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Reducing Hospital-Acquired Pressure Injuries through Measure-vention

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Abstract

The Braden scale may be outdated in the critical care setting to prevent hospital acquired pressure injuries (HAPIs). Applying evidence from the literature on Braden subscales and using "Measure-vention" for quality improvement, a quality improvement project using Braden subscales implemented in a 30-bed ICU reduced HAPIs by 63.5 percent.

Introduction

Hospital-acquired pressure injuries (HAPIs) can develop during a patient's hospitalization from sustained pressure to the skin. HAPIs can cause pain, infection, prolonged hospitalization, and death.[1] Despite prevention strategies, HAPIs remain a persistent problem in healthcare. The Agency for Healthcare Research and Quality (AHRQ) has cited HAPIs as the only hospital-acquired condition declining in performance.[2]

Annually, approximately 2.5 million people develop a pressure injury during their hospitalization, with an estimated 60,000 of those who will die from complications related to HAPIs.[3] The cost to hospitals per HAPI ranges from $500 to $70,000, while the impact on healthcare costs nationally range from $3.3 billion to $11 billion.[3]

Recent research[4] has identified risk factors of patients in critical and progressive care units to differentiate avoidable from unavoidable HAPIs. The instruments developed[4] can be applied to guide risk-based interventions to prevent HAPIs. This quality improvement project was built on a risk-based prevention strategy using the Braden subscales, versus the standard Braden total score. The approach described in this article simplifies the risk assessment and enables a more targeted and effective approach to HAPI prevention.

Background

The setting for this pilot was a 30-bed intensive care unit (ICU) of an acute care, Level II trauma hospital. The ICU treats a mixed population of medical/surgical, cardiac, and trauma patients. Incidence of HAPIs in the ICU from 2017-2018 had increased by 422 percent over the same period in the prior year. In June 2018, a team of frontline ICU staff, nursing leaders, quality nurse consultants, and process improvement consultants (the ICU HAPI team) came together to investigate each HAPI and identify the root cause of the increase in HAPIs. The team's purpose was to identify the root cause of the increased rate in HAPIs and develop process improvement strategies using a rapid cycle improvement framework to decrease HAPI incidence.

Literature Review

A comprehensive literature review was conducted to investigate the use of Braden subscales versus Braden total score to prevent HAPIs. The PICOT question used to guide the literature search was: In adult patients in a critical care setting (P), how does applying preventative measures for hospital-acquired pressure injuries by Braden subscale (I) compared to Braden total score (C) affect the incidence of avoidable hospital-acquired pressure injuries (O) within six months (T).

The following databases were used in the literature search: the Cochrane Database of Systematic Reviews, Joanna Briggs, Cumulative Index of Nursing and Allied Health (CINAHL), PubMed, and SCOPUS. From more than 3,000 articles returned using keywords hospital-acquired pressure injuries and Braden scale, the yield was further limited by using Boolean phrases "AND" and "OR" and adding the keywords *avoidable, unavoidable, intervention, risk assessment*, and *subscale*. Articles not printed in English or published before 2012 were excluded from the search. Additional articles were found from cited material in articles returned

by the searches.

Seven peer-reviewed research articles published between 2012 and 2020 contained information relevant to the specificity of using the Braden subscales to predict pressure injuries.

The Braden Scale is a risk assessment tool used by nurses that measures the risk of development of a pressure injury (PI).[5] The Braden Scale is the most widely used risk assessment tool and is credited with the best predictive ability in identifying PIs in adults.[6] From a systematic literature review, Alderden et al.[7] found the Braden total score sensitivity to be anywhere between 75%-92.5% and specificity to be between 26%-100%. The effectiveness of using the Braden scale in critical care was diluted, as almost all patients are determined to be at risk. Cox[5] found factors influencing HAPI development not addressed by the Braden Scale included advanced age, severity of illness, admission to the ICU, and length of stay beyond five days.

Despite its widespread acceptance as a risk assessment tool, use of the Braden Scale has not reduced the prevalence of HAPIs. Lim et al.[6] found that all six Braden subscales were individually predictive of PI development, with the activity subscale the highest predictor, followed by friction and shear. Lim et al.'s study found that Braden subscale scores were a strong indicator of PI development and recommends the Braden subscale scores be used independently to guide care for patients in preventing PIs.[6]

Mordiffi et al.[1] found the mobility subscale to be comparable to the Braden total score as a predictor of pressure injury. The Braden mobility subscale was 5.7 (95% CI 2.062, 15.676, p=0.001) times more likely to predict pressure injury development than the other five subscales.[1] Only the mobility subscale was found to be an independent predictor of PI development. In other

studies,[5,7,8] friction and shear, mobility, moisture, and sensory subscales were found to be individually predictive of pressure injury.

Gadd and Morris[8] found in a study of 20 patients with confirmed HAPIs that 19 percent of patients were determined not at risk (per Braden cut-off score of 18) although they had a subscale score at risk, and 81% of patients had at least one day at risk. However, interventions were not tailored to a specific subscale risk 46-97 percent of the time.

Study Design

Pittman et al.[4] established the occurrence of unavoidable HAPIs when appropriate evidence-based interventions were correctly implemented. The Braden Inventory Worksheet allocates points centered on the number of evidence-based interventions implemented based on the Braden subscales.[4] The Pressure Injury Prevention Inventory then aggregates this information to delineate whether the HAPI was avoidable or unavoidable. These two instruments evaluate HAPIs retrospectively, by using these tools prospectively, it was hypothesized that the ratio of unavoidable to avoidable HAPIs would increase.

A six-month pilot (Interventions by Braden Subscale Protocol) to reduce the incidence of HAPIs in the ICU incorporated the use of the Braden Inventory Worksheet and Pressure Injury Prevention Inventory.[4] Table 1 (*Interventions by Braden Subscale*) shows five of the six Braden subscales with specific interventions linked to each subscale. The activity and mobility subscales were combined as the interventions and scoring ranges were the same. The embedded table (on the right) defines how many interventions per subscale must be performed. Training for the pilot was developed and subsequently introduced to staff through regularly scheduled staff meetings. The pilot was launched in January 2020 for all patients in the ICU.

Process measures of success were: 1) rate of adherence to the protocol based on the number of correct interventions implemented utilizing the Braden subscale and 2) percentage of time the Measure-vention nurse had to intervene. Ultimately the goal was to decrease the percentage of Measure-vention episodes demonstrating effective protocol adherence. The outcome measure was the incidence of HAPIs in the ICU.

Methodology

The Institute for Healthcare Improvement's (IHI), a Plan-Do-Study-Act (PDSA) framework for improvement[9] had been used in several iterations prior to the pilot with the intent of reducing HAPI incidence. The first few PDSA's were focused on timely/accurate skin and risk assessments, turning patient's every two hours, and testing in-bed mobility devices to assist with turning. Through these PDSA cycles, it was determined that; a) the risk assessments were inconsistent and inaccurate, b) the staff had many questions around use of the Braden Scale, and c) interventions were not being tailored to the specific risks of the individual patient.

Measure-vention

In March 2019, the ICU HAPI team incorporated Measure-vention into process improvement work. Measure-vention is a simultaneous measurement and intervention process recognized by the Agency for Healthcare Research and Quality.[2] Applying Measure-vention inside the PDSA cycle enabled the frontline nurses to engage concurrently in process improvement and direct patient care.

Data Collection

The medical center's event reporting system was used to determine the incidence of all stage HAPIs in the ICU and calculated to a rate of per 1000 patients. To monitor process measures during the pilot for Interventions by Braden Subscale, a software application by Press

Ganey Associates, iRounds, was used. In iRounds, audits were developed by the medical center and used by nurses trained to the use of the application. To show improved reliability in processes where Measure-vention was employed, an audit was developed in iRounds where the Measure-vention nurse entered the number of times needed to intervene, or "-vention". To capture process measures and validate improvement over time, utilization of the Interventions by Braden Subscale protocol was monitored through iRounds. The audit consisted of five questions requiring a "yes" or "no" answer. Each question was related to a specific subscale and for each subscale value, the corresponding number of specific interventions for that subscale would be expected to be implemented, netting a "yes" answer. If the incorrect number of interventions (incorrect or omitted interventions) were implemented based on the protocol, the answer would be "no".

Data Analysis

Data on the incidence of HAPIs was summarized using a control chart to show the incidence of HAPIs pre- and post-interventions. Process measures were input into iRounds and exported to Microsoft Excel where the data was analyzed. Data on process measures and the outcome measure were reviewed at least bi-weekly with staff via huddles using a visual management board.

Results

The all-stage HAPI incidence rate, in the ICU, per 1000 patients is shown as a control chart in Table 2 (*Hospital Acquired Pressure Injuries*). The control limit for HAPI incidence was 29.948/1000 patients before the pilot was implemented, and a rate of 10.928/1000 patients at the end of the pilot (63.5 percent reduction). In November 2019, socialization began around the Interventions by Braden Subscale pilot and all ICU nurses were educated to the pilot at staff

meetings. Communication of the pilot continued with shift huddles, visual boards, and peer-to-peer accountability through the work of Measure-vention. Between March 2019 and November of 2019, the iterative PDSAs were implemented and some reduction was seen in the rate of HAPIs. It was after the pilot for Interventions by Braden Subscale was implemented that the most significant reduction was realized.

To monitor phases of the PDSA, from early adoption to sustainability, the project team monitored how often the Measure-vention nurse needed to intervene. When Measure-vention began in March 2019 the Measure-vention nurse needed to intervene in real time to correct a specific process 63 percent of the time (see Table 3, *Measure-vention Interventions*). In November 2019, when the Interventions by Braden Subscale pilot was implemented, the control limit was 35 percent, further decreasing the percent of time the Measure-vention nurse needed to intervene to 22 percent by May 2020. This is where full adoption by the nursing staff occurred and sustainability efforts were put in place.

Table 4 (*Utilization of Interventions by Braden Subscale Protoco*l) shows the percent compliance to the Interventions by Braden Subscale protocol. The Measure-vention nurses, using iRounds, performed real time measurement of adherence to the protocol. In November when education began, an immediate adoption of the protocol by nurses occurred. All subscale scores and the specified interventions, from Table 1, reached a sustained level of performance after January 1, 2020, except for the Nutrition subscale which sustained low performance throughout the pilot. Poor performance in the Nutrition subscale highlighted an opportunity in the ICU to improve feeding for critically ill patients and required a multi-disciplinary approach.

Performance in the other four subscales was maintained until the end of February when the medical center began to see their first cases of COVID-19. It is a testament that the staff

reconnected to the work in less than a month and performance improved once again to above 80 percent adherence to the protocol through the remainder of the pilot.

Limitations

Convenience sampling was used to monitor adherence to the Interventions by Braden Subscale protocol, limiting the generalizability of the results. Randomized control studies are not ethical for this type of work, though replication could improve the strength of the findings. COVID-19 presented a unique and unprecedented challenge during the pilot. The ability to replicate the study and reproduce the results may be hindered by the uniqueness of the patient population related to the pandemic and the mental burden placed on healthcare providers during the pandemic.

Conclusion

The results of the pilot demonstrated the efficacy of using the Braden subscales to guide preventative care of HAPIs, with implications as well related to the overutilization of resources. The intended next step is to engage leadership support to spread the Interventions by Braden Subscale pilot to the rest of the medical center using the Measure-vention format.

Key Points

- The Braden Scale may be an outdated risk assessment tool. Using the Braden subscales could prove to be of benefit in preventing HAPIs and reducing overutilization of resources
- Measure-vention is a reliable method to engage and empower frontline nurses to enhance quality of care and participate in rapid cycle improvement

References

1. Mordiffi S, Kent B, Phillips N, Huat G. Assessing pressure injury risk using a single mobility scale in hospitalised patients: A comparative study using case-control design. *J Research Nurs.* 2018;23(5):387-403. https://doi.org/10.1177/1744987118762006.
2. Agency for Healthcare Research and Quality. *Chapter 7. Layering Interventions and Moving Toward Excellence.* February 2016. Reviewed May 2016. Accessed October 12, 2020. https://www.ahrq.gov/patient-safety/resources/vtguide/guide7.html.
3. 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
4. Pittman J, Beeson T, Dillon J, Yang Z, Cuddigan J. Hospital-acquired pressure injuries in critical and progressive care: avoidable versus unavoidable. *Am J Crit Care.* 2019;28(5)*:*338-350. https://doi.org/10.4037/ajcc2019264.
5. Cox, J. (2012). Predictive power of the Braden scale for pressure sore risk in adult critical care patients: A comprehensive review. *J Wound Ostomy Continence Nurs.* 2012;39(6):613-621. https://doi.org/10.1097/WON.0b013e31826a4d83.
6. Lim E, Mordiffi Z, Chew H, Lopez V. Using the Braden subscales to assess risk of pressure injuries in adult patients: A retrospective case-control study. *Int Wound J*. 2019;3:665-673. https://doi.org/10.1111/iwj.13078.
7. Alderden, J, Cummins M, Pepper G, Whitney J, Zhang Y, Butcher R, Thomas D. Midrange Braden subscale scores are associated with increased risk for pressure injury development

among critical care patients. *J Wound Ostomy Continence Nur*s. 2017;44(5):420-428. https://doi.org/10.1097/WON.0000000000000349.

8. Gadd M, Morris M. Use of the Braden Scale for Pressure Ulcer Risk Assessment in a Community Hospital Setting: The role of total score and individual subscale scores in triggering preventative interventions. *Journal of Wound, Ostomy and Continence Nursing,* 2014;41(6):535-538. https://doi.org/10.1097/WON.0000000000000066.
9. Institute for Healthcare Improvement. Science of improvement: Testing changes. http://www.ihi.org/resources/Pages/HowtoImprove/ScienceofImprovementTestingChanges.aspx. Published 2020. Accessed October 10, 2020.

Table 1
Interventions by Braden Subscale

Sensory Subscale <=3
Offload heels (Heel protector boot or pillow)
Pressure redistribution (waffle cushion in chair – limit 1 hour)
Protect bony prominences (Mepilex)

Moisture Subscale <=3
Keep skin folds clean and dry (InterDry, Nystatin, Antifungal Cream)
Protect skin (barrier cream)
Urinary or Fecal Management Systems (consider external first)
LAL Surface (ICU Hil-Rom beds are LAL, Stryker and others – validate pump on)
Avoid multiple layers of linens/pads (max 3 layers)

Mobility/Activity Subscales <=3
Avoid positioning on red areas, protect bony prominences (Mepilex)
Promote out of bed mobility (limit 1-hour OOB)
Avoid multiple layers of linens/pads; remove transfer/sling sheet from under pt. (limit 3 layers)
Reposition frequently (at least q2hours)
Pressure redistribution (waffle cushion in chair – limit 1 hour)

Nutrition Subscale <=2
Maximize protein and caloric intake, fluids (PO >50% or encouraged intake)
RD Consult (at any point, re-consult as condition changes)
Early nutrition (enteral/parenteral)
Supplements as recommended (by RD)

Friction/Shear Subscale <=2
Raise knee gatch 10-20 degrees before raising HOB
Limit HOB to 30 degrees
Offload heels, bony prominences (Heel protector boot or pillow, Mepilex)
Promote out of bed mobility (limit 1hour OOB)
Moisturize Skin (Moisturizer)

Number of Interventions Required by Subscale

Subscale	Score	# of Interventions
Sensory	1 or 2	2
Sensory	3	1
Moisture	1 or 2	2
Moisture	3	1
Mobility	1 or 2	2, one must be turning
Mobility	3	1
Activity	1 or 2	2
Activity	3	1
Nutrition	1 or 2	2, one must be RD Consult or contraindication
Nutrition	3	1
Friction/Shear	1 or 2	2
Friction/Shear	2	1

Pittman, J., Beeson, T., Dillon, J., Yang, Z., & Cuddigan, J. (2019). Hospital-acquired pressure injuries in critical and progressive care: avoidable versus unavoidable. *American Journal of Critical Care, 28(5),* 338-350. https://doi.org/10.4037/ajcc2019264

Table 2
Hospital-acquired Pressure Injuries, all stages, per 1000 patients in ICU

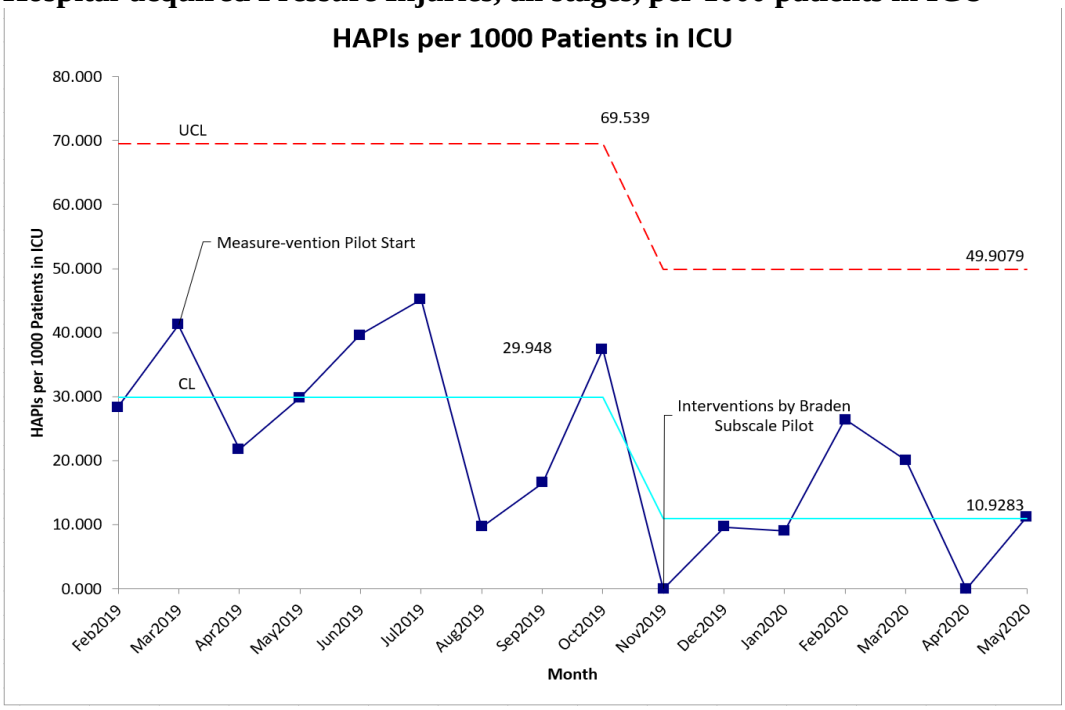

Table 3
Measure-vention Interventions

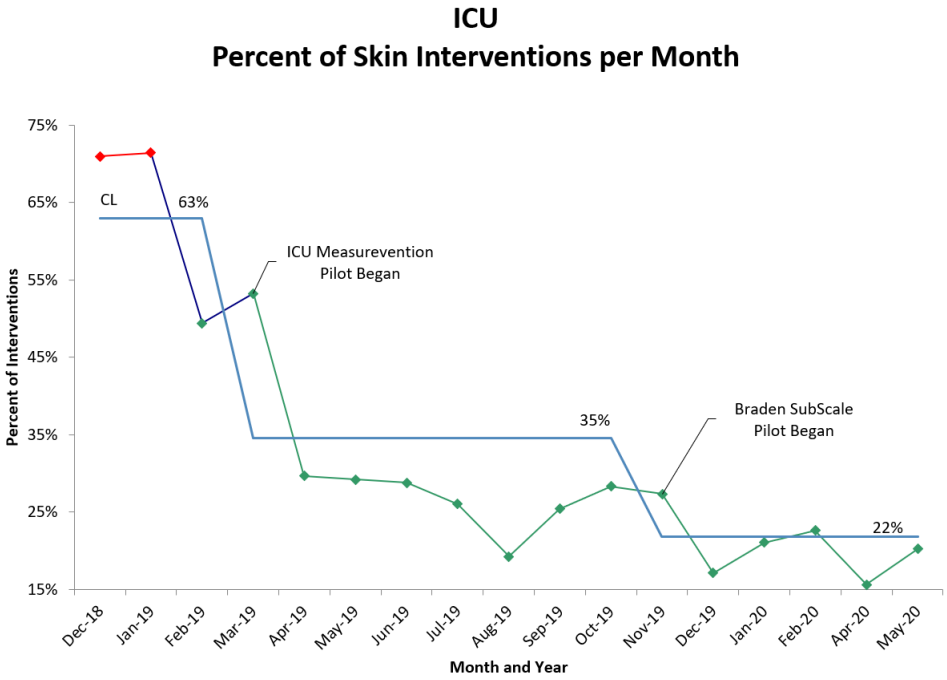

Table 4
Utilization of Interventions by Braden Subscale Protocol