sustainability can be achieved using continued audits with unit champion, continued staff education, and as new HAPI prevention devices are made available the bundle can be adjusted.

Implementing a Pressure Injury Prevention Bundle in Cardiac Surgical Critical Care

In the Cardiac Surgery Intensive Care Unit (CSICU) of a large University medical center, hospital acquired pressure injuries (HAPIs) occur at a rate higher than in the entire facility. This is due to characteristics of the patient population as well as the unit. This unit cares for adult patients, age 18 and older, undergoing cardiac surgical procedures and or requiring advanced cardiac life support. HAPIs can increase a patient's length of stay by ten to fifteen days. The longer stay as well as treatment for a HAPI can cost up to 50,000 dollars (Chello et al., 2018).

The cardiac surgery population is at an increased risk for HAPIs, as up to one third of patients develop a HAPI (Chello et al., 2018). This increased risk comes from prolonged operating table times, immobility, hypothermia, vascular disease, and vasoactive medication use (Chello et al., 2018). The NDNQI tracks safety topics to improve healthcare through consensus-based national standards for measurement and reporting, the hospital uses this benchmark to track progress (*NDNQI Measures Aim to Improve Healthcare Safety and Quality*, 2014). More recently the HAPI rate per 1,000 patient days is higher in the CSICU than the entire hospital average. For six months prior to implementation the HAPI rate in the CSICU was 9.02. The hospital HAPI rate was 3.19 for the same time frame. The National Database of Nursing Quality Indicators (NDNQI) mean benchmark was six to eight and a half for adult critical care units during the same time frame (*Unit Specific Quality Measures*, 2021).

A Braden Score is used to determine a patient's individual risk for HAPI (Rivera et al., 2020). A Braden assessment is performed and documented in the electronic medical record (EHR) once every shift on this unit, however, there is no standardized directive on what to do with the risk score received. This leads to inconsistencies in pressure injury prevention interventions (PIP) used (Rivera et al., 2020). Therefore, patients may not be receiving

interventions that would be of benefit and could potentially lower their risk of HAPI. Also, in this high acuity unit lifesaving interventions take precedence. Due to this, PIP interventions may be delayed (Cox & Schallom, 2017).

Aim

In order to find a solution to this problem a literature search was performed using the CINAHL database. PIP bundles are a grouping of evidence-based interventions that are used at the same time to prevent HAPIs. PIP bundles are a way to standardize care (Rivera et al., 2020). The literature search was narrowed for research regarding PIP bundles and critical care. Twenty-five articles were read and appraised for strength and quality of the research. Fives studies were found to be of good quality for this practice problem. Two systematic reviews and three retrospective/prospective cohort studies were included. Trisnaningtyas, Retnaningsih, and Rochana performed a systematic review and included 17 studies on the effects of PIP bundles (2020). Alshahrani, et. al., also performed a synthesis review but included all nursing interventions for PIP. In this review, eight studies included were on PIP bundles and their effects. McLaughlin, et. al., Rivera et. al., and Coyer, et. al. performed retrospective/prospective cohort studies on PIP bundle implementation (2022, 2020, & 2015). While PIP bundles are evidence based, they are all slightly different as there is no industry standard. See Table 1 for an evidence review table and quality rating of the studies used. All the studies determined that there was a reduction in HAPI with the implementation of a PIP bundle. In addition to this McLaughlin et.al. and Coyer, et. al. found that the bundle increased the length of time it took to develop a pressure injury (2022 & 2015). All studies recommended that future bundles include a risk assessment, skin assessment, skin care, repositioning, and prophylactic measures such as multilayer sacral dressings and/or heel protectors. See Table 2 for an evidence synthesis table.

The purpose of this project was to implement and evaluate the effectiveness of a PIP bundle in an adult cardiac surgical intensive care unit. Patients that were admitted without an existing pressure injury and had a Braden Score less than eighteen received the following; every two-hour repositioning including while in the chair, a pressure relief cushion to sit on while in the chair, a multi-layer sacral dressing, heel protectors while in bed, encouraged mobility, and continued use of the current specialty bed selection protocol. The main process and outcome goal was to have one hundred percent compliance of documentation and use of the PIP bundle for patients with Braden Score less than eighteen. A long- term outcome goal is to decrease the HAPI rates on the CSICU. There was no specific rate drop goal set at the beginning of the project.

Framework

For this project the Knowledge to Action framework was helpful with implementation. This framework has two cycles of the process that are dynamic and interact with one another (Field et al., 2014). See Figure 1 for visual depiction of the Knowledge to Action framework. A problem was identified and a possible solution also found. The knowledge creation step was performed by creating the evidence review and synthesis. This step was implemented in the action cycle (Field et al., 2014). The PIP bundle solution was then tailored to the context where it was implemented. Also, during this process barriers to implementation were assessed. Once barriers were identified solutions to overcome them were assessed. Educational offerings were held to disseminate the knowledge. Once implementation occurred the process was monitored to ensure that the intervention was being used. If it was not, discussions were held with the group to determine the reasons why and how to adjust the plan. Handouts and

educational materials were used to help sustain this knowledge use. This was a cyclical process and adjustments were made at any time to assist with knowledge and use.

Methods

Context

Hospital units are complex environments with multiple moving parts. All parts can be either facilitators or barriers to change. This unit is very familiar with quality improvement projects. This familiarity was a facilitator as the team is aware of the process and flexible with their work flow. However, staff had occasionally voiced the feeling of “being projected out,” this can be a barrier to implementation. It was highlighted that these interventions were not novel ideas and that some nurses may have already been performing parts of this bundle on their own accord. This helped reduce the project feel. Educational offerings on the evidence behind the intervention as well as how to use it can help overcome barriers. Along with this education, showing that the intervention was easy to use and saved time helped with adoption (Mathieson et al., 2018). This project affected nurses the most. As such, their feedback and participation were vital for success of the project. The prior structure and process for PIP was primarily determined by the individual nurses. The Braden Score and PIP interventions were documented in the Daily Care flowsheet. There was an algorithm to determine when to use a supportive surface mattress for patients based on their Braden score and mobility. Outside of this, what was used and when, was determined by the individual nurse. The project continued to encourage nurses to use the current process for supportive surface mattress use.

Intervention

The proposed intervention was a PIP bundle, several pieces to be used together to help decrease HAPI risk. This bundle was applied to all patients admitted to the unit without an

existing pressure injury and with a Braden Score of less than or equal to eighteen. Patients that fit these two criteria received the following; every two-hour repositioning including while in the chair, a pressure relief cushion to sit on while in the chair, a multi-layer sacral dressing, heel protectors while in bed, encouraged mobility, and continued use of the current specialty bed selection protocol. The sacral dressing was to be used throughout the admission to the CSICU. The mobility component was the patient getting out of bed to the chair at least once in a 24-hour period. Patients with open chests, femoral IABP, femoral Impella were excluded due to activity restrictions. See figure 2 for the current process as well as the desired process. The Braden Score is documented once per twelve-hour shift, as such the bundle was documented similarly. The nurses were to use the PIP bundle in the newly implemented intervention selection cell in the EMR that is located under the Braden Score result. This new documentation piece would allow for better assessment of implementation. The EMR change could not be made, as such, the Daily Care flowsheet within the electronic medical record (EMR) was utilized to track which components are completed and how often. The implementation of this intervention took place over fifteen weeks. The IRB approval was achieved by July 29th of 2022. Go-live was August 29th of 2022. All nurses were educated on the bundle and process prior to the start of implementation. Education on process and importance of evidence-based practice use helped encourage successful implementation. Updates on progress were provided to the nurses through email every two weeks and at the end of the project. When the bundle or components of the bundle were not being documented and used, emails were sent out and discussions held with staff to determine why it was not being used and how to improve the process for compliance. To encourage sustainability the PIP bundle was introduced in the novice nurse classes provided to

new graduate nurses on the unit. The PIP bundle was also suggested to be added to the orientation packet for all nurses that are new to the unit.

Measures

For this project the daily Braden Score and number of times the bundle was applied was collected. Application of the bundle was determined by documentation. The data collected were measurements. Braden Score and PIP bundle use was collected at time of admission and after 48-hours. These timepoints provided initial compliance with the bundle as well as short term continued use. Data was collected daily for new admissions and patients reaching the 48-hour mark on the unit. Run-charts and percentage of compliance were sent out to the staff weekly so they could see their progress. The EMR change was unable to be made before the Go-Live date, due for time constraints, as well as, facility EMR requirements. Due to this, the documentation of the interventions was done in the Daily Care Flowsheet in the EMR. As it was not a specific location for this documentation, it was a bit more work on the nurses' part to ensure that it was documented. Since this is a busy fast paced unit, only requiring this documentation once a shift, i.e., every twelve hours, did not increase documentation requirements by a significant amount. Every two-hour repositioning was documented every two hours as it was supposed to be done this way prior to implementation. All pieces of the PIP bundle were already stocked on the unit and pared high enough so every patient could receive one, as such there should not have been extra cost to the unit. The long-term goal of this project was to decrease the number of HAPIs developed on the unit. With a relatively short implementation time frame this may not be able to be seen initially but with sustainability the effects will eventually show.

Data was collected at least three times a week by the project lead and entered directly into REDCap, a HIPAA compliant password protected server. See Figure 3 for the data collection

tool used. Manual chart audits were used to collect the data. Unit census was used to ensure no qualifying participants were missed. Data was only collected by the project lead to ensure it was complete and accurate. Outcomes were analyzed based on run charts. The charts were analyzed looking for runs, shift, and trends. This was used to determine if the outcomes were due to the intervention used.

Analytics

Data for this project was analyzed quantitatively. Data was analyzed weekly in the form of percentages for initial and 48-hour compliance. The data may show some variation due to the characteristics of the unit and patient population. In 48-hours, some patients Braden Score may improve to above eighteen, as such they will not have a second data point. Other times patients may be transferred to another level of care or pass away, leaving only an initial data point. Both types of variation would be due to special-cause. Along with this special-cause variation there will be some inherent random variation that occurred. To track progress over the course of the project run charts were utilized measuring weekly compliance. Time helped familiarize the team with the process and thus improved the compliance and adherence as the project continued.

Ethics

When working with humans in a quality improvement project it is important to ensure ethical treatment. The process was analyzed and developed so there were no harmful effects to the participants. Patients had an adherent benefit of this intervention as it would help reduce their risk of developing a life changing HAPI. As preserving one's autonomy is important patients in this unit had the ability to refuse interventions they did not wish to have. Education was given on the importance of the interventions but interventions were not forced upon participants. This quality improvement project was conducted under the belief that it would benefit all those

affected. Non-human Subject's Research determination from the Human Research Protections Office (HRPO) of the UMSOM Institutional Review Board (IRB) was obtained prior to project implementation. All data used was de-identified to protect privacy and confidentiality.

Results

Project was completed in 16 weeks with the first week being listed as week zero as staff education was not completed prior to Go-Live. The EMR change was unable to be made due to timing and strict facility EMR requirements. 50% of admitted patient (n=88) received the completed bundle. 57% of patients that remained on the unit at 48-hours (n=62) received the completed bundle. There were no shifts or trends in the data. There was an expected amount of runs in both sets of data. See Figure 4 for admission data run chart and Figure 5 for 48-hour run chart data. Due to this it is exceedingly difficult to determine if the changes in rates were due to interventions or random. A weekly "Thank You" snack basket was introduced week 1 of implementation. An increase in compliance was seen following this. However, for the remainder of implementation, the "Thank You" snack basket did not continue to improve compliance. Week 2 at 48-hours had 88% compliance, additional education was given to the Novice Nurse Cohort this week. This additional education may account for the increase in compliance. Between week 4 and 5 the one-page bundle reminder sheets were unexpectedly removed from the unit. This was during a time period when Joint Commission could visit the hospital. The reminder sheets being removed could account for the decrease in compliance during week 4. Individual bundle component compliance was analyzed at the completion of the project. 100% compliance with documentation was not achieved in the implementation timeframe except for week 8 at 48-hours. There is no explanation for this sudden change in compliance. There is an astronomically low data point at 48-hours at week 11. There were no major staffing changes or

supply shortages at this time. This leads to no obvious cause for this change. On admission sacral dressing use, heel protectors, and two-hour repositioning had greater than 90% compliance (Figure 6). The pressure relief cushion and mobility had 74% and 68% compliance respectively. At 48-hours sacral dressing use and two-hour repositioning had greater than 98% compliance. Heel protectors, mobility, and pressure relief cushion had greater than 80% compliance. The pressure relief cushion, two-hour repositioning, and mobility components had increased compliance at 48-hours. The average HAPI rate during implementation was 5.26, a decrease of 3.67 or 42.7%. Cost effectiveness was not tracked during this process. This is due to the unit being parred for all patients to receive one of each component at admission.

There were several barriers that were encountered during this process. One of the most problematic barriers was the inability to elicit feedback from the staff despite multiple attempts. Without this feedback changes were not able to be made to the process during implementation to increase compliance. Following implementation, a post-survey was sent out. Fifteen surveys were returned with responses. A few of the responses indicated the bundle was confusing to use. If input had been received during implementation, clarification could have been given. Other post-survey responses identified patient condition and competing priorities as limiting factors. Some staff reported not using the bundle based on unwillingness to participate.

There were also facilitators to the process. The clinical site representative (CSR) was supportive and assisted with the process where ever they were able. This included placing the bundle in the weekly huddle emails as well as sending the post-survey. The charge nurses assisted by reminding staff during pre-shift huddle to use the bundle. The supply chain for bundle components also facilitated this process. There were no shortages during implementation for the individual components. Having a unit parr that allowed for all admitted patients to receive

the components also facilitated the process. All components were placed in the patient's room prior to admission. This allowed for timely application.

Discussion

The overall HAPI rate on the unit decreased during bundle implementation. With no shifts, trends, or unexpected number of runs it is not possible to determine if this decrease was due to the intervention or random occurrence. As stated earlier, supply cost was not tracked during this process. Addressing the cost to the unit was an oversight during project development, as the unit was parred for all patients to receive one of each component. Future quality improvement projects regarding PIP bundles should include this. It was not considered at the start of the project that there may be an increased utilization of these supplies during this time. As stated earlier other studies have found that PIP bundles were an effective way to reduce HAPI rates. These studies occurred over longer timeframes to show definitive change. Time frame was a limitation in this study. 15-weeks is not long enough to show lasting-changes in HAPI rates. A factor that could have limited the bundle use is the patient population. The population can be critically ill, in critical situations life-saving measures will take priority over HAPI prevention. Internal validity is affected by an ever-changing staff composed of agency and per diem making on-going education difficult. Due to time constraints for this project in-depth education could not be provided. Quick educational in-services were given to staff in pre-shift huddles and on the unit during shifts. Education included when to use the bundle and how to apply the bundle. An integral part to success for this project was staff feedback. Staff members were asked for feedback in person and email throughout the project implementation. However, there was very little feedback that was received from staff. Due to this, meaningful changes to the implementation strategies were not able to be made. Documentation in the Daily Care flowsheet

was cumbersome. If the bundle had been added to the EMR as initially planned, there may have been increased compliance seen. Moving forward, discussions can be held with the information technology (IT) department regarding bundle results and outcomes to provide further support for the EMR change.

Conclusion

There was a decrease in HAPI rate during this quality improvement initiative. However, due to the lack of trends in the data there is no way to determine if this change was due to implementation of the PIP bundle. There was significant adoption of the intervention by the staff. This can be seen in the increased use of bundle components. The increased use of bundle components assists in decreasing patients' HAPI risk. PIP bundles are an effective standardized intervention for use in the CSICU. Bundles may be a cost-effective intervention as well. Return on investment can be monitored easily over time to determine cost-effectiveness. A PIP Bundle has the potential to improve healthcare quality, safety, and outcomes for patients in the CSICU. The PIP bundle standardizes prevention across all at risk patients ensuring equal and quality care. Standardization reduces confusion surrounding PIP interventions. With decreased risk of pressure injury, patients will see improved outcomes. While PIP bundles can assist with HAPI rate reduction it can only do so with sustainability. To sustain, a standard admission par with bundle components should be maintained. Continued audits and use of a unit champion should also continue. If supplies change, the bundle can be adjusted to fit current needs; as there is no industry standard.

Future quality improvement initiatives should look at cost-effectiveness as that was overlooked during this project. Future projects should also explore a different variety of implementation strategies. More in-depth education on HAPIs as well as prevention should be

utilized to improve bundle compliance. In summarization, a PIP bundle can be an effective strategy to decrease HAPI rates in the CSICU. Future quality improvement initiatives can further strengthen this evidence and process.

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Tables

Table 1. Evidence Review

Citation: Alshahrani, B., Sim, J., & Middleton, R. (2021). Nursing interventions for pressure injury prevention among critically ill patients: A systematic review. <i>Journal of Clinical Nursing, 30</i> , 2151–2168. https://doi.org/10.1111/jocn.15709					Level and Quality II, B
Purpose/ Hypothesis	Type of Evidence Research Design	Sample – Population, Size, Setting	Intervention/Procedures	Primary Outcome/Measures	Results/Conclusions
To synthesize the evidence on most effective interventions to prevent pressure injuries (PI) in the adult critical care population	Systematic review of 4 electronic databases	Sampling Technique: # Eligible: Included 14 studies: RTCs (3), quasi-experimental (8), case series (2), and cross-sectional (1) studies # Accepted: 8 studies on PI prevention bundles	Control: Pre-intervention skin practices Intervention: PI prevention bundle (bundles varied in interventions) <u>Intervention fidelity</u> (describe the protocol): Protocols varied per study	DV: Development of a pressure injury State the instrument, reliability, and measurement procedure: Use the EPUAP/NPIAP/PPPIA stages (I, II, III, IV, unstageable, deep tissue injury). Identification and staging was performed by nurses.	Statistical Results: Use of RCT and quasi-experimental can be moderately certain PI prevention bundles reduce the number and severity of PI <u>Clinical Significance:</u> PI prevention bundles can be a simple yet effective intervention to prevent PI in critical care patients, as long as the pieces are based on the best evidence and tailored to the unit Conclusions: PI prevention bundles can reduce the number and severity of PI in the critical care population. Bundles should only have as many elements as needed. Adding more pieces does not make the bundle more effective and may decrease compliance
Citation: Trisnaningtyas, W., Retnaningsih, R., & Rochana, N. (2021). Effects and interventions of pressure injury prevention bundles of care in critically ill patients: A systematic review. <i>Nurse Media Journal of Nursing, 11</i> (2), 154–176. https://doi.org/10.14710/nmjn.v11i2.28881					Level and Quality II, B

Purpose/ Hypothesis	Type of Evidence Research Design	Sample – Population, Size, Setting	Intervention/Procedures	Primary Outcome/Measures	Results/Conclusions
Synthesize the evidence of PI prevention bundles on the incidence of PI in critically ill patients	Systematic review of 6 databases	<p>Sampling Technique: #Eligable: 836 studies # Accepted: 17 studies with evidence level II were included: quasi-experimental (14), RCT (2), and cohort (1).</p> <p>Group Homogeneity: There was heterogeneity in the methods and statistical values, therefore a meta-analysis could not be performed</p>	<p>Control: Pre-intervention skin practices</p> <p>Intervention: PI prevention bundle (bundles varied in interventions)</p> <p><u>Intervention fidelity</u> (describe the protocol): Protocols varied per study</p>	<p>DV: Incidence of PI</p> <p>State the instrument, reliability, and measurement procedure: Varied by study</p>	<p>Statistical Results: Pressure injury prevention bundles reduced incidence by 4.3-36.2%</p> <p><u>Clinical Significance:</u> Multi-intervention bundles can reduce the incidence of PI in critical care patients.</p> <p>Conclusions: PI prevention bundles can reduce PI incidence in critical care patients. Best to use 7 intervention measures: risk assessment, skin care, reposition, nutrition, support surface, education, and medical device maintenance</p>
<p>Citation: Rivera, J., Donohoe, E., Deady-Rooney, M., Douglas, M., & Samaniego, N. (2020). Implementing a pressure injury prevention bundle to decrease hospital-acquired pressure injuries in an adult critical care unit: An evidence-based, pilot initiative. <i>Wound Management & Prevention</i>, 66(10), 20–28. https://doi.org/10.25270/wmp.2020.10.2028</p>					<p>Level and Quality III, B</p>
Purpose/ Hypothesis	Type of Evidence Research Design	Sample – Population, Size, Setting	Intervention/Procedures	Primary Outcome/Measures	Results/Conclusions

<p>Initiate a PI prevention bundle to standardize the process and to reduce PI incidence</p>	<p>Pre- and post-implementation study</p>	<p>Sampling Technique: Pre- intervention: January 2017-February 2018, 9 PI, rate of 3.4 Post-intervention: February 2018-November 2018, 1 PI rate of 0.48</p> <p>Group Homogeneity: All patients were from a CCU, acutely ill with cardiac disease</p>	<p>Control: Pre-intervention skin practices</p> <p>Intervention: PI prevention bundle</p> <p><u>Intervention fidelity</u> (describe the protocol): Braden scale assessment used. Bundle had 2 sections one for ≥19 and ≤18. Audits were performed weekly to track adherence. WOC nurses collected the data. PI data was collected daily and reported monthly.</p>	<p>DV: Incidence of pressure injury</p> <p>State the instrument, reliability, and measurement procedure: Incidence was reported daily by the resource nurse or bedside nurse through a WOC nurse consult</p>	<p>Statistical Results: Pre- intervention: January 2017-February 2018, 9 PI, rate of 3.4 Post-intervention: February 2018-November 2018, 1 PI rate of 0.48</p> <p><u>Clinical Significance:</u> The use of a PI prevention bundle can help reduce the incidence of PI in critical care patients</p> <p>Conclusions: Implementation of the bundle created standardization and reduced the PI incidence. Staff support was vital for success.</p>
<p>Citation: Coyer, F., Gardner, A., Doubrovsky, A., Cole, R., Ryan, F. M., Allen, C., & McNamara, G. (2015). Reducing pressure injuries in critically ill patients by using a patient skin integrity care bundle (inspire). <i>American Journal of Critical Care</i>, 24(3), 199–209. https://doi.org/10.4037/ajcc2015930</p>					<p>Level and Quality III, A</p>
<p>Purpose/ Hypothesis</p>	<p>Type of Evidence Research Design</p>	<p>Sample – Population, Size, Setting</p>	<p>Intervention/Procedures</p>	<p>Primary Outcome/Measures</p>	<p>Results/Conclusions</p>
<p>To test the InSPiRE bundle for reducing PI in critically ill adult patients in the ICU</p>	<p>Pre- and Post-implementation study. Intervention group was compared with a similar control group that received standard care.</p>	<p>Sampling Technique: # Accepted: 207 # In control: 102 # In intervention: 105</p> <p>Power analysis: Based of control group incidence rate of 0.1154 per day. So,</p>	<p>Control: standard care</p> <p>Intervention: InSPiRE skin care bundle</p> <p><u>Intervention fidelity</u> (describe the protocol): The InSPiRE tool was implemented</p>	<p>DV: Incidence of pressure injury</p> <p>State the instrument, reliability, and measurement procedure: A standardized skin assessment tool was used. Pressure injuries were</p>	<p>Statistical Results: The incidence of PI was significantly different p=.04. reduced PI from 30%-18%.</p> <p><u>Clinical Significance:</u> An evidence-based bundle can lower the incidence of</p>

		<p>408 days of observation time per group, 102 people per group with mean stay of 4 days. would detect 50% reduction in PI rate with 80% power and significance (p<0.05).</p> <p>Group Homogeneity: Patients were accepted if they were admitted to the ICU, expected to have >24-hour stays, and >18y.o. Most patients were male with a mean age of 55. Pre-and Post-groups were demographically similar</p>	<p>(addresses clinical assessment, documentation, hygiene, repositioning, and strategies to prevent PI. Intervention group was compared to a similar control group that received standard care.</p>	<p>divided into skin and mucosal. International guidelines for staging were used I-IV. 2 images of a PI were documented</p>	<p>PI and increase the time to develop PI. Intervention can also reduce the severity of PI.</p> <p>Conclusions: InSPiRE was effective at reducing incidence, type, and severity of PI.</p>
<p>Citation: McLaughlin, J. M., Tran, J. P., Hameed, S. A., Roach, D. E., Andersen, C. R., Zhu, V. Z., Sparks, B. B., Phillips, L. G., Koutrouvelis, A. P., & Tyler, D. S. (2022). Quality improvement intervention bundle using the puppies acronym reduces pressure injury incidence in critically ill patients. <i>Advances in Skin & Wound Care</i>, 35(2), 102–108. https://doi.org/10.1097/01.asw.0000803248.34424.ce</p>					<p>Level and Quality III, B</p>
Purpose/ Hypothesis	Type of Evidence Research Design	Sample – Population, Size, Setting	Intervention/Procedures	Primary Outcome/Measures	Results/Conclusions
<p>To determine if a prevention quality improvement bundle is able to decrease PI incidence, delaying onset, or cost</p>	<p>Retrospective/prospective cohort study. Retrospective for 12 months January 2015-January 2016. Prospective January 2017-January 2018. Order set was placed in the EMR</p>	<p>Sampling Technique: # Accepted: 930 # In control: 599 # In intervention: 331</p> <p>Power analysis:</p> <p>Group Homogeneity: Patients in the pre- group were older and had worse kidney function. The post-group had higher rates of major surgery, pressor use, DM, heart failure, and</p>	<p>Control: standard care</p> <p>Intervention: PI prevention bundle</p> <p>Intervention fidelity (describe the protocol): Visual tool check lists were used. For 4 months during the prospective period staff was familiarized with the protocol. Protocol was implemented into all patients EMR. The ICU nurse</p>	<p>DV: incidence of PI</p>	<p>Statistical Results: incidence of PI was lower in the post intervention group (p=.005). The post intervention group also took longer to develop a PI (p=0.04). Every point higher in the Braden score was showed a 17% decrease in risk (p=.0003).</p> <p>Clinical Significance The use of a bundle can decrease incidence of PI and</p>

		ventilated. Length of stay was similar between the 2 groups.	manager assessed compliance weekly.		increase the length of time it takes to develop a PI Conclusions: A multi modal PI bundle is effective.
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Note: Evidence Level and Quality determined using the Johns Hopkins evidence-based practice for nurses and healthcare professionals: Model and guidelines (Dang, et. al., 2022)

Table 2. Evidence Synthesis

Category (Level Type)	Total Number of Sources/Level	Overall Quality Rating	Synthesis of Findings
Level 1 - Experimental study · Randomized Controlled Trial (RCT) · Systematic review of RCTs with or without meta-analysis	0		
Level II · Quasi-experimental studies · Systematic review of a combination of RCTs and quasi-experimental studies, or quasi-experimental studies only, with or without meta-analysis	2	B	<p>Trisnaningtas, Retnaningsih, and Rochana performed a systematic review of PI prevention bundles in critically ill patients. The bundles in this review all varied on the types of interventions included. The findings in this study showed that the use of PI prevention bundles reduced the incidence of PI in critically ill patients. The bundles that were most effective consisted of risk assessment, skin assessment and care, repositioning, nutrition, education, support surface, and medical device care (2021).</p> <p>Alshahrani, et. al., performed a systematic review of nursing interventions to prevent PI in critically ill patients. As part of this review 8 studies pertained to PI prevention bundles. Like the review by Trisnaningtas, et. al. all of the bundles included varying interventions. The evidence from these studies is moderately strong. This review also found that PI prevention bundles are effective at reducing the incidence as well as severity of PI. The review also echoes the importance of including risk assessment, skin assessment and care, nutrition, and repositioning (2021).</p> <p>Both of these systematic reviews found that using a PI bundle is an effective intervention to prevent PI.</p>

<p>Level III · Non-experimental study · Systematic review of a combination of RCTs, quasi-experimental, and non-experimental studies, or non-experimental studies only, with or without meta-analysis · Qualitative study or systematic review of qualitative studies with or without meta-synthesis</p>	<p>3</p>	<p>B</p>	<p>All of the studies that were level III were retrospective and prospective cohort studies. These studies all involved the implementation of a PI prevention bundle. The specific interventions included in these bundles varied per study. McLaughlin, et. al. found that after the implementation of a PI prevention bundle that included interventions that addressed prophylaxis, risk assessment, education, support surfaces, skin care, nutrition, and repositioning. This bundle was successful at reducing the PI incidence from 6 to 2 percent. They also found that the bundle increased the length of time it took to develop a pressure injury (2022). Coyer, et. al. performed a study using the InSPiRE PI prevention bundle. This bundle used interventions that addressed assessment, hygiene, repositioning, and strategies for preventing PI in ICU. This study found that the incidence of PI was significantly decreased in the post implementation group. They also found that patients in the intervention group had longer times to PI development (2015). Rivera, et. al. also studied implementation of a PI prevention bundle to help solve a lack of standardization. The interventions included a skin assessment on admission, prophylactic dressings, repositioning, nutrition, head of bed to no higher than 30 degrees, and early mobility. The bundle had a significant effect on PI incidence (2020). All of these bundles stated the importance of using interventions to address skin assessment, hygiene/skin care, prophylactic measures and repositioning. All three of these studies found that using a PI bundle is an effective intervention to prevent PI.</p>
<p>Level IV · Opinion of respected authorities and/or reports of nationally recognized expert committees/consensus panels based on scientific evidence</p>	<p>0</p>		
<p>Level V · Evidence obtained from literature reviews, quality improvement, program</p>	<p>0</p>		

evaluation, financial evaluation, or case reports · Opinion of nationally recognized expert(s) based on experiential evidence			
Recommendations Based on Evidence Synthesis: This evidence review and synthesis provides good and consistent evidence for practice change. A PI prevention bundle is an effective tool to help prevent PI in the critically ill. These bundles should include a risk assessment, skin assessment, skin care, repositioning, and prophylactic measures.			

Note: Evidence Overall Quality determined using the Johns Hopkins evidence-based practice for nurses and healthcare professionals: Model and guidelines (Dang, et. al., 2022)

Figures

Figure 1. Knowledge to Action Framework (Field et al., 2014)

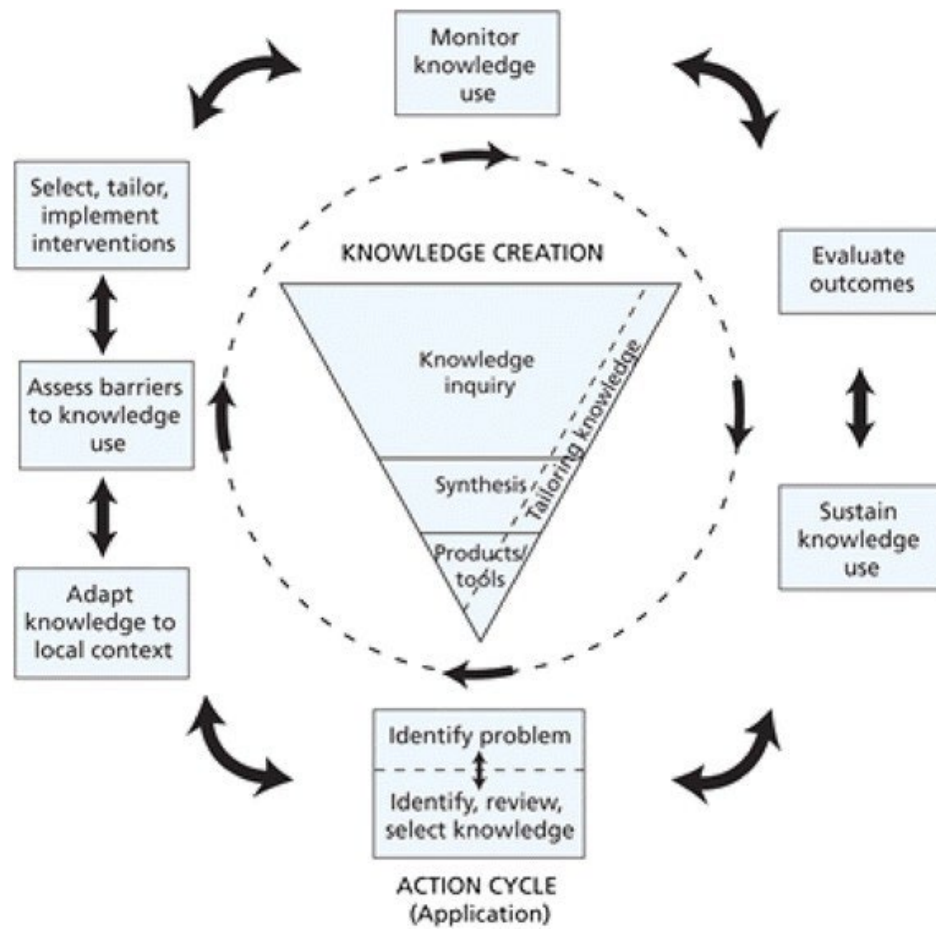
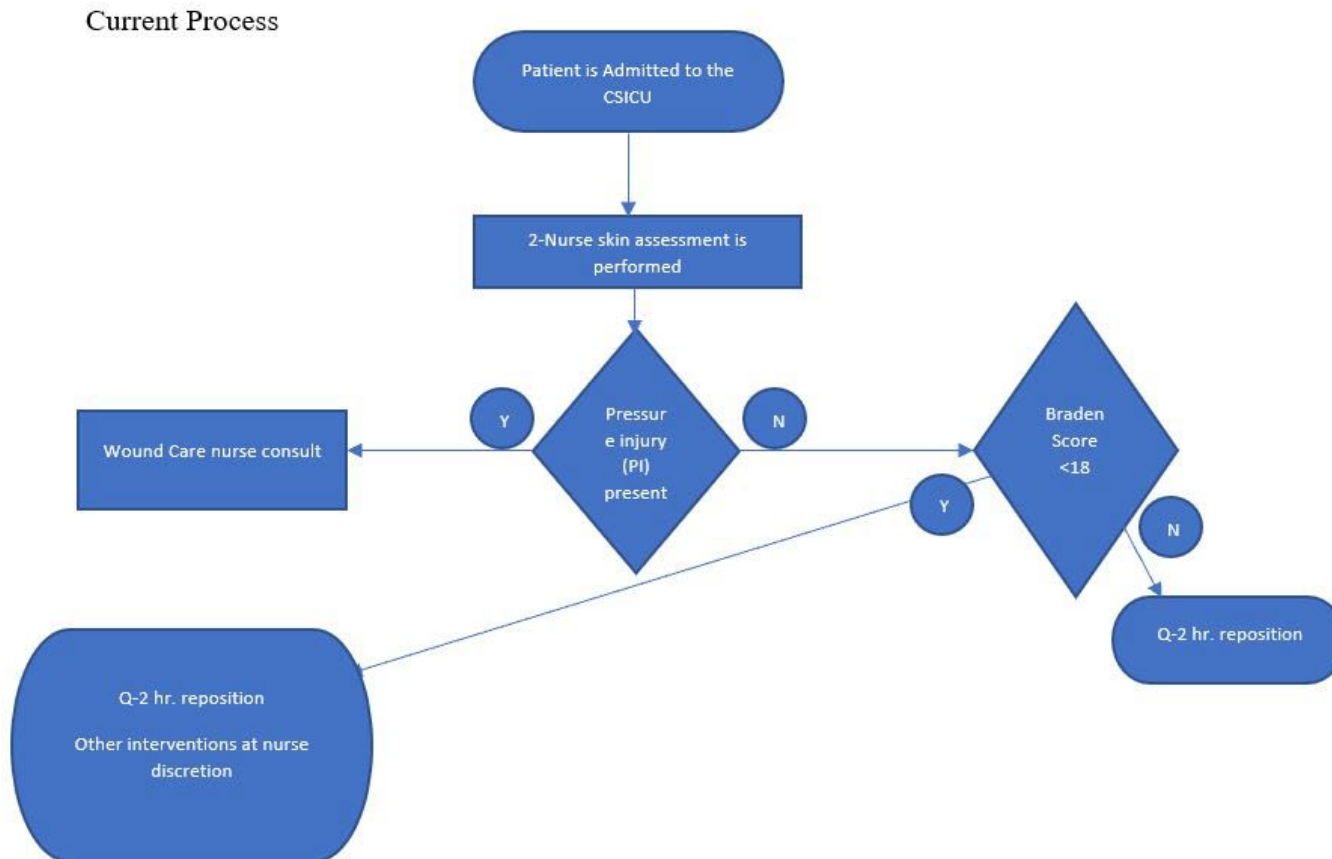


Figure 2. Current and Desired Process Maps for PIP



Proposed Process

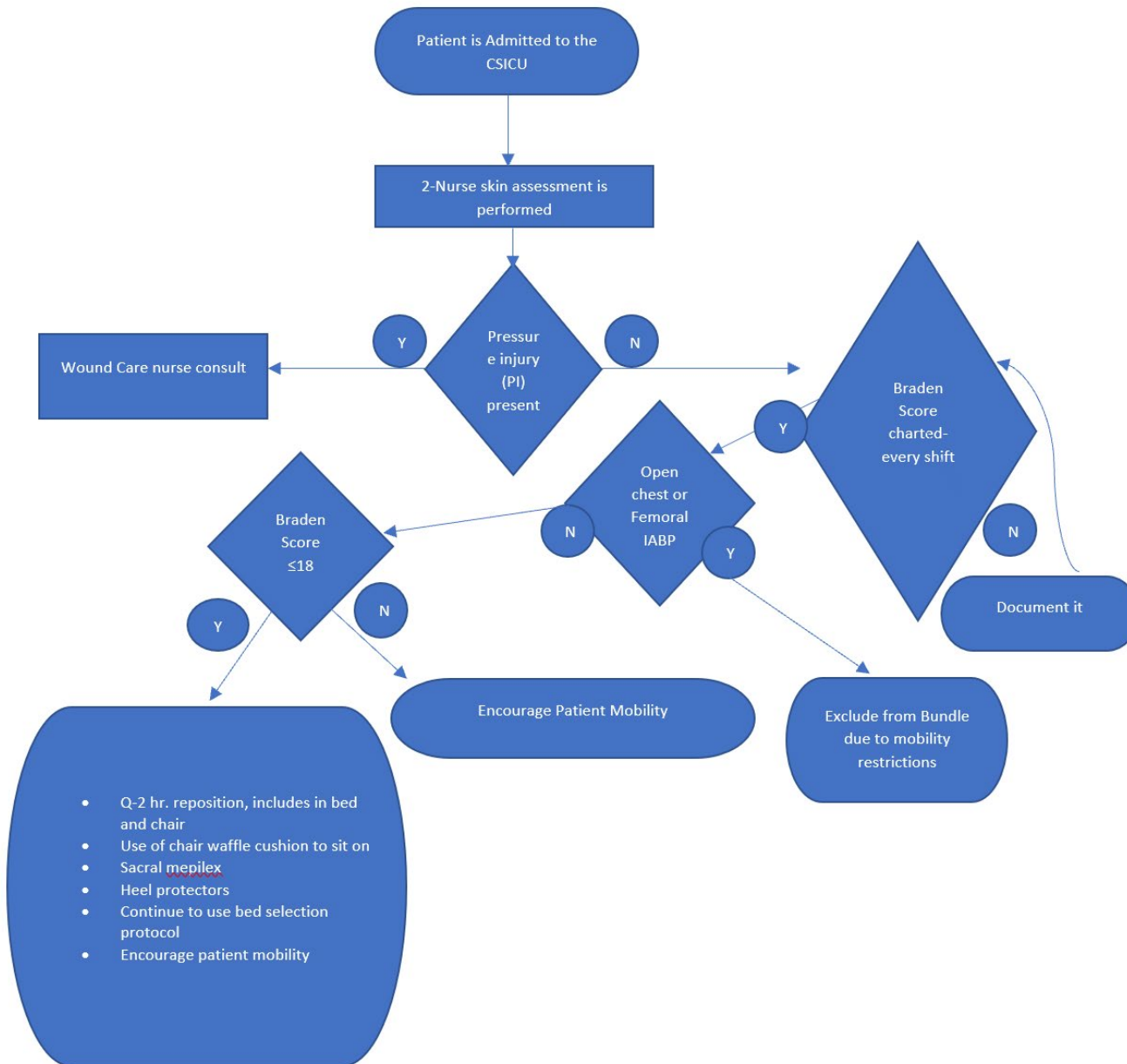


Figure 3. PIP Bundle Data Collection Tool

Please complete the survey below.

Thank you!

1) MRN _____

2) Braden Score _____

3) Time Point Admission
 48 Hours

4) Preventative Sacral Mepilex Yes
 No

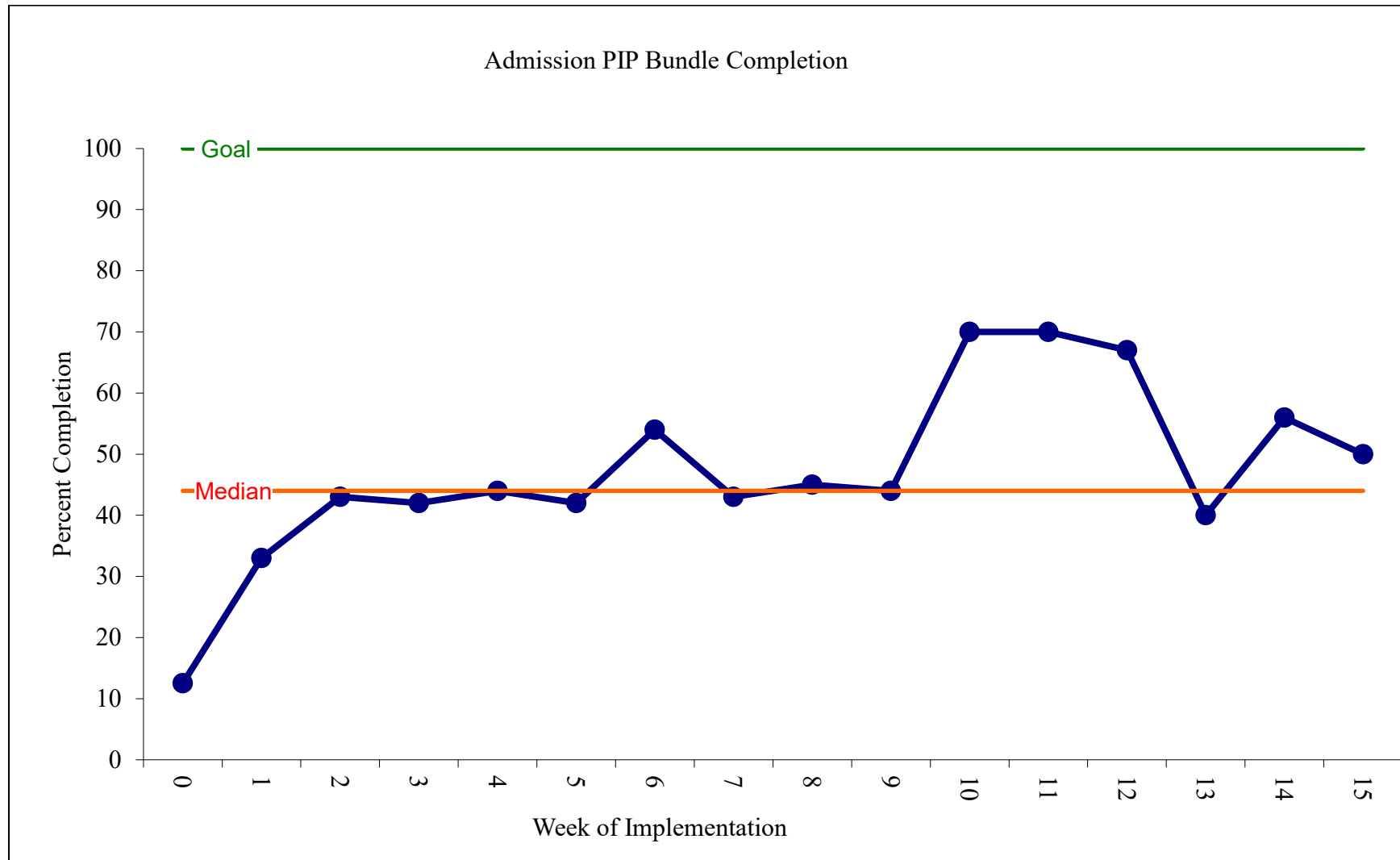
5) Heel Protectors Yes
 No

6) Waffle Cushion Yes
 No

7) Mobility OOB to Chair
 Ambulated

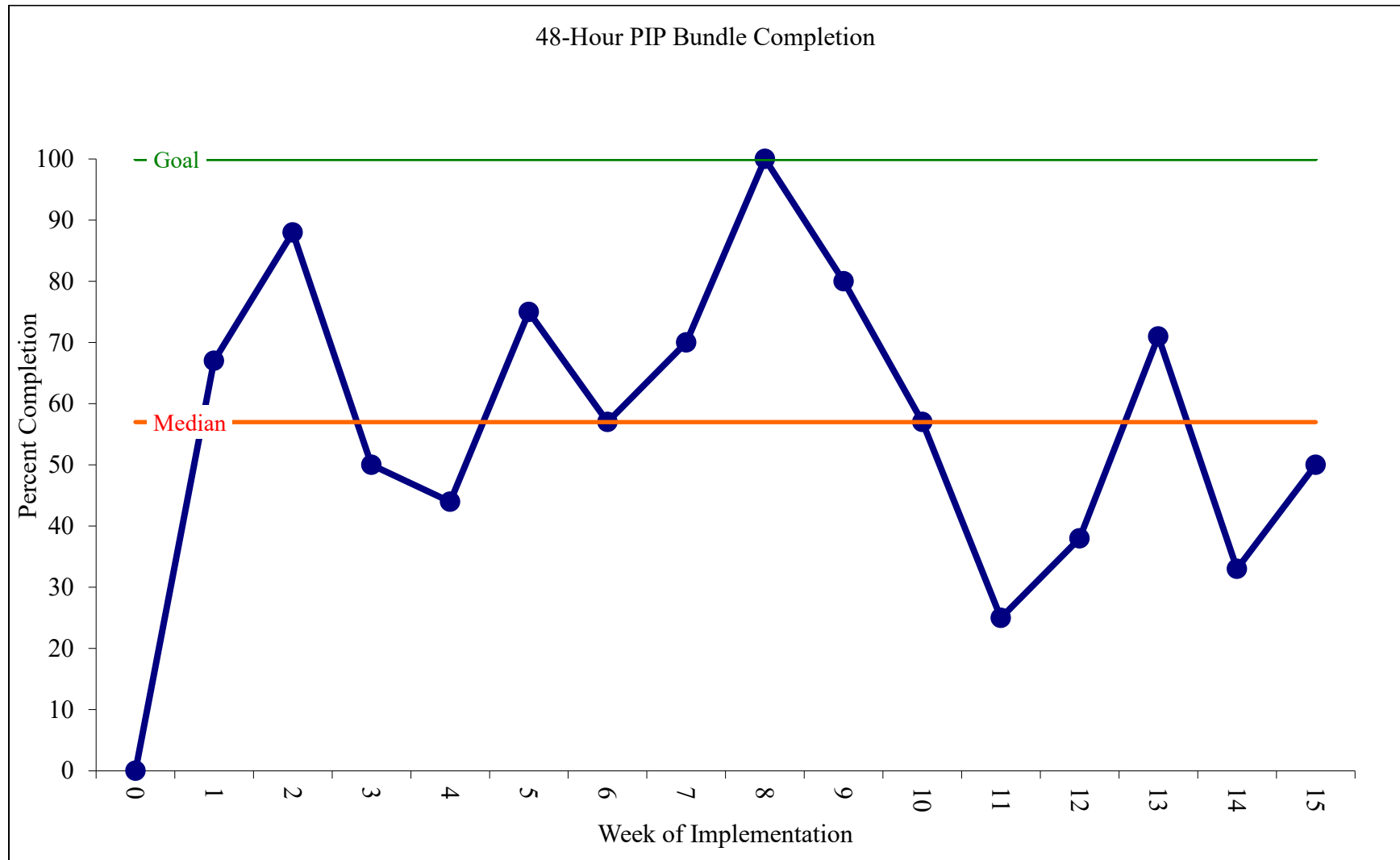
8) 2-hour Repositioning 8
 10
 12
 14
 16
 18

Figure 4. Admission Data Run Chart



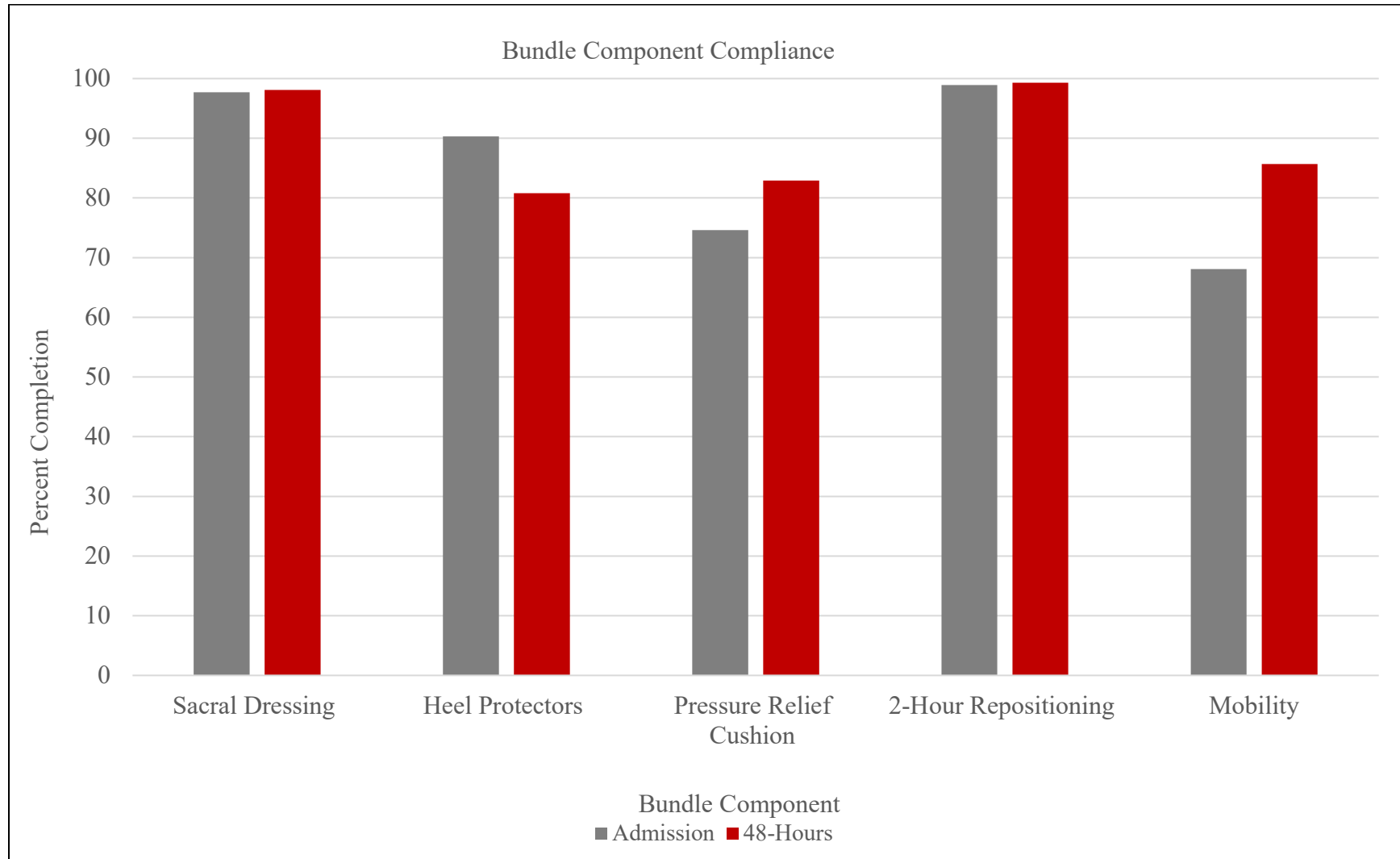
Note. A Run Chart illustrating the compliance of documentation of bundle at admission

Figure 5. 48-hour Data Run Chart



Note. A Run Chart illustrating the compliance of documentation of bundle at 48-hours.

Figure 6. Individual Bundle Component Compliance



Note. A Bar Chart illustrating individual bundle component compliance