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A comparison of hospital-acquired pressure injuries in intensive care and non-intensive care units: a multifaceted quality improvement initiative

Laurie Goodman,[1] Ekta Khemani,[2,3] Francis Cacao,[4] Jennifer Yoon,[1] Vanessa Burkoski,[5] Scott Jarrett,[5] Barbara Collins,[5] Trevor N T Hall[2]

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[1]Professional Practice, Humber River Hospital, Toronto, Ontario, Canada
[2]Department of Quality and Patient Safety, Humber River Hospital, Toronto, Ontario, Canada
[3]Department of Anesthesia, Niagara Health, St. Catherines, Ontario, Canada
[4]Critical Care, Humber River Hospital, Toronto, Ontario, Canada
[5]Senior Administration, Humber River Hospital, Toronto, Ontario, Canada

Correspondence to
Laurie Goodman;
lgoodman@hrh.ca

ABSTRACT

Hospital-acquired pressure injuries (HAPI) are a significant cause of morbidity and mortality, and represent a major health concern worldwide. Patients suffering from HAPI report a poor quality of life on several dimensions of health. Moreover, HAPI is reported to lengthen in-hospital stay in the acute setting, posing significant healthcare resource utilisations and costs. Given the clinical and economic burden of HAPI, recent best practice guidelines provide recommendations to reduce the prevalence of pressure injuries. Humber River Hospital (HRH), a large community hospital in Toronto, Canada, has a daily census of approximately 500 patients. The aim of this project was to reduce the prevalence of HAPI within the intensive care unit (ICU) and non-ICU setting at HRH within a 1-year period. Using the International Pressure Injury/Ulcer Prevalence (IPUP) Survey we established a baseline prevalence of HAPI of 27.6% (n=315) for non-ICU and 30% for ICU (n=33) patients at our institution in 2015. Using the Plan-Do-Study-Act (PDSA) method for quality improvement, we implemented a multifaceted approach aimed at improving equipment, digital documentation and education on risk assessment, prevention and treatment strategies. Over multiple PDSA cycles, our prevalence of HAPI reduced to 16% for non-ICU patients with no changes to the HAPI prevalence in ICU patients in 2016. Sustainability continues with HAPI prevalence currently at 10% in 2017 for non-ICU patients, which outperforms the Canadian prevalence (13.7%) by census size for 2017. However, the prevalence of HAPI in the ICU increased to 45% in 2017 despite multiple quality improvement initiatives, suggesting critically ill patients represent a unique challenge for reducing HAPI for these patients at our institution.

PROBLEM

The prevalence of pressure injuries in the healthcare setting is wide, ranging from 0% to 72.5%, with large variations observed between different countries and clinical settings (eg, hospital and community care).[1] According to the National Healing Corporation (2005), the worldwide incidence of PrU in intensive care units (ICU) ranged widely from 1%- 56%.[2 3] Further, there is wide variation reported in PrU prevalence in ICUs between countries and continents: 49% across Western Europe,[4] 22% in North America,[5 6] 50% in Australia[7 8] and 29% in Jordan.[9]

Humber River Hospital (HRH) is a large community hospital in Toronto, Canada and recognises the importance of hospital-acquired pressure injuries (HAPIs) given the burden of illness, morbidity and mortality. With the recent international clinical practice guidelines and recommendations on pressure injuries[2 5 11] and as a part of a continuous model for improvement, this initiative was undertaken to reduce the prevalence of HAPI within the ICU and non-ICU settings at HRH within a 1-year period. The implementation of a multifaceted, hospital-wide quality improvement plan to reduce the prevalence of HAPI at our institution was under way. This quality initiative was supported by the senior administration and clinical practice leaders, and management and interprofessional staff provided support at the unit level.

BACKGROUND

A pressure injury is a 'localised injury and/or underlying tissue, usually over a bony prominence, resulting from sustained pressure (including pressure associated with shear)'.[2] Prevalence rates vary globally from 18.1% for acute settings in Europe[3] to 26% across all healthcare settings, as seen in a 2004 Canadian study[4] representing significant healthcare burden. In addition to the pain reported by patients from pressure injuries, recent literature suggests there is a significant decrease in the quality of life of patients with pressure injuries. A recent systematic review reveals that pressure injuries affect several dimensions of quality of life, including physical, social, psychological and financial aspects.[6]

Moreover, the high prevalence rates of pressure injuries are correlated with an increase

in healthcare resource utilisation and significant healthcare costs.[7] Studies on pressure injuries in the acute care setting reveal that hospital HAPIs lengthen hospital stay by approximately 4.3 days.[8] In fact, literature has shown that HAPIs involve a much higher cost to the healthcare system in Canada than non-HAPIs ($C44 000–90 000 vs $C11 000–18 500).[9]

Recently, the US National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel and Pan Pacific Pressure Injury Alliance collaborated to update the guidelines on the prevention and treatment of pressure injuries.[2] Further, in Canada, the Registered Nurses Association of Ontario also updated their Best Practice Guidelines in 2016.[11] These guidelines reviewed recent evidence and provided recommendations for healthcare organisations to reduce the prevalence of pressure injuries globally. Consequently, HAPI is considered a key indicator for the overall quality of healthcare organisations.

Given the clinical, psychological and financial burden of HAPI, HRH conducted a quality improvement initiative to understand the prevalence of HAPI and implement a hospital-wide quality improvement plan to reduce the prevalence of HAPI for ICU and non-ICU patients. ICU patients were separated from non-ICU patients as literature reveals that pressure injuries are a common complication in the ICU setting.[12–14]

MEASUREMENT

This quality improvement initiative was completed over 3 years (2015–2017), with baseline data collected in 2015. Point prevalence was extracted for patients that only had HAPI from the overall survey results for the purposes of this study. Those that had a pre-existing pressure injury on admission to facility were not included in this study.

Baseline data were collected using the International Pressure Ulcer/Injury Prevalence (IPUP) Survey methodology.[15] To date, the IPUP is the largest global running database for pressure injuries. Survey teams included clinical practice leaders as data recorders and nurses assisted with the patient assessments and data collection. Together they were considered a data collection team and each team was assigned to one or two units depending on patient census size. Scantron forms were manually populated and were then sent to a third party for analysis. The survey was completed annually in the month of February.

Baseline data revealed a point prevalence of 27.6% (n=315) for non-ICU patients and 30% for ICU patients (n=33) at HRH in 2015. These results were a driving force behind the development of a wound and skin strategic quality improvement initiative that aimed to reduce the prevalence of HAPI.

DESIGN

The wound and skin strategic plan is a multifaceted approach, involving three key areas for change: (1) Equipment. (2) Education. (3) Digital documentation. Project champions (clinical practice leaders and resource persons) were secured for this initiative to promote and support changes. Feedback from stakeholders was frequently elicited throughout the project. Stakeholders consisted of an interprofessional committee including senior administration. A Plan-Do-Study-Act (PDSA) methodology[16] complemented this initiative over a 1-year period. A repeat point prevalence on HAPI for ICU and non-ICU patients was conducted in 2016 and again in 2017 to assess sustainability.[16–18]

STRATEGY

With interprofessional collaboration and evidence-based guidelines, we undertook a number of overlapping interventions in the form of PDSA cycles over a 1-year period.

PDSA cycle 1: equipment (October 2015–December 2016)

The aim of PDSA cycle 1 was to acquire pressure injury prevention equipment with interprofessional input. As our institution moved to a new facility in October 2015, we procured equipment that would minimise HAPIs including pressure redistribution mattresses for the emergency department stretchers, microclimate air pressure redistribution beds and seat cushions. Recognising that early mobility may help reduce HAPIs, we also procured equipment that would help facilitate mobility for patients including a ceiling lift, protective heel booties, additional pillows for patient positioning and patient chairs in each room. All staff received transitional orientation training on all new equipment prior to the move and were provided with ongoing educational support.

In addition, the wound product formulary and supply carts were revised to remove potential sensitising ingredients from the wound product formulary that may contribute to dermatitis and subsequent skin breakdown.[19] An evidence-based practice approach was used for standardising wound products that incorporates the best evidence available, clinician experience and patient preference.[20] Product education sessions were conducted at each unit level.

PDSA cycle 2: guideline adoption, education and implementation (January 2016–December 2017)

The aim of PDSA cycle 2 was to educate nurses on evidence-based practices to standardise nursing practice and to reduce the prevalence of HAPI. To implement these practice changes, local policies and guidelines at HRH were developed using evidence-based recommendations.[2 11] Implementation of these practice changes was conducted using multiple methods including formal education sessions, small group at each unit level, electronic messaging communications and one-on-one teachable opportunities.[20 21] Education on HAPI for nurses was expanded from 3½ hours to 7½ hours in both small and large group settings using a case-based approach. Education was offered from January 2016 to December 2017 and included six complementary modules reflecting the different facets to prevent pressure injuries. A pre-education and posteducation 5-point Likert Questionnaire[22]

evaluating the educational intervention was completed by each participant following the 7½-hour education session.

Additionally, the ICU implemented a tailored education initiative. The promotion of healthy, intact skin in the ICU population was integrated into daily care. There was a focus on: minimising the layers of linen between the patient's skin and pressure redistribution surface; implementation of disposable, absorbent underpads; and removal of disposable incontinent briefs from the ICU supply cart. These strategies were to emphasise continence promotion rather than managing incontinence, while optimising the pressure redistribution air beds to their full effectiveness.

In January 2016, a comprehensive pressure injury risk assessment was instituted hospital-wide for each patient to be completed on admission and at regular intervals throughout the hospitalisation (every 48 hours for non-ICU patients and every 12 hours for ICU patients). The comprehensive pressure injury risk assessment included four components: (1) Screening for pressure injuries using the validated Braden Scale.[23] (2) Physical skin inspection. (3) Identification of additional risk factors for pressure injuries. (4) Nutritional screening for malnutrition.[24]

PDSA cycle 3: electronic documentation (January 2016–April 2016)

The aim of PDSA cycle 3 was to develop and implement electronic documentation that reflects the standards of care for pressure injuries as outlined in our newly implemented guidelines. From February to April 2016, electronic pressure injury documentation with clinical support was implemented across HRH. Electronic documentation changes included:

- Triaging for pressure injuries in the emergency department.
- Electronic automatic population of the risk level of pressure injury.
- Electronic wound and skin specialist nurse referral for more severe pressure injuries.
- Development of a new documentation screen for pressure injury assessment, separate from other wounds.
- Creation and implementation of a pressure injury discharge report.

By developing electronic documentation, we were able to assess nurses' compliance with HAPI guidelines. Moreover, electronic documentation allowed HRH to monitor and track HAPI within our institution, with the goal of early identification of high-risk patients leading to prompt interventions.

RESULTS

The 2016 IPUP Survey results showed a HAPI point prevalence of 16% (n=405) for non-ICU patients and 30.6% (n=11) for ICU patients (table 1).

Table 1 Comparison of hospital-acquired pressure injuries (HAPIs) in intensive care unit (ICU) and non-ICU populations (2015–2017)

	2015	2016	2017
Non-ICU HAPI, % (medicine, surgical, emergency admitted)	87/315=27.6%	64/405=16%	45/457=10%
ICU HAPI, %	10/33=30%	11/36=30.6%	18/40=45%

This represents an absolute risk reduction (ARR) of 11.6% for non-ICU patients, but an increase of 0.6% for ICU patients from the 2015 baseline point prevalence.

The IPUP Survey was repeated in 2017 and showed a HAPI point prevalence of 10% for non-ICU patients (n=457) and 45% for ICU patients (n=40) (table 1). This represents an ARR of 17.6% for non-ICU patients compared with the 2015 baseline results. ICU patients had an increase in point prevalence for HAPI in 2017 by 15% compared with the 2015 baseline results (table 1).

Adherence to the quality improvement initiatives, particularly with respect to digital documentation preintervention and postintervention were assessed and an increase in compliance in all dimensions was realised (table 2).

Furthermore, results of the pre-educational and posted-ucational intervention questionnaires noted an average 2-point increase (2.5 to 4.5) on a 5-point Likert Scale in their knowledge level on pressure injuries following the education session (n=332).

LESSONS AND LIMITATIONS

One of the biggest lessons of our study is that point prevalence of HAPI was collected rather than incidence. The IPUP Survey, a validated pressure injury survey, is designed to collect prevalence data rather than all the data collected over the year. Consequently, our data,

Table 2 Compliance with Humber River Hospital quality initiatives: all patients, intensive care unit (ICU) and non-ICU combined (2015–2017)

Quality initiatives	2015 (%)	2016 (%)	2017 (%)
Skin assessment documented within 24 hours of admission	89.9	98.4	93.4
Braden Scale Score within 24 hours of admission	76.3	90.5	83.5
Braden Scale Score completed (every 48 hours (non-ICU) and every 12 hours (ICU))	87.8	86.3	85.5
N	358	441	497

especially for ICU patients where our sample size was significantly smaller, may not be representative of all patients with HAPI over the year. The largest sample size for ICU patients was 40 patients compared with non-ICU patients where the largest sample size was significantly larger (ie, 457).

Nonetheless, we chose to analyse ICU patients separately in our study given the evidence that ICU patients represent a unique cohort of patients. In fact, a recent systematic review identified seven risk factors for pressure injuries in critically ill patients including age, prolonged ICU admission, diabetes mellitus, cardiovascular disease, hypotension, prolonged mechanical ventilation and vasopressor administration.[25] Interestingly, the shared attribute of all seven of the identified risk factors is that they are all non-modifiable.[25]

Another study found that five variables, including peripheral arterial disease, mechanical ventilation >72 hours, respiratory failure, liver failure and severe sepsis/septic shock, were independent predictors with statistical significance for skin breakdown in the ICU patient population.[26] These risk factors are also non-modifiable.

These studies may suggest why the prevalence of HAPI was either unchanged or increased for ICU patients at our institution, despite all the quality improvement initiatives that were implemented.

Although this formative quality improvement project was successful, due to overlapping rapid PDSA cycles, it is difficult to delineate which intervention was most effective in reducing the prevalence of HAPI at our institution. Furthermore, a move to a larger site in 2015 led to an increase in nursing staff with transitional training on beds, mobility and enhanced mobility equipment. This increase may account for some of the initial decrease in HAPIs that was found, as it could be argued that the increase in nurse training led to early detection and thus early interventions. However, the decrease for the non-ICU patients has been sustained.

CONCLUSIONS

Pressure injuries are a significant cause of morbidity and mortality, and are correlated with an increase in healthcare resource utilisation and significant healthcare costs. Literature suggests that pressure injuries are often avoidable with the provision of quality healthcare services and a focus on prevention. This multifaceted quality improvement initiative leveraged risk assessment, prevention, treatment strategies and electronic documentation. Multiple PDSA cycles were used with the aim to reduce the prevalence of HAPI in the non-ICU and ICU settings. Sustained reduction in HAPI year-over-year has been realised in non-ICU patients representing a significant decrease from the baseline year (reduction of 17.6%). This reduction may represent a cost savings of approximately $1.8–3.7 million (n=41 cases) over 2 years, by applying the total net adjusted hospitalisation cost estimates for HAPI.[9] Results were not realised in the ICU setting with an increase in prevalence from the baseline year (increase of 15%). Multiple factors may influence HAPI prevalence increase in ICU patients and further research is warranted towards reduction strategies for HAPI in ICU settings. Overall, HRH has seen a sustained decrease in HAPI and outperforms the Canadian prevalence by census size for 2017.

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