

**Implementing a Checklist to Reduce Hospital Acquired Pressure Injuries**

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### Abstract

**Problem:** According to the National Database of Nursing Quality Indicators data, a 24-bed Surgical Intensive Care Unit in an academic medical center had a consistent trend of high hospital acquired pressure injury rates, exceeding the national benchmark for the three out of four quarters in 2021. Monthly unit-based data also reported at least forty more pressure injuries occurred in the unit in 2021 compared to other adult intensive care units. **Purpose:** The purpose of this quality improvement project is to implement a pressure injury bundle checklist to ensure staff use the evidence-based strategies that are needed to reduce the number of hospital acquired pressure injuries in their critically ill patients. **Method:** Nurses, certified nursing assistants and respiratory therapists were educated on the checklist. Copies of the checklist were placed at the nurse's station and each staff member checked off the components that were completed throughout the shift. The de-identified checklists were then submitted in a folder at the end of each shift. Every week, the total number of collected checklists were compared to the total number of patients who were on the unit within that week to measure compliance. The number of monthly hospital acquired pressure injuries in the unit was tracked to measure the impact of the checklist. **Results:** Results showed 100% staff (n=262) were educated on the checklist and its process. Within the 14 weeks of implementation, staff nurse checklist compliance was 51% (1923/3763). The number of pressure injuries the month prior to implementation was 8. The number of monthly pressure injuries acquired in the unit decreased by 50% in the latter two months of the implementation period (n=3; n=4). **Conclusions:** Creation of and adherence to the checklist impacted the number of pressure injuries patients acquired while the checklist was in place on the unit. **Keywords:** checklist, hospital-acquired pressure injuries, HAPI, intensive care unit, pressure injury

### **Implementing a Checklist to Reduce Hospital Acquired Pressure Injuries**

Critically ill patients are susceptible to developing pressure injuries while in the hospital, with a reported incidence ranging from 10%-26% (Chaboyer et al., 2018). Pressure injuries are associated with increased morbidity and mortality as well as an increase in hospital length of stay (Lin et al., 2020). They also pose a significant financial burden on health care systems, costing \$26.8 billion in the United States annually (Padula et al., 2019). Most pressure injuries (PI) are potentially preventable.

In an adult surgical intensive care unit (SICU) at a large academic, Magnet-designated hospital in an urban city, the National Database of Nursing Quality Indicators data showed a consistent trend of high hospital acquired pressure injury (HAPI) rates, exceeding the national benchmark for the three out of four quarters of data in 2021. Furthermore, monthly data collected within the hospital also reported the SICU had at least forty more HAPIs than each of the four other adult intensive care units (ICU) in calendar year 2021.

As described in the Fishbone diagram (see Figure 1), multiple factors contributed to an increase in HAPIs. One notable factor was the lack of education staff received on how to prevent HAPIs. Further, the pandemic led to a severe staffing shortage at the bedside and only applicants available to hire were new graduate nurses. A decrease in staffing directly impacts the workload and time nurses have to perform PI assessments and interventions and hinders the ability to coordinate preventative care with others (Tayyib & Coyer, 2017). There are many competing priorities and interventions that need to be performed on critically ill patients and preventing HAPIs was not recognized as a top priority. Furthermore, there were many aspects of PI prevention to take into consideration regarding various supplies and strategies to utilize that may have caused confusion and led to many being inadvertently overlooked.

### **Available Knowledge**

Having a pressure injury prevention (PIP) bundle checklist to refer to throughout the shift can help remind bedside staff of evidence-based strategies to apply to patients. A literature search was performed by searching databases including PubMed, Medline, and CINAHL for studies published in English from the year 2015 to 2022. Key terms included “pressure injury”, “pressure ulcer”, “prevention”, “bundle”, “checklist”, “adults”, and “intensive care unit”. There were four studies that included a PIP checklist. Studies were appraised for level of evidence and quality grading using the Johns Hopkins Evidence-Based Practice Model (see Table 1).

The PIP protocol adherence checklist used in the Coyer et al. (2015) study led to a significant reduction in PI incidences, and it was stated that the checklist resulted in a higher percentage of compliance in the intervention group. Although the studies included in both systematic reviews were deemed moderate to low quality evidence, Lin et al. (2020) and Alshahrani et al. (2021) concluded PIP bundles decreased PI incidence. Given the wide variety of implementation strategies employed in the various studies, one single effective strategy could not be identified. However, Lin et al. (2020) confirmed reminder systems were helpful in prompting bedside nurses to adhere to the interventions within the bundles, thus supporting the checklist intervention. Alshahrani et al. (2021) recommended, since knowledge decreases over time, reinforcement of the role of the nurse in the PIP initiative is necessary. The checklist would satisfy this recommendation. Preventing PIs in critically ill patients is a complex healthcare intervention and clarifying what unit-based resources and processes are needed to support success, along with making it clear what interventions nurses perform each shift is crucial (Alshahrani et al., 2021). Furthermore, the McLaughlin et al. (2022) study discovered the PIP protocol, which was incorporated into the electronic health record as an orderset, was found

to be cumbersome. Given the extensive list of interventions within the PIP bundle, the nurses requested the checklist be in a more user-friendly paper form for easy reference.

In summary, PIP bundles have been found to be effective in reducing PIs in ICU patients. The need for the nurse to have a visual, user-friendly reminder about what interventions to implement within a complex multi-component bundle was evident. The purpose of this quality improvement project was to implement a PIP bundle checklist to ensure staff use the evidence-based strategies that are needed to prevent HAPIs in the critically ill patient.

### **Rationale**

Using Graham et al. (2006) Knowledge to Action framework (see Figure 2), the need to reduce HAPIs was identified and the funnel for knowledge creation included researching the evidence to create a PIP bundle checklist which was implemented using the action cycle of the framework, taking into account local evidence, context, and culture of the unit. Barriers were assessed and addressed prior to the execution of the checklist. A defined measurement plan was initiated to monitor for knowledge use during implementation. Outcomes were evaluated to determine the impact of the checklist, and sustainability strategies were pursued using a feedback loop that cycles through the action phase again (Graham et al., 2006).

### **Methods**

The SICU is a 24-bed unit in a 767-bed tertiary and quaternary hospital. Most patients are acutely ill, post-operative adult patients who have undergone one of the many complex surgeries offered by over ten different surgical services. In the SICU, shifts are 12 hours and a registered nurse (RN) to patient ratio is 1:1, 1:2 or, at times, 1:3 if all patients have orders for lower level of care. Certified nursing assistant (CNA) ratio can range from 1:8 to 1:24,

depending on staffing. There are two respiratory therapists (RT) assigned to the SICU each shift. The unit can be extremely challenging but is also a rewarding workplace.

This SICU has strong, collaborative nursing, physician, and nurse practitioner (NP) leadership who are engaged and supportive of bedside staff. Striving for zero harm is a shared commitment and staff are open to change to improve patient outcomes. Patient outcome metrics are discussed in monthly staff meetings and the data is displayed openly on the unit. RTs are not unit-based, but rather are assigned to a different unit each shift. There is a dedicated Wound Ostomy Continence Nurse (WOCN) assigned to the SICU, who is consulted by the nurse or providers for preventative and treatment recommendations. The WOCN is the only healthcare team member who stages the pressure injuries using a standardized reliable and valid tool.

The site team consists of interdisciplinary leadership in the SICU as well as members of the SICU Skin Care Committee, WOCN and manager of the RT department (See Table 2). All were instrumental in assessing for the root cause of PIs and deciding on the planned intervention, including the creation of the current and desired states of the process maps as illustrated in Figure 3. The maps clearly depict how complex PIP is in the SICU. This inherent complexity contributes to no clear ownership for applying all necessary PI reducing strategies which can lead to some being missed.

A multi-component PIP checklist was created by the DNP student using research evidence and the most recent international clinical practice guidelines (European Pressure Ulcer Advisory Panel, National Pressure Injury Advisory Panel & Pan Pacific Pressure Injury Alliance, 2019). The checklist includes clinical and risk assessments, skin hygiene, heel protection, repositioning, selection of support surfaces, sacral prophylactic dressing, nutrition, mobility, and strategies to prevent device-related PIs (see Appendix). The DNP student gained approval for

the checklist by in-house wound and critical care experts, namely the SICU Medical Director, Lead NP, WOCN, assistant nurse manager (ANM) and senior clinical nurses (SCN).

Several strategies were utilized to implement the checklist. An evidence-based PowerPoint was created by the DNP student which stated the purpose of the project to include unit-based HAPI outcomes, elaborated on each component of the checklist, described the patient consequences of acquiring a PI with the intention to personalize this with each staff member, and reviewed the process to complete the checklist. It was shared for feedback with the ANM, WOCN, SCNs, and Skin Care Committee members, who all volunteered to be PIP Champions. Identifying champions is an evidence-based implementation strategy that has proven to be successful in ICUs (Lin et al., 2020; Rosa et al., 2020). Within the first two weeks of September 2022, the education package was delivered to SICU staff in in-person and virtual staff meetings, which are offered during both shifts, and via email; and the education was given to the RTs in their shift huddles.

Bright-colored copies of the checklist were placed at each nurse's station. Throughout the shift, each staff member checked off the PIP components that were completed. There was a folder outside the nurse manager (NM) office to place the completed checklists at the end of each shift. To incentivize staff and raise awareness of the project, flyers were hung in the unit and breakfast was served on the kick-off date. From September through November of 2022, the DNP student rounded frequently to reinforce the education and checklist and sought opinions on barriers from facilitators (Lin et al., 2020). These strategies are also useful when formulating a sustainability plan (Tayyib & Coyer, 2017). Reminders about the checklist along with the overall checklist compliance were shared weekly as continued awareness is essential (Coyer et al., 2015). See attached Figure 4 for a Gant Chart that provides a detailed timeline for the project.

Structure, process and outcome measures were defined (see Table 3). Although the PIP bundle checklist has not been deemed as a reliable and valid tool, there is merit in its face validity given it was created based on the clinical practice guidelines developed by international expert stakeholders. Furthermore, as stated above the checklist was approved internally by skilled professionals. Targeted and tailored education that focuses on the application of knowledge is an important implementation strategy and lays the foundation of expectations; therefore, it was important to evaluate the success of the education dissemination (Lin et al., 2020). Sign off sheets were utilized for the staff meetings to track attendance. The RT Manager provided the total number of RTs educated so the total percent of staff who received the education could be calculated.

The percentage of compliance with completing the checklists was important to monitor. The checklists were collected by the DNP student and the number of completed checklists were compared to the total number of patients who required a checklist. Furthermore, the number of HAPIs reported in the SICU were used to evaluate the effectiveness of the checklist. All HAPI data was entered into a centralized database by the WOCNs. This data was released monthly to the NM by the Quality and Safety Department. It included the total number of new pressure injuries patients acquired while in the SICU each month, including both reportable and non-reportable Stage III, Stage IV and unstageable HAPIs.

Descriptive quantitative statistics, run charts and bar graphs were utilized to help evaluate process measures and outcomes. The run charts and bar graphs were posted on the unit and descriptive statistics, including percentages, mean, median and ranges, were shared with staff for continued awareness on checklist compliance and HAPIs. Throughout the study, if checklist compliance was low then the DNP student met with the site team and queried staff to establish



strategies and tactics to leverage facilitators and mitigate barriers. Other inferences from the data can be realized from the evidence. For example, Tayyib & Coyer (2017) claimed barriers to PI prevention are workload and knowledge. Acuity fluctuates in the SICU and is unpredictable. An increase in acuity results in numerous, rapid interventions which may hinder implementation of PIP strategies given competing priorities. It was important to take note of acuity as well as staffing ratios when monitoring checklist compliance. Furthermore, completed checklists were affected by knowledge gaps from the onboarding of new staff. The implementation of this project occurred at the same time many new graduate RNs came off orientation. They can be challenged with time management, which leads to difficulties in completing all tasks necessary for the critically ill patient. However, the checklist is intended to keep them on track of what is required for HAPI prevention each shift.

Non-human Subject's Research determination from the Human Research Protections Office of the UMSOM Institutional Review Board was obtained prior to project implementation. Data was collected and stored in a locked cabinet in a locked room. Data was collated and analyzed through a password protected computer system. No patient identifiers were used in this QI project.

### **Results**

Structure, process and outcome measures were monitored throughout the implementation of the project. Overall, 100% (262/262) of the SICU RNs, CNAs, NPs and RTs received the education (Table 4). However, since there are many RTs who are randomly assigned to the SICU each shift, a RT Quick Reference was created explaining the purpose and expectations of the project. The Charge Nurse gave the document to the RTs at the beginning of the shift which was a needed additional implementation strategy to ensure continued awareness of the project.

Checklist compliance data was recorded in an excel spreadsheet, including total number of collected checklists, total number of expected checklists and a differentiation between dayshift and nightshift compliance (see Table 5). Unit census per shift was recorded to determine the number of expected checklists for each shift. Furthermore, the percentage of completed checklists compared to the volume of expected checklists was recorded in the run chart over the duration of the 14-week implementation period (see Figure 5).

A total of 1,923 checklists were collected with 3,763 required, resulting in a mean of 51% compliance. Adherence ranged from 28% in week 4 (67/241) to 75% in week 13 (214/284). Day and night shifts were equally compliant. Two significant decreases in compliance were related to the absence of the DNP student during week 4 and high acuity and low staffing during week 11. As seen in Figure 5, the median was 44% with three runs: two above the median and one below it. There was also a favorable 9-point shift indicating a special cause variation. This shift begun when the Charge Nurses were asked to distribute and collect the checklists.

September HAPI data showed the same number of HAPIs as the month before implementation, which was a reported eight HAPIs each for both months (see Figure 6). However, most of the pressure injuries occurred within the first two weeks of the implementation period which coincided with when the education was being disseminated. The number of monthly PIs acquired in the unit decreased by half in October and November (n=3; n=4).

Several strategies were successful in implementing the PIP bundle checklist. The DNP student was able to easily obtain buy-in from the SICU interdisciplinary leadership team to help drive the use of the checklist. They recognized the need for the QI project to improve HAPI rates. The education was effective, and although the personalization perspective was helpful, the staff were motivated most by knowing that the unit surpassed all other ICUs in HAPI rates.

Other successful implementation strategies included placing bright-colored copies of the checklist at each nurse's station for ease of use and visibility. However, despite the checklist being readily available at the nurse's station, staff were forgetting to retrieve and submit them. Therefore, the DNP student asked the Charge Nurses to pass them out at the beginning of the shift and collect them at the end of the shift which proved to be helpful. Furthermore, through feedback from staff, the checklists were also placed in the multi-purpose room, which is where many staff convene when not in patient care, and near the central monitors where every nurse captures important EKG data at the beginning of each shift.

Having no patient identifiers on the checklist posed as a barrier because it was difficult to discern which patients did not receive the interventions. Staff claimed checklists were not completed due to lack of time, staffing, patient acuity, or failing to remember. In summary, multiple implementation strategies and tactics were utilized to effectively facilitate the QI project with the ongoing education, weekly rounding, use of champions and monitoring checklist compliance as major action items to promote sustainability.

### **Discussion**

This QI project demonstrates that the use of an evidence-based PIP bundle checklist is feasible and is effective in reducing PIs. The initial and ongoing education along with the actual use of the paper checklist allowed for continuous awareness and real-time reminders. Although the compliance with submitting the checklist did not reach the goal of 100%, it appears, by the decrease in PIs, the evidence-based strategies were still being consistently implemented. These outcomes align with other studies that also used this bundled approach to decrease the incidence of PI (Alshahrani et al. 2021; Coyer et al., 2015; Lin et al., 2020; McLaughlin, 2022). The nurses appreciated having the paper checklist readily available to refer to throughout the shift,

sharing the same sentiment found in the McLaughlin (2022) study. This QI project adds to the body of evidence that bundled approaches can be effective.

Not all goals were met during the implementation. The two weeks where compliance dropped was not surprising as the lack of continuous rounding and an increase in workload were mentioned as potential barriers in the literature. Lin et al. (2020) stressed the importance of frequent rounding to reinforce education and seek feedback from staff. Given week 4 was in the beginning of the implementation period, the absence of the DNP student proved to be impactful, resulting in a compliance of 28% (67/241), the lowest of the project. Furthermore, Tayyib & Coyer (2017) indicated that an increase in workload poses as a significant barrier to project implementation which coincides with what occurred in week 11. Short staffing combined with an increase in acuity can lead to the checklist not being used, and therefore HAPI prevention assessment and strategies not being prioritized. On the other hand, adding the Charge Nurses as champions during week 5 was the driving force that resulted in a sustained compliance above the median. Champions are strong facilitators (Lin et al., 2020; Rosa et al., 2020). The Charge Nurses assisted in reminding staff about the checklist and became experts in teaching best practices.

There were minimal costs related to implementing this project. However, the hope was that specific supplies or devices were used consistently to prevent PIs in patients, which may have led to an increase in certain supplies being consistently utilized. This, in turn, may have led to an increase in cost not realized. According to the European Pressure Ulcer Advisory Panel, National Pressure Injury Advisory Panel & Pan Pacific Pressure Injury Alliance (2019), the cost of care for individuals who acquire a pressure injury ranges between \$500 and \$152,000; therefore, decreasing the number of PIs can result in major cost savings.

There are limitations to this project. These findings are limited to one ICU in an academic medical center. Furthermore, there may have been potential for bias because the DNP student is also the manager of the unit where the project was implemented. Staff may have felt more compelled to comply with the project, although the overall compliance data did not indicate this. Lastly, the number of expected checklists may have not been accurate for each shift. The patient census was recorded at the end of each shift, but there is constant movement of patients in and out of the unit making it difficult to track with precision. This has the potential to impact the compliance data, but the outcome data remains the same.

### **Conclusion**

Utilizing a bundled approach in the form of a checklist can be an effective strategy to drive best practices at the bedside. Caring for ICU patients is very complex with multiple competing priorities to consider when providing high quality, safe care. This particular project focused on decreasing PIs, however this type of intervention can be used to decrease other nurse sensitive quality indicators. Furthermore, this evidence-based strategy can be utilized by various disciplines to elicit and engrain change in the delivery of care.

To ensure sustainability of best practices, components of the checklist will continue to be shared in multiple forums, so the momentum and knowledge does not wane. There is belief that the initiative may have helped new graduate nurses build HAPI prevention strategies into their nursing practice. Therefore, all new hires will be asked to complete the PIP bundle checklist for the first three months of employment to ensure the strategies are automatically incorporated into daily routines. Having a smaller number of staff to track will make it easier to monitor those who are non-compliant with completing the checklist and subsequently allow real-time feedback to be provided.

Ultimately, by using Graham et al. (2006) Knowledge to Action Framework, the QI project allowed for a culture change on the unit whereby through the use of feedback cycles, pressure injury prevention was always at the forefront leading to an overall decrease in PIs during the implementation period.

### References

- Alshahrani, B., Sim, J., & Middleton, R. (2021). Nursing interventions for pressure injury prevention among critically ill patients: A systematic review. *Journal of Clinical Nursing*, 30(15-16), 2151-2168. <https://doi.org/10.1111/jocn.15709>
- Centers for Medicare and Medicaid Services. (2022, April 2). *Hospital Acquired Condition/Present on Admission Indicator*. <https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/HospitalAcqCond>
- Chaboyer W., Thalib L., Harbeck E., Coyer F., Blot S., Bull C., Nogueira P., & Lin F. (2018). Incidence and prevalence of pressure injuries in adult intensive care patients: A systematic review and meta-analysis. *Critical Care Medicine*, 46(11), 1074-1081. <https://doi.org/10.1097/CCM.0000000000003366>
- Coyer, F., Gardner, A., Doubrovsky, A., Cole, R., Ryan, F., Allen, C., & McNamara, G. (2015). Reducing pressure injuries in critically ill patients by using a patient skin integrity care bundle (INSPIRE). *American Journal of Critical Care*, 24(3), 199-210. <https://doi.org/10.4037/ajcc2015930>
- European Pressure Ulcer Advisory Panel, National Pressure Injury Advisory Panel and Pan Pacific Pressure Injury Alliance. (2019). *Prevention and Treatment of Pressure Ulcers/Injuries: Clinical Practice Guideline. The International Guideline*. EPUAP, NPIAP, PPPIA.
- Graham, I., Logan, J., Harrison, M., Straus, S., Tetroe, J., Caswell, W., & Robinson, N. (2006). Lost in knowledge translation: Time for a map? *The Journal of Continuing Education in the Health Professions*, 26(1), 13-24. <https://doi.org/10.1002/chp.47>

- Lavallee, J., Gray, T., Dumville, J., Russell, W., & Cullum, N. (2017). The effects of care bundles on patient outcomes: A systematic review and meta-analysis. *Implementation Science*, 12 (142), 1-13. <https://doi.org/10.1186/s13012-017-0670-0>
- Lin, F., Wu, Z., Song, B., Coyer, F., & Chaboyer, W. (2020). The effectiveness of multicomponent pressure injury prevention programs in adult intensive care patients: A systematic review. *International Journal of Nursing Studies*, 102, 1-14. <https://doi.org/10.1016/j.ijnurstu.2019.103483>
- McLaughlin, J., Tran, J., Hameed, S., Roach, D., Andersen, C., Zhu, V., Sparks, B., Phillips, L., Koutrouvelis, A., & Tyler, D. (2022). Quality improvement intervention bundle using the PUPPIES acronym reduces pressure injury incidence in critically ill patients. *Advances in Skin & Wound Care*, 35, 102-108. <https://doi.org/10.1097/01.ASW.0000803248.34424.ce>
- National Database of Nursing Quality Indicators (NDNQI). (2022, April 2). *How is NDNQI used?* [NDNQI Indicators - National Database of Nursing Quality Indicators \(NDNQI\)](#)
- Newhouse, R. (2006). Examining the support for evidence-based nursing practice. *Journal of Nursing Administration*, 36(7/8), 337-340. <https://doi.org/10.1097/00005110-200607000-00001>
- Padula W., & Delarmente B. (2019). The national cost of hospital-acquired pressure injuries in the United States. *International Wound Journal*, 16(3), 634-640. <https://doi.org/10.1111/iwj.13071>
- Rosa, R., Teixeira, C., & Sjoding, M. (2020). Novel approaches to facilitate the implementation



of guidelines in the ICU. *Journal of Critical Care*, 60, 1-5.

<https://doi.org/10.1016/j.jcrc.2020.07.014>

Tayyib, N., & Coyer, F. (2017). Translating pressure ulcer prevention into intensive care nursing practice: Overlaying a care bundle approach with a model for research implementation.

*Journal of Nursing Care Quality*, 32(1), 6-14.

<https://doi.org/10.1097/NCQ.0000000000000199>

**Table 1**

*Evidence Review and Synthesis*

Citation: Lin, F., Wu, Z., Song, B., Coyer, F., & Chaboyer, W. (2020). The effectiveness of multicomponent pressure injury prevention programs in adult intensive care patients: A systematic review. <i>International Journal of Nursing Studies</i> , 102, 1-14. <a href="https://doi.org/10.1016/j.ijnurstu.2019.103483">https://doi.org/10.1016/j.ijnurstu.2019.103483</a>					<b>Level and Quality IIIA</b>
<b>Purpose/Hypothesis</b>	<b>Type of Evidence Research Design</b>	<b>Sample – Population, Size, Setting</b>	<b>Intervention/Procedures</b>	<b>Primary Outcome/Measures</b>	<b>Results/Conclusions</b>
“This systematic review evaluated the effectiveness of pressure injury prevention (PIP) programs in reducing pressure injury prevalence and incidence in the adult intensive care population. It also critically appraised the program components and strategies used to implement these programs.”	Systematic Review with no meta-analysis	Sampling Technique: Searched 5 databases published in English from 2000-2018 with multiple, pertinent, research terms; also used MeSH headings, free text and key words. Alternate spelling and synonyms were used (e.g. pressure injury; prevention, bundle; ICU) Reference list of included articles were reviewed too Inclusion: Research papers; original peer reviewed articles and quality improvement projects with specific inclusion criteria (p.2) Exclusion: Letters, commentaries, editorials, and conference abstracts/ presentations; outcome results that could not be separated to differentiate ICU patient population results # eligible: 1518 by title, then 1479 excluded post title/abstract screening # accepted: 21 articles (12 QI/9 Research) Flow chart of search process was included, appeared to be homogenous sample	Preferred Reporting Items for Systematic Reviews and Meta-analyses was used; Each study included different bundles and implementation strategies, so no meta-analysis was performed. Screening performed independently by 2 reviewers with a third reviewing those articles when disagreements occurred. Two evidence-based data extraction forms were used for critical appraisal. QI-MQCS is valid and reliable tool but does not indicate high or low quality scores- just a numeric rating. MMAT tool was recently revised to not include percentages to indicate quality of papers; Using only articles in English and not using grey literature can lead to publication bias; Table describing the sample/setting; components of bundle; main results and quality rating were included for each study	DV: Outcome data taken from each study when applicable including patient outcomes (change in PI incidence, prevalence, and incidence and prevalence of PI stages); care process outcomes (compliance to intervention protocols, staff and patient satisfaction rates and participation rates); organizational outcomes (hospital and/or ICU length of stay, costs to treat injuries)	Statistical results for each study were included in table. Most of the PIP multi-component programs demonstrated a significant decrease in the incidence and prevalence of PIs in ICU patients. Level of evidence was low due to research designs and various threats to validity and a call for more rigorous evidence with RCTs was suggested. There were opportunities for risk of bias, Hawthorn effect with before and after design studies, publication bias when no grey literature or non-positive QI studies were used. Studies included various interventions in bundles and different implementation strategies, it was not possible to clarify what strategies worked best. It was stated that strategies that aim to reinforce adherence, such as reminder systems, can be helpful to prompt nurses to implement the interventions within the bundle.

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</i> , 30(15-16), 2151-2168. <a href="https://doi.org/10.1111/jocn.15709">https://doi.org/10.1111/jocn.15709</a>					Level and Quality IIB
Purpose/Hypothesis	Type of Evidence Research Design	Sample – Population, Size, Setting	Intervention/Procedures	Primary Outcome/Measures	Results/Conclusions
<p>“To systemically synthesize the evidence on the most effective nursing interventions to prevent pressure injuries (PI) among critical care patients.”</p>	<p>Systematic Review with no meta-analysis</p>	<p>Sampling Technique: Searched 4 databases published from 2007-2019 with multiple search terms and some search phrases were targeted to prompt more comprehensive identification of relevant studies (e.g. pressure ulcer; ICU; nurse). No other information was given Inclusion: Primary research conducted in ICU setting; study assessed nursing interventions, skills or knowledge/attitudes toward prevention; primary outcome needed to be PI development Exclusion: None stated</p> <p># eligible: 2366 found and 1119 were duplicates; 1074 were excluded for unknown reasons leading to 45 eligible # accepted: 14 articles (8 quasi-experimental, 3 RCTs, 2 case series &amp; 1 cross sectional) PRISMA flow diagram included 9/14 studies included multi-component PI prevention interventions; appeared to be homogenous sample of studies</p>	<p>Preferred Reporting Items for Systematic Reviews and Meta-analyses was used; Each study included different bundles and implementation strategies, so no meta-analysis was performed. 1 author screened title and abstracts for inclusion criteria; 2 authors independently screened full text articles; there were no disagreements. Same 2 authors screened for quality assessment using various tools with one being an evidence-based tool- Joanna Briggs Institute critical appraisal tool. Discrepancies were resolved by agreement. Percentage of quality rating was calculated-high, moderate and low. Quality percentages for each study were included in the table. Only primary published research was used so publication bias may exist. Table describing the aim; sample/setting; method; interventions; findings and quality rating were included for each study</p>	<p>DV: Incidence of pressure injury</p>	<p>Evidence-based PI prevention bundles can significantly reduce the incidence of PI, as confirmed by 7 of the studies. Statistical results for each study were included. Limitations were not well-defined. It was concluded with moderate certainty that evidence-based PI prevention bundles are effective to reduce the number and severity of pressure injuries in the ICU patient. Evidence-based interventions included repositioning, risk &amp; skin assessment, surface support, application of gel-adhesive dressing, and heel elevation. Multiple implementation strategies varied in each study making it challenging to produce conclusions on which was most effective, but it was declared that an intervention framework should clarify what unit-level resources and process are required to support success along with making it clear what interventions nurses take each shift is important. Also noted was over time knowledge begins to dissipate so continuous training is needed and the importance of the nurse knowing his/her role in the PI prevention initiative is crucial as well.</p>

Citation: Coyer, F., Gardner, A., Doubrovsky, A., Cole, R., Ryan, F., 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), 199-210. <a href="https://doi.org/10.4037/ajcc2015930">https://doi.org/10.4037/ajcc2015930</a>					Level and Quality IIA
Purpose/ Hypothesis	Type of Evidence Research Design	Sample – Population, Size, Setting	Intervention/Procedures	Primary Outcome/Measures	Results/Conclusions
<p>“To test an interventional patient skin integrity bundle, the InSPiRE protocol, for reducing pressure injuries in critically ill patients in an Australian adult intensive care unit.”</p>	<p>Experimental Design- Controlled before and after design in a 36-bed general ICU in a tertiary referral hospital in Australia.</p>	<p>Sampling Technique: Convenience Inclusion: Patients &gt;18 yrs old admitted to ICU and expected to stay more than 24 hours. Exclusion: Patients with community-acquired loss of skin integrity upon admission; pressure injuries diagnosed within 24 hours of admission; medical orders within protocol were contraindicated # eligible pts: 904 for control; 1052 for intervention # accepted: 207 # in control:102 # in intervention: 105 with no attrition for each group Flowchart of recruitment and enrollment included Power analysis was met: minimum of 102 patients per group was needed for 80% power and p&lt;.05.</p> <p>Group Homogeneity: Intervention/Control homogeneous based on NS p values in Table 2 for demographic and clinical characteristics except for BMI, number of comorbid conditions, serum albumin level and intervention group placed on nonpowered pressure redistribution support surfaces.</p>	<p>Control-ICU standard skin care practices which clearly stated and compared to the components of the protocol in a side-by-side table making it easy to differentiate between the two groups. Intervention-InSPiRE protocol included assessment of skin integrity, strategies to prevent Pis, protection against forces of pressure and friction (p.202). Intervention Fidelity: ICU nurses received training a month before rollout on protocol through induction programs, in-services, meetings and 1:1 bedside education using brochures, powerpoints and handouts and champions were identified. It was not stated who performed the training. These resources were available through the entire study. During study, ongoing education, and feedback on the ICU’s data on incidence of PI was shared. Treatment fidelity was measured by using a protocol adherence checklist. More details on implementation program needed to replicate study.</p>	<p>DV: Cumulative incidence of Pis calculated by dividing the total number of new cases of Pis, multiplied by 100, by the total number of participants in the specific time frame. Pressure injury development within the ICU stay and number of pressure injuries per patient were also measured. Research nurses were trained on how to collect data in clinical assessments and use of data collection tools and interrater reliability was performed. Data collection form was developed by researchers therefore not a reliable or valid tool. Evidence-based tool to stage Pis was used along with a standardized skin assessment tool that was not clarified whether it was a reliable or valid tool. All information was de-identified but how this was done was not shared.</p>	<p>Significant difference in cumulative incidence of skin PI (p=.04) between the intervention (18.1%, 19/105 patients) and control (30.4%, 31/102). Log Rank Mantel-Cox test showed the intervention group had significantly fewer number of PI develop during ICU stay. Chi Square test showed fewer number of PI per patient and compliance with expected interventions were similar in both groups except the intervention group had a statistically significant higher compliance with repositioning devices, positioning care practices, frequency, and type of position along with the application of heel protectors. Researchers concluded protocol did reduce the development of pressure injuries in their ICU patients. Use of protocol adherence checklist raised awareness. Threats: international differences in ICU workload &amp; standard practices, and patient ratios, single site, intervention fidelity- replication of study needed to address generalizability</p>

Citation: McLaughlin, J., Tran, J., Hameed, S., Roach, D., Andersen, C., Zhu, V., Sparks, B., Phillips, L., Koutrouvelis, A., & Tyler, D. (2022). Quality improvement intervention bundle using the PUPPIES acronym reduces pressure injury incidence in critically ill patients. <i>Advances in Skin &amp; Wound Care</i> , 35, 102-108. <a href="https://doi.org/10.1097/01.ASW.0000803248.34424.ce">https://doi.org/10.1097/01.ASW.0000803248.34424.ce</a>					<b>Level and Quality VB</b>
Purpose/ Hypothesis	Type of Evidence Research Design	Sample – Population, Size, Setting	Intervention/Procedures	Primary Outcome/Measures	Results/Conclusions
“To assess whether a quality improvement bundle focusing on prevention is effective in reducing pressure injury (PI) incidence or costs or delaying PI onset.”	Research: Combined retrospective/prospective cohort study at an academic tertiary SICU	Sampling Technique: Not stated but appears to be convenience Inclusion: Adult patients admitted to ICU with LOS > 48 hrs and Braden Scale ≤ 18 Exclusion: LOS < 48hrs or PI present on admission. # eligible: 930 patients admitted to ICU during time frames # accepted: 930 # in control: 599 # in intervention: 331(pts without prevention protocol in place were eliminated-due to orderset not ordered or RN using clinical judgement and not implementing it) Power analysis: None stated  Group Homogeneity: Intervention/Control largely heterogenous based on p values on Table 2 for demo and clinical characteristics. Pre-intervention pts were older with higher creatinine levels; post intervention pts had statistically significant differences with multiple clinical characteristics and risk factors	Control (pre-intervention): Not clearly stated, but retrospective data collection alludes to normal standard of care. What this entails is unknown. Intervention: PIP bundle: Prophylaxis, risk assessment, education, support surfaces, skin care, nutrition, repositioning, enlist help. Intervention Fidelity: Investigators educated staff on study protocol in morning/ evening but content is unclear; visual tools included PIP checklists based on EBP guidelines, unit-specific manuals outlining availability of products & how to access, PI staging posters, acronym PUPPIES for visual reminder; protocol was created as a stand-alone and ICU admission orderset in EHR; Nurse Manager assessed compliance in weekly rounds included reviewing education and PI assessments; anonymous evaluative and self-reported compliance surveys were sent to ICU staff. Response rate not included. Overall, threats to intervention fidelity exists.	DV: Development of HAPI or stage 3 or 4 PI to include deep tissue injury and unstageable PI; Delayed time to PI onset (# of days post admission to ICU pt developed a PI) Tool used to determine staging of PI was not shared; No details on anonymous surveys to evaluate protocol/barriers nor self-report survey on compliance  Base Cox model was used to evaluate time to event of PI occurrence.  Investigators collected specified demographic, clinical and compliance data by using the EHR. P value=.05	Authors stated the protocol was effective in reducing PI incidence and delayed PI onset. The incidence of PI in preintervention group was 6% compared to 2% post intervention group (p=.005). Significant increase in time to PI incidence with preintervention being 5 days and postintervention being 9 days (p=.04). Compliance varied according to specific intervention from 50%-86.7%. RNs were given the freedom to use their clinical judgement over implementing protocol which led to a smaller sample size. Feedback from RNs was orderset was not helpful and part of protocol were overlooked because it was so extensive. RNs requested a paper checklist that includes all elements of bundle in a more user-friendly format.  Threats: Sample size difference between 2 groups, cohort heterogeneity, no QI method identified, intervention fidelity, Hawthorn effect given observational study, measurement tools not clearly stated

Category (Level Type)	Total Number of Sources/Level	Overall Quality Rating	Synthesis of Findings
<p><b>IMPLEMENTING A CHECKLIST</b></p> <p>Level I · Implementing a checklist · Systematic review of a combination of RCTs and quasi-experimental studies, or quasi-experimental studies only, with or without meta-analysis</p>	<p>1 1 controlled before/after study design</p>	<p>B</p>	<p>The pressure injury prevention (PIP) bundle used in the Coyer et al. (2015) study resulted in reduced PI incidences. The protocol adherence checklist and implementation strategies used in this study led to significant findings with PI incidences reducing from 30% to 18% post implementation. It was stated that the checklist helped to measure treatment fidelity and resulted in a higher percentage of compliance in the intervention group.</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>2 Systematic Reviews</p>	<p>A</p>	<p>Although the studies included in their systematic review were deemed moderate to low quality evidence, the authors, Lin et al. (2020), concluded PIP bundles did decrease PI incidence. Alshahrani et al. (2021) also concluded PIP bundles are effective in preventing PIs. Given the wide variety of implementation strategies employed in the various studies, one single effective strategy could not be identified. However, Lin et al. (2020) confirmed reminder systems were helpful in prompting bedside nurses to adhere to the interventions within the bundles. Alshahrani et al. (2021) recommended, since knowledge decreases over time, continuous training and reinforcement of the role of the nurse in the pressure injury prevention initiative is necessary. Alshahrani et al. (2021) also acknowledged that preventing PIs in critically ill patients is a complex healthcare intervention. Using an intervention framework to clarify what unit-based resources and processes are needed to support success, to include how to avoid barriers during implementation, along with making it clear what interventions nurses perform each shift while recognizing their clinical expertise is crucial (p.2164).</p>
<p>Level V · Evidence obtained from literature reviews, quality improvement, program evaluation, financial evaluation, or case reports · Opinion of nationally recognized expert(s) based on experiential evidence</p>	<p>1 combined retrospective/prospective study design</p>	<p>B</p>	<p>McLaughlin et al. (2022) study found implementing a multi-modal pressure injury prevention bundle resulted in a significant reduction of pressure incidences in a surgical intensive care unit. The PIP protocol was incorporated into the electronic health record as an orderset, however the nurses found this cumbersome. Given the extensive multi-component PIP bundle, the nurses requested the checklist be in a more user-friendly paper form for easy reference.</p>
<p>Recommendations Based on Evidence Synthesis: Pressure injury prevention bundles have been found to be effective in reducing pressure injuries in critically ill patients in the ICU setting. Implementation strategies vary across studies, and although the evidence to utilize a checklist in the implementation phase is not robust, the need for the nurse to have a visual, user-friendly reminder about what interventions to implement within a complex multi-component bundle was evident.</p>			

**Table 2**

*Interdisciplinary Site Team*

<b>Team Member Name/Credentials/Title</b>	<b>Responsibilities</b>
Lead Skin Care Champion Unit Clinical Educator and Senior Clinical Nurse	Participate in discussion on root cause of HAPIs Participate in discussion about process maps Approve pressure injury checklist Educate staff during implementation Reinforce its use and process with staff
Assistant Nurse Manager	Participate in discussion on root cause of HAPIs Participate in discussion about process maps Approve pressure injury checklist Educate staff during implementation Reinforce its use and process with staff
Senior Clinical Nurses	Participate in discussion on root cause of HAPIs Participate in discussion about process maps Approve pressure injury checklist Educate staff during implementation Reinforce its use and process with staff
Wound Ostomy and Continence Nurse	Approve pressure injury checklist Educate staff during implementation Reinforce its use and process with staff
Medical Director	Participate in discussion on root cause of HAPIs Approve pressure injury checklist Reinforce its use and process with staff
Lead Nurse Practitioner	Participate in discussion on root cause of HAPIs Approve pressure injury checklist Reinforce its use and process with staff

Manager of Respiratory Department	Approve pressure injury checklist Educate Respiratory Therapy on the checklist and process Reinforce its use and process with staff
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**Table 3**

*Measurement Plan*

<b>Structure Measures</b>	<b>Numerator Statement</b>	<b>Denominator Statement</b>	<b>Inclusion and Exclusion Criteria</b>	<b>Frequency of Measurement</b>	<b>Source of Measure</b>
Evidence-based PIP bundle checklist will be created by 7/26/22.	N/A	N/A	N/A	Once	N/A
100% of SICU nurses, certified nursing assistants, advanced practice providers and respiratory therapists will be educated on the PIP bundle checklist and process by using a PowerPoint with a handout delivered by Senior Clinical Nurses, Assistant Nurse Manager, and DNP student in in-person and virtual staff meetings, and via email by 9/8/22.	# of SICU nurses, certified nursing assistants, advanced practice providers and respiratory therapists educated	# of total SICU nurses, certified nursing assistants, advanced practice providers and respiratory therapists	<p>Inclusion: SICU nurses, certified nursing assistants, advanced practice providers, and respiratory therapists</p> <p>Exclusion: Residents, fellows and attendings Because of the rotating nature of their schedules</p>	Daily	<p>Sign off sheet with names of all SICU staff who attended a staff meeting or read the email sent by DNP student</p> <p>Verbal verification from respiratory manager of the number of respiratory therapists educated.</p>

Process Measures	Numerator	Denominator	Inclusion/Exclusion	Frequency of Measurement	Source of Measure
<p>100% of Surgical ICU nurses, certified nursing assistants, and respiratory therapists will use the checklist to implement PI prevention best practices for each SICU patient each twelve-hour shift from 9/1/22 to 11/30/22.</p>	<p># of completed checklists submitted each shift</p>	<p># of patients in the SICU each shift who required a checklist</p>	<p>Inclusion: Each SICU patient must have a checklist list completed each shift</p> <p>Exclusion: Patients who are ordered comfort care or patients who are off of the unit entire shift</p>	<p>Each shift i.e. 2x/day</p>	<p>DNP Student will collect and review the checklists from both shifts daily</p>
Outcome Measures	Numerator	Denominator	Inclusion/Exclusion	Frequency of Measurement	Source of Measure
<p>There will be 0 hospital acquired pressure injuries in the SICU from 9/1/22 to 11/30/22.</p>	<p>Total # of HAPIs in the SICU</p>	<p>N/A</p>	<p>Both reportable and non-reportable Stage 3, stage 4 and unstageable HAPIs</p>	<p>Monthly</p>	<p>UMMC issued report from Division of Quality and Safety</p>

**Table 4***Structure Measures: Education Compliance*

<b>Participants</b>	<b>% Compliance with Receiving the Education</b>
Nurses (n=77)	100
Certified Nursing Assistants (n=16)	100
Advanced Practice Providers (n=9)	100
Respiratory Therapists (n=160)	100

**Table 5**

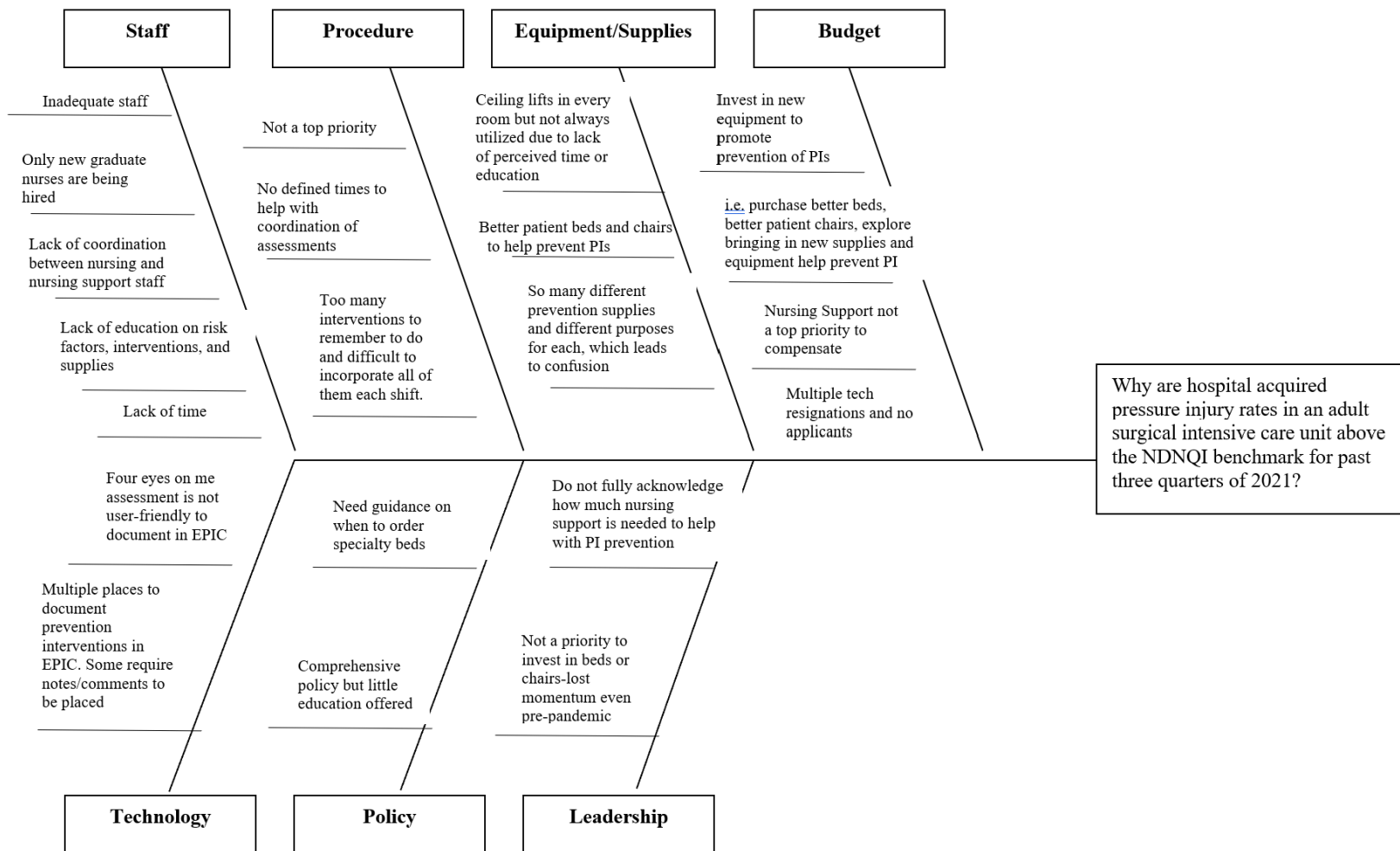
*Process Measure: Checklist Compliance*

<b>Week</b>	<b># Expected Checklists</b>	<b># Completed Checklists</b>	<b>% Completed Checklists</b>	<b>% Compliance on Dayshift</b>	<b>% Compliance on Nightshift</b>
1	298	132	44	66	34
2	243	115	47	48	52
3	239	97	41	63	37
4	241	67	28	42	58
5	261	116	44	47	53
6	261	127	49	50	50
7	284	157	55	56	44
8	270	134	50	41	59
9	268	144	53	44	56
10	284	155	55	58	41
11	282	127	45	49	51
12	273	157	57	48	52

13	284	214	75	46	54
14	275	181	66	51	49

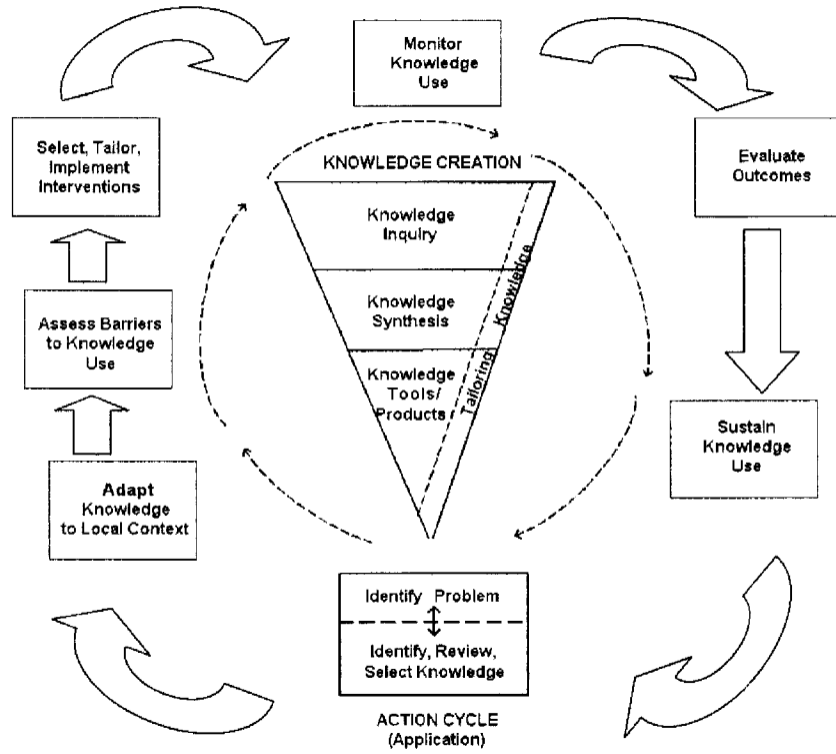
**Figure 1**

*Fishbone Diagram*



**Figure 2**

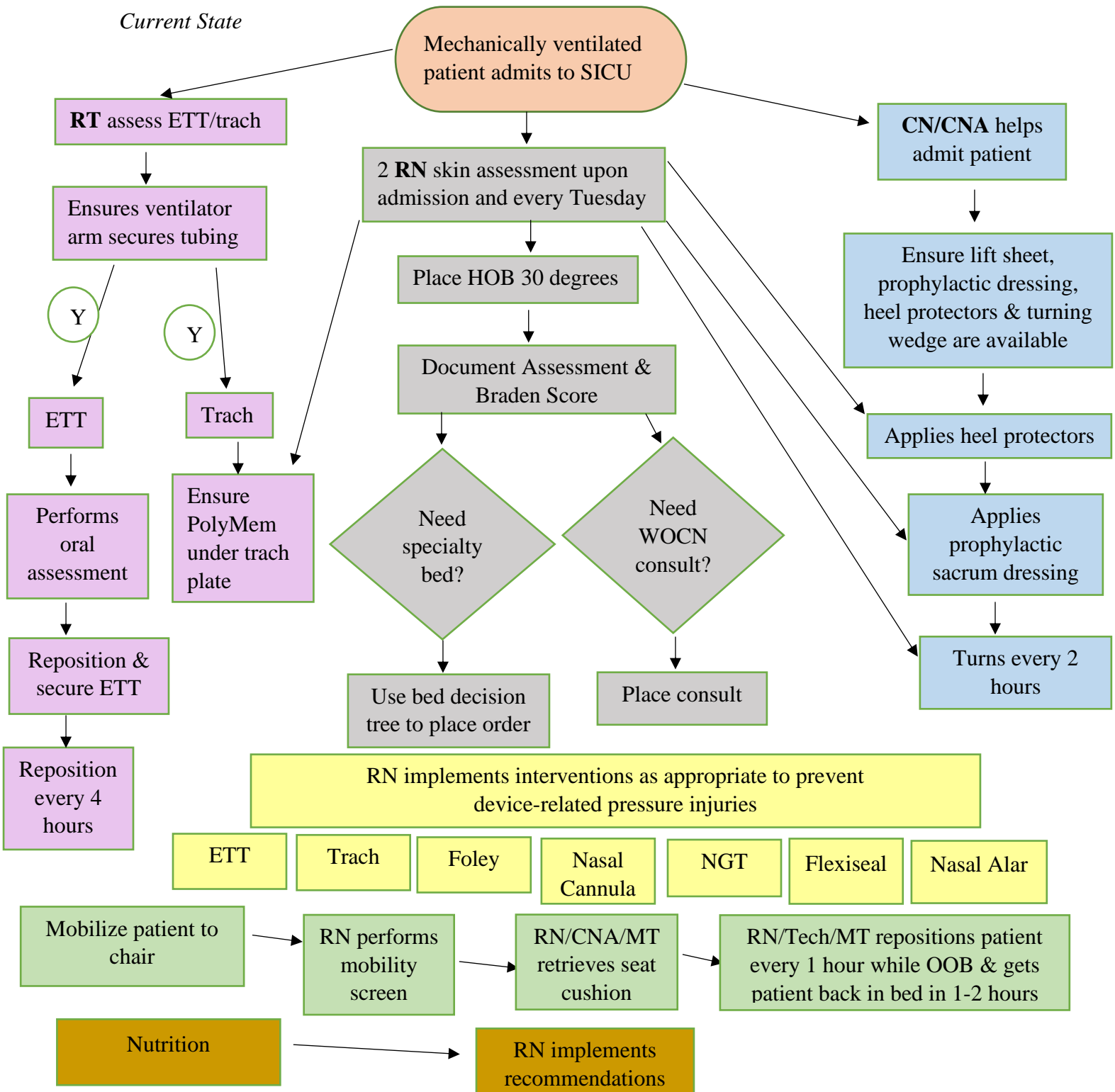
*Knowledge to Action Framework*



**Figure 3**

*Process Maps: Current State & Desired State*

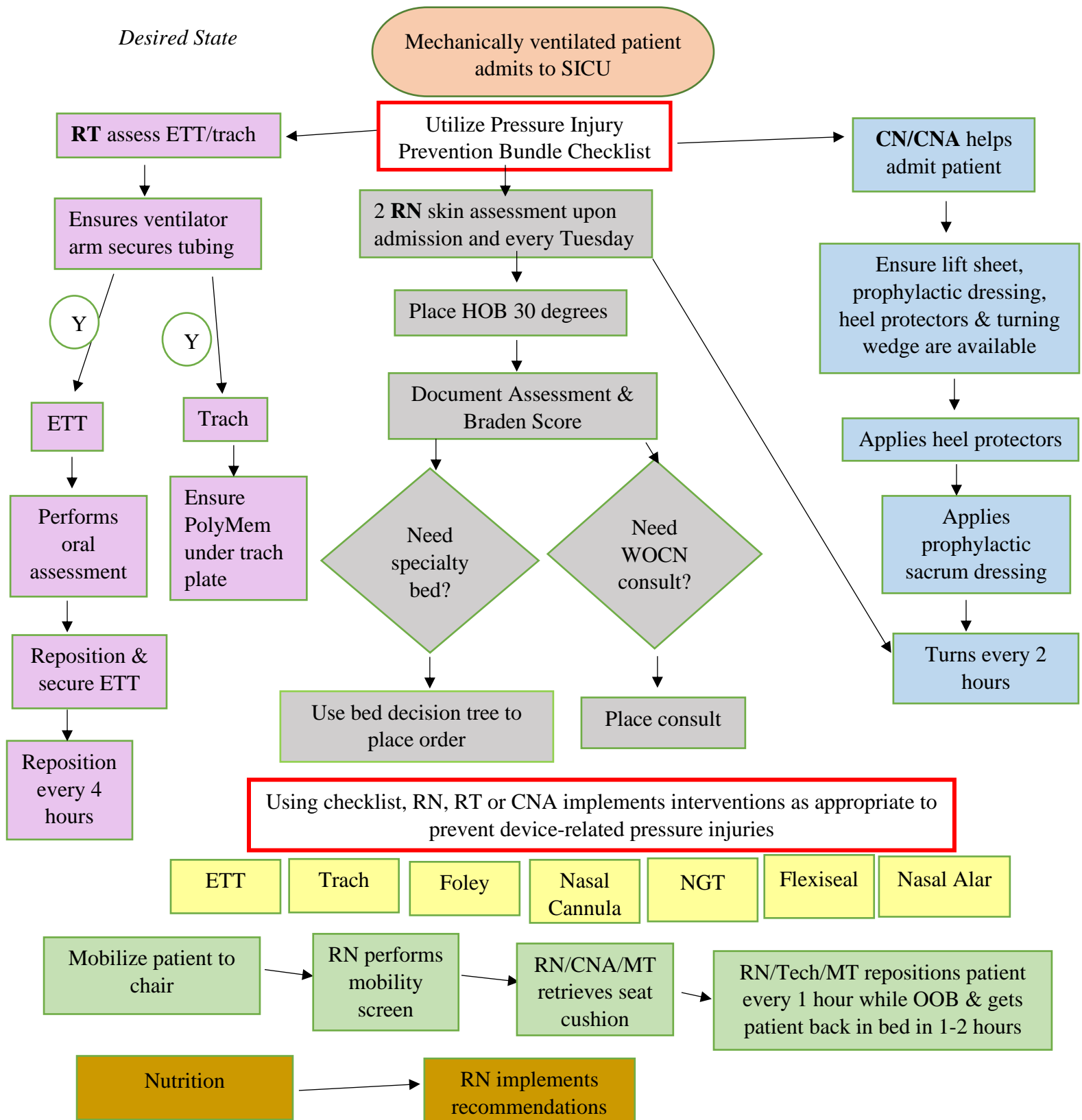
*Current State*



KEY: Oval=start or end of process; Rectangle=step in process; Diamond= decision point; ICU=Intensive Care Unit; RN= Nurse; CN=Charge Nurse; CNA=Certified Nursing Assistant; RT=Respiratory Therapist; MT= Mobility Tech; US= Unit Secretary; ETT=Endotracheal Tube; WOCN=Wound Ostomy Continence Nurse; NGT=Nasogastric Tube



*Desired State*



KEY: Oval=start or end of process; Rectangle=step in process; Diamond= decision point; ICU= Intensive Care Unit; RN= Nurse; CN=Charge Nurse; CNA=Certified Nursing Assistant; RT=Respiratory Therapist; MT=Mobility Tech; US=Unit Secretary; ETT=Endotracheal Tube; WOCN=Wound Ostomy Continence Nurse; NGT=Nasogastric Tube

Figure 4

Gantt Chart

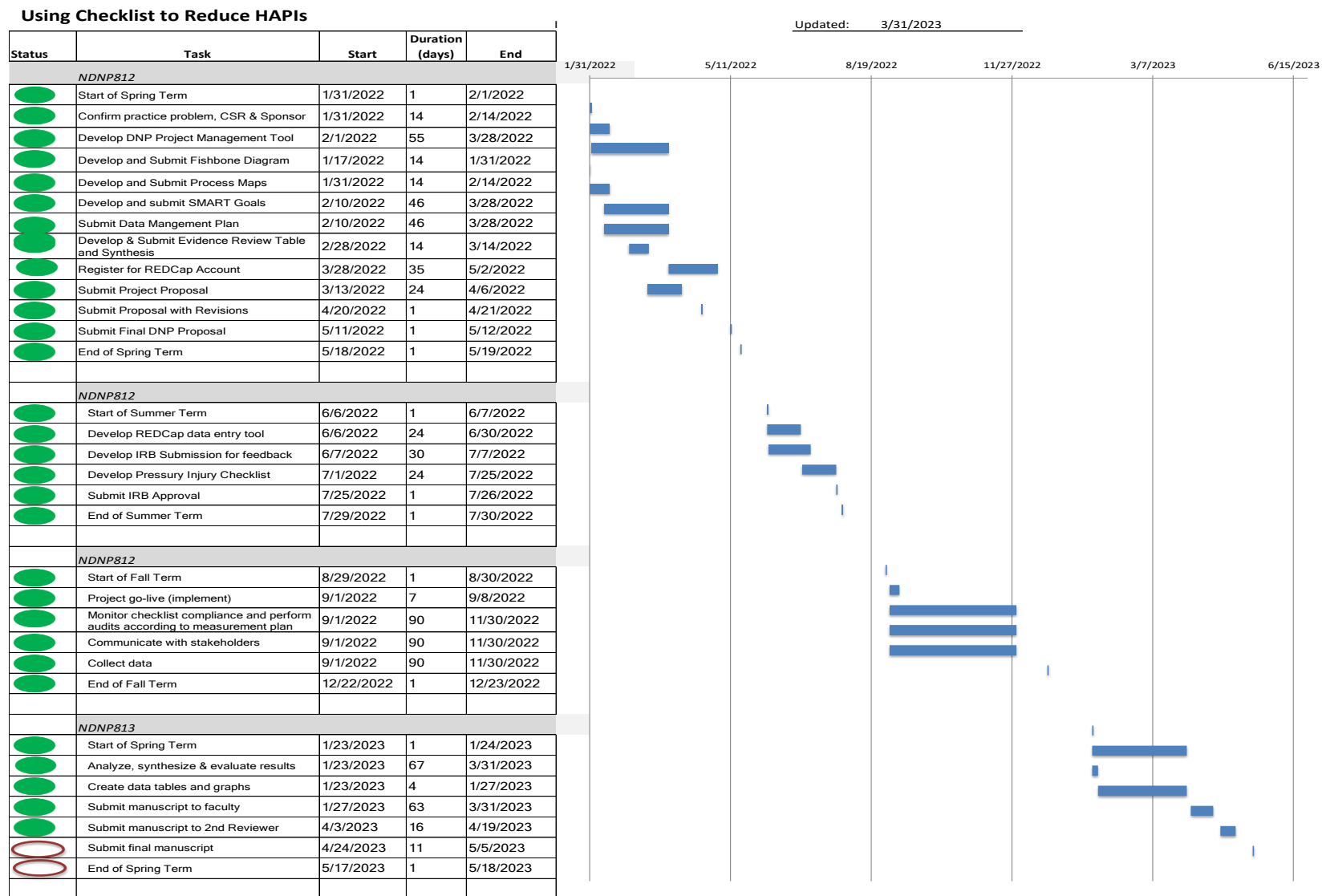
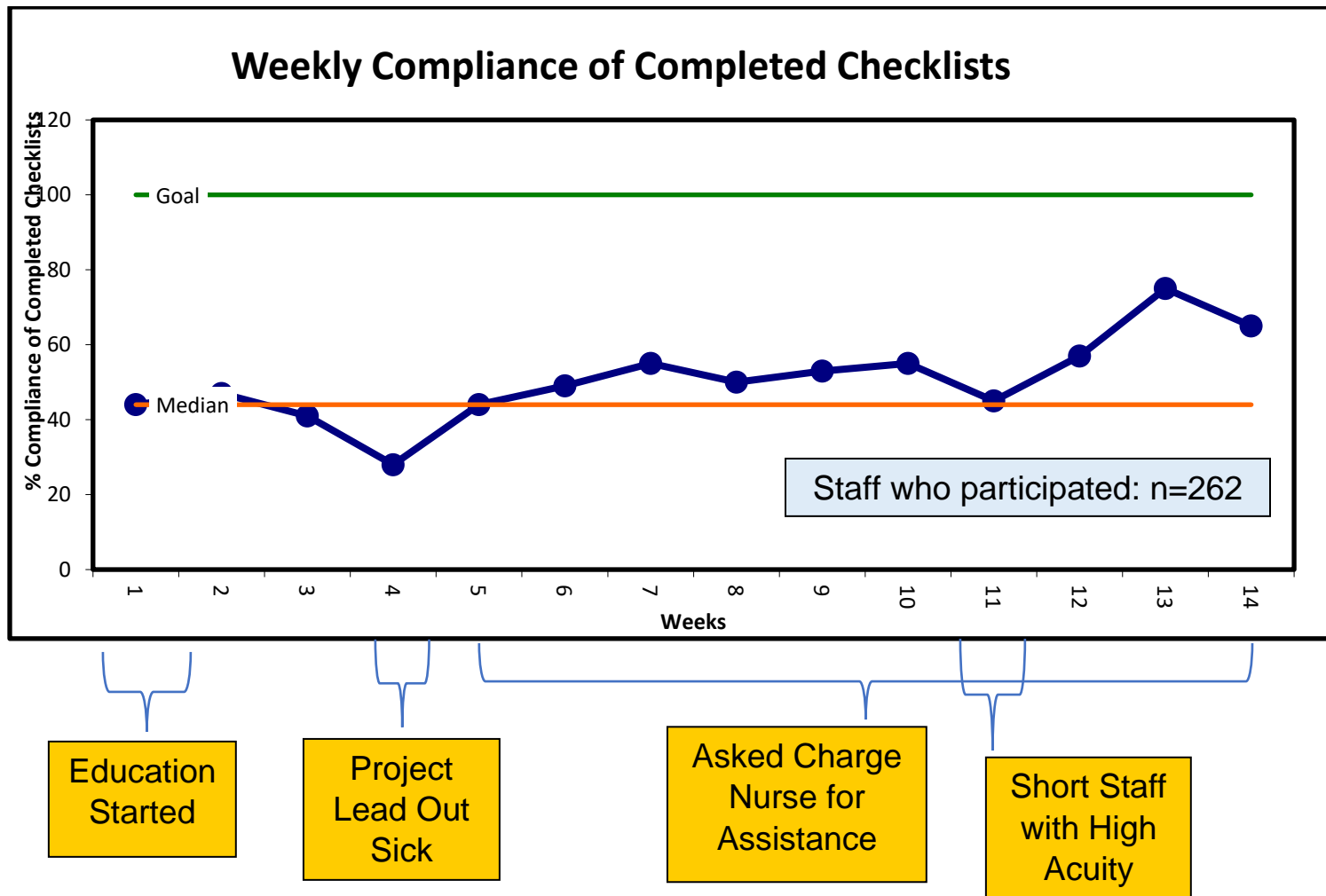


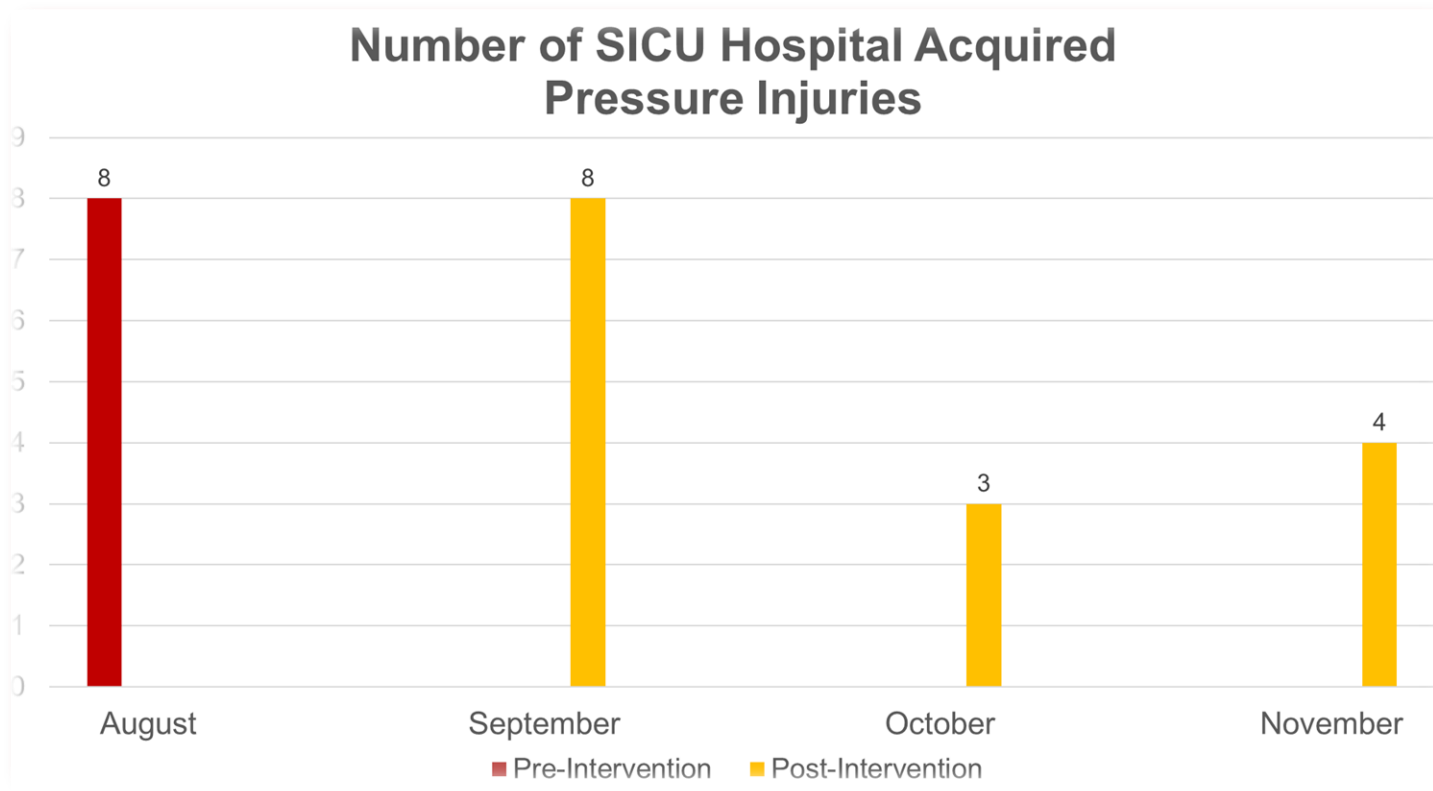
Figure 5

Process Measures: Run Chart



**Figure 6**

*Outcome Measure: Monthly HAPI Data*



**Appendix A**

**PIP Checklist**

**Directions:** Initial each component of the below interventions that were completed during your shift. For each 'No' that is checked, enter a comment describing why it was not completed. Choose 'N/A' if the intervention does not apply.

Name of RN: \_\_\_\_\_

Name of CNA: \_\_\_\_\_

Name of RT: \_\_\_\_\_

Date: \_\_\_\_\_

Shift: **AM** **PM** (Please circle one)

<b>Interventions</b>	<b>Initials</b>	<b>Y/N</b>	<b>N/A</b>	<b>Comments</b>
<b>2 RN Skin Assessment Completed upon Admission &amp; Every Tuesday</b>				
<b>Skin Assessment Performed Every 4 hours</b>				
<b>Braden Scale Completed</b>				
<b>Specialty Bed Ordered &amp; Turned On</b>				
<b>Turned Every 2 Hours With Foam Wedge: Semi-Fowlers, Right Side, Left Side NOT weight shifted when patient is in bed</b>				
<b>Heel Protectors On</b>				
<b>Sacral Prophylactic Dressing On</b>				
<b>CHG Bath Performed and Skin Moisturized</b>				
<b>Nutrition Plan Implemented</b>				
<b>NGT is H-taped</b>				
<b>KEO is Bridled with Appropriate Slack at the Septum</b>				
<b>OOB to Chair Completed and Documented: Weight shifted every hour</b>				
<b>WOCN Consulted for Identified and/or Potential for Pressure Injury</b>				

# TURN OVER FOR MORE INTERVENTIONS

## When patient is mechanically ventilated

Interventions	Initials	Y/N	N/A	Comments
Oral & Nare or Trach Assessment Performed Every 4 Hours				
Ventilator Tubing Secured By Arm with Appropriate Slack				
For ETT: Reposition ETT Every 4 Hours				
For Trach: Place Polymem Under Trach Plate				

## Special Considerations

<b>Medical Devices:</b> Inspect skin under device at least every 12 hours, Secure and Protect skin with dressings & reposition as ordered or when clinically indicated				
<b>Lines &amp; Drains:</b> Not Under Patient & Padded to Prevent Skin Breakdown (i.e. when ABD Binder is in use or when rectal probe in use)				
<b>Foley Securement Device in Place</b>				
<b>Purewick:</b> Ensure suction is set at 40 mmHg & never exceeds 80 mmHg; Replace catheter with perineal care				
<b>Flexi-Seal:</b> Position indicator line checked, balloon deflated, and balloon has less than 45mls of water each shift				
<b>Pulse Ox: Nasal Alar:</b> Rotated every 4 hours and sensor site checked every 2 hours				
<b>Pulse Ox: Forehead Pulse Ox Sensor:</b> Rotated every 4 hours				

