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Are pressure injuries related to skin failure in critically ill patients?

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ABSTRACT

Background: Pressure injuries contribute significantly to patient morbidity and healthcare costs. Critically ill patients are a high risk group for pressure injury development and may suffer from skin failure secondary to hypoperfusion. The aim of this study was to report hospital acquired pressure injury incidence in intensive care and non-intensive care patients; and assess the clinical characteristics and outcomes of ICU patients reported as having a hospital acquired pressure injury to better understand patient factors associated with their development in comparison to ward patients.
Methods: The setting for this study was a 630 bed, government funded, tertiary referral teaching hospital. A secondary data analysis was undertaken on all patients with a recorded PI on the hospital's critical incident reporting systems and admitted patient data collection between July 2006 to March 2015.
Results: There were a total of 5280 reports in 3860 patients; 726 reports were intensive care patients and 4554 were non-intensive care patients, with severe hospital acquired PI reported in 22 intensive care patients and 54 non-intensive care patients. Pressure injury incidence increased in intensive care patients and decreased in non-intensive care patients over the study period. There were statistically significant differences in the anatomical location of severe hospital acquired pressure injuries between these groups ($p = 0.008$).
Conclusion: Intensive care patients have greater than 10-fold higher hospital acquired pressure injury incidence rates compared to other hospitalised patients. The predisposition of critically ill patients leaves them susceptible to pressure injury development despite implementation of pressure injury prevention strategies. Skin failure appears to be a significant phenomenon in critically ill patients and is associated with the use of vasoactive agents and support systems such as extra corporeal membrane oxygenation and mechanical ventilation.

1. Introduction

A pressure injury (PI) is a localised injury to skin and soft tissues usually over a bony prominence due to pressure, friction or sheer forces or a combination of these.[1] They contribute significantly to patient morbidity and healthcare costs.[2–4] The prevalence of hospital acquired PIs (HAPI) varies between 3–34% worldwide, depending on the facility.[5–7] Multicomponent interventions to reduce PIs have been recommended and introduced across many healthcare systems.[8] The Australian Commission on Safety and Quality in Healthcare has focused on PI prevention and management with National Safety Quality Health Service (NSQHS) Standard

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Eight.[9] There has been an overall downward trend in healthcare facility acquired PIs in some facilities reporting trends over time.[10] Despite this, studies of tertiary Australian hospital PI point prevalence rates have identified prevalence rates between 2% and 23%, and higher in the intensive care population.[11,12] Healthcare regulatory bodies either fine or do not compensate providers for HAPI based on the premise that they are preventable and the result of poor care.[13,14] More recent findings suggest that poor care may not be the cause of many of these injuries.[15] In Queensland, hospitals are fined $30,000 for stage 3 and $50,000 for stage 4 hospital acquired PIs.[16]

Based on available risk assessment tools such as the Waterlow score[17] and Braden Scale,[18] critically ill patients are a high risk group for PI and typically have 2–3 times the rate compared to ward patients.[19] Within Queensland, a recent analysis of HAPI point prevalence data revealed an ICU prevalence of 11.5% (excluding Stage 2 PI) compared to 3.0% in the general wards.[20] A key component in the pathogenesis of PI is the ability of the skin and tissues to withstand reduced perfusion as a consequence of forces applied.[19] Critically ill patients with very high severity of illness are at increased risk of PI and may suffer from skin perfusion failure with trivial forces rather than poor care. In this hospital, despite a long-standing commitment to prevention and management of PI and a previously documented downward trend in prevalence, we observed an increase in reported HAPI, with an increase in Winter 2014.[21,22,23]

In light of these factors, we undertook an observational study of patients reported as having a HAPI through the hospital incident monitoring system and analysed in detail, those that were the subject of financial penalty. The aim of this study was to assess the clinical characteristics and outcomes of ICU patients reported as having a HAPI, as a high risk subset with readily available demographic and clinical data and compare to ward patients with PI.

2. Methods

The setting for this study was a 630 bed, government funded, tertiary referral teaching hospital, with a predominantly cardiothoracic case-mix. The hospital has 20 ICU beds. We conducted a secondary data analysis using multiple data sources available in the hospital. Patients with a HAPI were identified through the hospital critical incident reporting systems and the Queensland Hospital Admitted Patient Data Collection (QHAPDC). Additional data were obtained from the intensive care unit (ICU) and/or cardiac surgical databases by linkage on patient unit record number (URN) and date of admission. The QHAPDC contains episode-level records collected from all Queensland hospitals on all patient separations (discharged, died, transferred or statistically separated) from any hospital permitted to admit patients, including public psychiatric hospitals. Patients were included if there was a recorded HAPI between July 2006 to March 2015. An outline of interventions that occurred during the study period is shown in eTable 1 in Appendix A.

The incident reporting system is maintained by the hospital's safety and quality unit. A specific database field had been set up to identify patients with HAPI. From June 2006 to October 2009 limited data based on records from the hospital's Advanced Incident Monitoring System (AIMS) were used. From November 2009 to July 2013 additional data were collected using AIMS. From July 2013 to 2015, Queensland Health's clinical incident reporting system (PRIME CI) was used. Changes in definitions of PI occurred in July 2012 with the change from four stages to six stages/categories. The new EPUAP/NPUAP staging was used in our facility from October 1st, 2012. Queensland Health includes a "mucosal" category (defined by NPUAP as PI found on mucous membranes with a history of medical device use at the wound location) in addition to the four stages/categories, suspected deep tissue injury (sDTI) and unstageable categories.[24] Reporting is voluntary but encouraged by the hospital quality and safety unit. The incident reporting systems (AIMS and PRIME CI) capture the stage of the PI when it is reported but were not designed to monitor changes in PI stage. Currently, within the hospital, the Quality Effectiveness Support Team and the podiatry team (ankle and below) review each patient that is flagged in PRIME CI to check the PI stage and ensure correct documentation. The incident report may be amended if a PI has been staged incorrectly. A separate auditing process of all hospital patients (ICU and ward), based on chart review, is undertaken by trained clinical coders to identify hospital patients with stage 3 and 4 PI not present at admission for the purposes of financial penalty. The coders code the medical record once the patient has been discharged. The coders capture the highest PI stage. For example, if a patient develops a stage 1 PI and it progresses to a stage 3, then it is coded as a stage 3. However, the clinical incident report would have reported it as a stage 1.

Many of the fields in the critical incident monitoring database were text based descriptive fields. To define an anatomical location of the PI, key words such as sacrum, hip and heel were searched in the text fields and manually reviewed to define a body area. Duplicates were determined by the unit record number, site of PI and time of report and excluded. A similar process was used to extract the admission Waterlow score with the number extracted from the text field. The 4-level Waterlow risk category was similarly obtained. Risk categories were "not at risk", "low risk", "high risk", and "very high risk" based on the text field reported in the incident monitoring database or by converting the score into the risk category.

For reporting and comparisons over time, PI were divided into two categories with "severe" defined as stages 3 and 4, and sDTI, and non-severe defined as stages 1 and 2, mucosal, and unstageable. Suspected deep tissue injury was defined as severe as their evolution to exposure of additional layers of tissue can be rapid, with deterioration to full thickness tissue loss reported at around 9%.[25,26]

Data from the incident reporting system were compared to data extracted from the QHAPDC to determine the completeness of incident reporting in the ICU subset of patients. Previous work has compared prevalence reporting and incident reporting in non-ICU patients in this hospital.[23] Continuous data were summarised as mean and standard deviation if approximately normally distributed, or otherwise as median and interquartile range. Categorical variables were reported as counts and proportions. Differences between continuous variables were assessed by the Kruskal–Wallis test and contingency tables were used to compare proportions using either the Chi square or Fisher's exact test. The observed counts of PIs were converted to rates per 1000 hospital separations or occupied bed days to account for increased hospital activity. Exact 95% confidence intervals were calculated. Statistical significance was defined as p-value of less than 0.05 and all analyses were performed using STATA version 13. Microsoft Excel® was used to generate graphs. The Prince Charles Hospital Research and Ethics Committee approved the study (HREC/14/QPCH/216).

3. Results

From July 2006 to March 2015, there was a total of 6634 HAPI reports in 3860 patients, which was reduced to 5280 reports in 3860 patients after duplicates were removed, which consisted of 726 ICU reports and 4554 non-ICU reports.

Both HAPI incident reports and patients with HAPI have increased over time (Table 1) in both data sets. In the ICU, there

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