Pressure injury point prevalence: state-wide survey to identify variability in Western Australian hospitals

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KEYWORDS

pressure injury, prevalence, risk factor, survey

ABSTRACT

Objective
A point prevalence survey was conducted across Western Australia to monitor adherence to national safety and quality health service standards, and to create baseline data on which to improve. The study identified significant areas for targeted interventions.

Design
A state-wide point prevalence survey of patients and their medical records.

Setting
Public hospitals in Western Australia (WA).

Subjects
Data was collected from 2,281 inpatients.

Main outcome measure(s)
The aim of the study was to determine pressure injury prevalence and characteristics, adherence to guidelines, significant related factors and their attributable burdens.

Results
8.7% of patients had pressure injuries. 6.3% were hospital-acquired (HAPIs). Over 1,000 HAPIs per year were attributed to being older, a long-term patient, having acute renal failure or volume depletion. 65% of patients had a skin inspection; less likely in birthing mothers and long-term patients. 70% of patients were screened with a risk assessment tool. 36% of patients were identified as at risk of a pressure injury; and of these, 71% had prevention plans in place. One third of all adults with HAPIs were not identified as at risk using current practices.

Conclusion
The prevalence and characteristics of pressure injuries and HAPIs was comparable with prior state-wide results. The survey identified variations in rates of: skin inspections, using risk assessment tools; and applying plans for those at risk of pressure injuries. Multivariable logistic regression identified areas for improvement: the main groups at risk of pressure injuries; and patient groups with lower rates of skin inspections and screening.

INTRODUCTION

Pressure injuries are frequent and largely preventable injuries of the skin and subcutaneous tissue that increase morbidity and mortality (National Pressure Ulcer Panel et al 2014). Pressure injuries significantly reduce quality of life, increase length of stay in hospital and cost approximately 1.9% of all public hospital expenditure (Nguyen et al 2015). There has been substantial research to support improved clinical practice to ameliorate pressure injuries, such as the development of the International Prevention and Treatment of Pressure Ulcers: Clinical Practice Guidelines.

The Australian Commission on Safety and Quality in Health Care (ACSQHC) introduced National Safety and Quality Health Service Standards and include guidelines to prevent and manage pressure injuries (ACSQHC 2012). In relation to these standards, a multi-focused point prevalence survey was conducted to assess the current situation in Western Australia (WA). Prior surveys had been conducted and the rate of HAPIs in 2011 was 6.3%, a 17% increase since 2009 (Mulligan et al 2011). Subsequently, state-wide pressure injury prevention strategies were implemented and this current survey would determine rates, proportion related to medical devices, and using multivariable logistic regression determine factors associated with HAPIs and gaps in screening.

The aim of the study was to determine the prevalence and characteristics of pressure injuries and to use logistic regression to determine significant factors associated with HAPIs and adherence to guidelines, in order to identify areas where improvements can be made.

METHOD

Participation

Hospitals were included in the audit if they had at least 40 acute and/or subacute beds and admitted public patients. Accordingly, 14 metropolitan and 6 regional hospitals throughout the state were included in the study. Participants included multiday-stay public in-patients from acute and subacute wards in the hospitals on survey days in May 2014. Exclusions: dialysis patients, mental health wards, unqualified newborns, hospital in the home, and day surgery/procedure patients.

Ethics approval: The study attained ethical approval from the Department of Health Human Research Ethics Committee (#12/2014).

Audit tool and data collection

The project methodology was built on previous wound prevalence surveys (Mulligan et al 2011; Prentice et al 2009). Qualitative and quantitative data were collected by over 400 surveyors who attended educational sessions and passed a competency test. Each audit was conducted by a hospital-based clinician with an external surveyor.

Survey teams examined medical records for each patient. In addition, a full body skin inspection was conducted on consenting patients. The pressure injury audit tool consisted of the following elements:

1. The presence and details of pre-existing and hospital-acquired pressure injuries from the medical records and/or on inspection of the participants' skin.
2. Determination of whether patients had a skin inspection for pressure injuries within 8 hours of presentation.
3. Documented use of a validated pressure injury risk assessment tool (Braden scale©, Braden Q or Western Australian Health Glamorgan Pressure Injury Tool) within 8 hours of presentation.

4. If at risk, whether preventative measures and a management plan had been implemented.
5. Whether the patient/carers had been involved in pressure injury prevention or management discussions.
6. If the patient had one or more pressure injuries the following were recorded:
    a. location of the pressure injury(s)
    b. whether it was hospital acquired or present on admission
    c. whether it was medical device related
    d. classification by stage
    e. if preventative equipment was in place
    f. if a management plan was in place.

Data analysis

Data analysis included testing the statistical significance of differences between groups using the Pearson's Chi-squared test for categorical data. Data was supplemented using data linkage to extract previous diagnoses and admissions, and the Australian Bureau of Statistics data on socio-economic status and hospital accessibility. Univariable and multivariable logistic regression models were fitted to test for significantly different outcome percentages between hospitals and patient characteristics. Odds rations (ORs) were obtained from the models to compare outcomes against the reference hospital (hospital 11 – with the largest group of audited patients). Attributable burden was calculated for an annual basis to estimate the number of patients potentially affected by any significant factors.

FINDINGS

Participants

Of the 3,181 patients who were hospitalised on the day of the pressure injury audits, 2,288 consented to having a skin inspection (table 1). Data for seven patients was missing, leaving a final cohort of 2,281 patients (71.7%). Paediatric patients were significantly less likely to consent to a skin inspection than adults, OR=0.5 (95% CI: 0.4-0.8).

Slightly more females (52%) than males (47.8%) participated in the audit, and just under half of all participants were aged 65 years or older (49%). The majority of hospitals were from the Perth metropolitan area (14 of 20 hospitals), which also comprised 91% of the final patient cohort.

Pressure injuries

Overall, 8.7% of patients (207 patients) were identified as having at least one pre-existing or hospital-acquired pressure injury (HAPI).

6.3% (142) of patients had one or more HAPIs (table 2). The prevalence of HAPIs ranged from 0-11% across the 20 hospitals. Nearly three quarters of patients (73%) had only one HAPI, with a further 17% (25 patients) having two pressure injuries and 9% (13 patients) having three pressure injuries.

The frequency of having at least one HAPI was approximately three times greater for older adults compared with young adults and adults, and five times greater than for children.

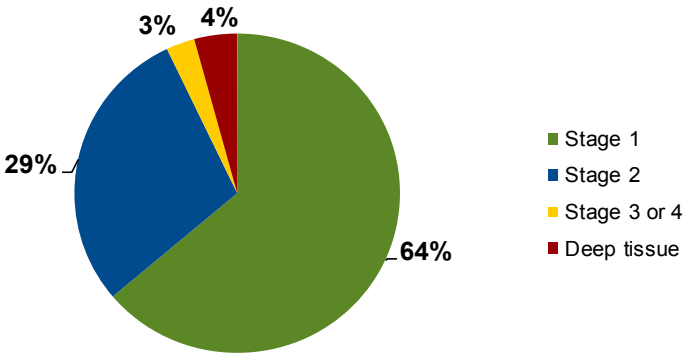
Table 1: Patient and hospital characteristics, point prevalence survey

Patient demographics	patients	%
Total number of patients admitted on survey day	3,181	100.0
Patients consenting to having a skin inspection	2,288	71.9
Sex		
Female	1,191	52.2
Male	1,090	47.8
Age group		
Child (0 to 15yrs)	214	9.4
Young adult (16 to 24yrs)	120	5.3
Adult (25-64yrs)	825	36.2
Older adult (65yrs and over)	1,122	49.2
Total	2,281	100.0
Hospital location		
Metropolitan hospitals (14)	2,073	90.9
Regional hospitals (6)	208	9.1
Total	2,281	100.0

Table 2: Characteristics of pressure injuries, point prevalence survey

Characteristics	Number of patients	Percentage of patients
Pressure injuries		
Patient does not have a PI	2,074	91.3
Patient has one or more PIs	198	8.7
Patient has one or more HAPIs	142	6.3
HAPIs by age group		
Child (0 to 15 years)	4	1.9
Young adult (16 to 24 years)	4	3.4
Adult (25 to 64 years)	28	3.4
Older adult (65 years and over)	106	9.9
Hospital location of patients with HAPI		
Metropolitan	131	6.5
Country	11	5.4
Number of HAPIs		
Patients with one	104	73.2
Patients with two	25	17.6
Patients with three	13	9.2
Three most common locations		
Sacrum	43	24.9
Buttock	21	12.1
Heel	21	12.1
Risk assessment for pressure injuries		
Skin inspection undertaken within 8 hours of presentation	1,483	65.2
Screened with a risk assessment tool within 8 hours of presentation	1,596	70.3
Identified as at risk of developing a pressure injury	711	36.6
If at risk, management plan in place (N=711)	507	71.3
If at risk, patients (or carer) input into a management plan (N=711)	310	44.3
Medical device related pressure injury	49	18

Figure 1: Pressure injuries by stage, with severity increasing from 1 to 4, or deep tissue.



HAPIs were staged using the National Pressure Ulcer Advisory Panel (2016) pressure injury definitions. The majority of HAPIs were assessed as stage 1 (64%) or stage 2 (29%), 3% were stage 3 or 4, and a further 4% were suspected deep tissue pressure injuries (no HAPIs were unstageable pressure injuries) (figure 1).

The percentage of patients with at least one HAPI was significantly higher than the average percentage of HAPIs found within this survey in two distinct populations: older adults (9.9%) and in patients with a stay of six or more days (9.9%).

Conversely, the percentage of patients with at least one HAPI was significantly lower than the percentage of HAPIs found within this survey in the adult population (3.4%); paediatrics (1.9%); and patients with a length of stay between zero and five days (3.5%).

Using a multivariable logistic model of the probability of a patient having at least one HAPI, older adult patients were significantly more likely to have at least one HAPI than adults, OR = 2.4 (95% confidence interval, CI: 1.5-3.7). Similarly, patients with a stay of six or more days were significantly more likely to have at least one HAPI than patients with a stay of between zero and five days, OR = 2.2 (CI: 1.5-3.2). Patients with an additional diagnosis of acute renal failure were significantly more likely to have at least one HAPI than patients without that diagnosis, OR = 2.6 (CI: 1.7-4.2), and similarly for patients with an additional diagnosis of volume depletion, OR = 2.5 (CI: 1.5-4.1).

The estimated burden attributable for each significant risk factor was calculated (table 3). The table shows the estimated annual change in the number of individuals with at least one HAPI when the risk factor is absent from the population. For example, the presence of at least one HAPI among an estimated 1,505 individuals each year can be attributed to being an older adult (>65yrs) as opposed to being adult (25-64yrs). This corresponds to 5% (3-8%) of the estimated annual number of older adult hospitalisations in all WA hospitals examined.

Table 3: Multivariate logistic model of the probability of a patient having at least one HAPI and the estimated attributable burden if applied to the annual number of patients in Western Australia.

Patient Characteristic	Reference Group	Adjusted OR (LCI, UCI)	Change in the number of patients with the outcome (LCI, UCI)	Annual change in the number of patients with the outcome (LCI, UCI)	Annual change as a percentage of the estimated annual number of patients with the risk factor (LCI, UCI)
Older adults	Adults	2.4 (1.6, 3.7)	-58 (-84, -29)	-1505 (-2186, -761)	-5 (-8, -3)
Stay 6+ days	Stay 0-5 days	2.2 (1.5, 3.2)	-48 (-69, -26)	-752 (-1076, -405)	-5 (-8, -3)
Acute renal failure	-	2.6 (1.7, 4.2)	-20 (-31, -10)	-369 (-565, -180)	-11 (-18, -6)
Volume depletion	-	2.5 (1.5, 4.1)	-14 (-23, -5)	-277 (-457, -101)	-10 (-17, -4)

In addition, 18% (49) of pressure injuries were identified as medical device related and the cases were distributed across most hospitals.

Prevention strategies were in place for the majority of patients, with bed and/or chair support surfaces to prevent pressure injuries in use, and over 400 adjunct devices in use, such as limb elevator or foam wedges.

Risk Assessment

The audit identified differences in patient care processes across the hospitals.

Documented evidence of a full body skin inspection within 8 hours of presentation (65%).

A larger proportion of patients from metropolitan (65.9%) than regional (58.5%) WA hospitals had the evidence of a skin inspection within 8 hours of presentation (p=0.03). At the individual hospital level, rates of assessment ranged from 38.8% to 90% (p<0.01). A multivariable logistic regression model of the probability of having documented evidence of an initial skin inspection was fitted. This identified that patients staying over 6 days and adults having single, live births, were significantly less likely to have documented evidence of an initial skin inspection. The attributable burden of these factors is estimated in table 4.

Table 4: Multivariable logistic model of the probability of a patient having documented evidence of a skin inspection conducted within 8 hours of presentation. Odds ratios and 95% confidence intervals.

Patient Characteristic	Reference Group	Adjusted Odds ratio (OR) and confidence intervals	Estimated annual change in the number of patients with the outcome	Estimated annual change in the number of patients with the outcome	Estimated annual change as a percentage of the estimated annual number of patients with the risk factor
Length of stay: 6+ days	LCA 0-5 days	0.6 (0.5-0.7)	99 (58-142)	1562 (914-2228)	8 (5-12)
Additional diagnosis: adults with single live birth	-	0.1 (0.07-0.16)	87 (74-100)	6691 (5685-7666)	47 (40-54)

Patients with documented use of pressure injury risk assessment tool within 8 hours of presentation.

Use of a pressure injury assessment tool within 8 hours of presentation was documented for 70% of patients (Table 2), ranging from 42% to 95% across the 20 hospitals, (p<0.01). Risk assessments were conducted on a larger proportion of males (73%) than females (67.8%), p=0.01. In addition, larger proportions of adults (67.4%) and older adults (76.9%), were assessed compared with children and young adults (both 55%), p<0.01.

Patients identified as at risk of developing a pressure injury

Of the 1,945 patients who were risk assessed for pressure injuries, 36.6% were found to be at risk of developing a pressure injury. Almost half of children (49.6%) and older adults (45.5%) assessed were identified as being at risk, compared with one fifth of young adults (19.8%) and one quarter of adults (22.8%). There was significant variation at the hospital level with proportions of at risk patients ranging from 10% to 61.4% (p<0.01).

All children and young adults who had one or more HAPIs were identified as being at risk, while only two thirds of adults (62.5%) and older adults (66.4%) with HAPI's were identified as at risk.

The majority of patients (92%) were assessed with the Braden scale. To determine the accuracy in this population the prediction values were calculated (table 5). Screening sensitivity was 63.4% for patients aged 65 years and over compared with 100% for patients aged 16 to 24 years.

Table 5: HAPI prevalence and respective prediction of pressure injuries using the Braden Scale.

Age groups	patients screened	HAPIs	Rate	Sens 1	Spec 2	PPV 3	NPV 4
Young adults (16 to 24 yrs)	70	3	4.3	100.0	82.1	20.0	100.0
Adults (25 to 64 yrs)	574	21	3.7	66.7	78.3	10.4	98.4
Older adults (65 yrs and over)	798	71	8.9	63.4	94.3	13.2	94.3
All ages 16 yrs and over	1442	95	6.6	65.3	68.2	12.6	96.5

Sensitivity, 2. Specificity, 3. Positive predictive value, 4. Negative predictive value

Patients identified as at risk who have a pressure injury prevention and management plan insitu

Over two thirds (71.3%) of patients who were deemed at risk of developing a pressure injury had a bedside pressure injury management plan. The proportions of at risk patients who had a plan did not differ significantly by age, sex or hospital location (metropolitan or regional). At the individual hospital level, the rates of at risk patients who had a bedside plan ranged from 54% to 100%.

Limitations of the study include: data was collected from a large number of surveyors recruited across WA Health with varying levels of clinical and audit experience; the preventative strategies which were in place for pressure areas were reviewed on management plans but not necessarily viewed in practice at the time of the survey. To mitigate this a number of data verification steps were applied both on the day and during the data entry, including entries being double checked.

DISCUSSION

Early last decade, prevalence estimates for pressure injuries for in-patients in acute and subacute health care facilities in Australia ranged from 5.6-48.4% (mean 25.5%) and 29-38.5% in New Zealand (Australian Wound Management Association 2012). In 2003, Victoria reported a state-wide prevalence of 26.5%, of which two thirds were HAPIs. Following the introduction of a number of interventions the prevalence of pressure injuries declined to 17.6% (Victoria Health 2006). The prevalence of HAPIs in Queensland subsequently declined from 12.4% (2008) to 4% (2012) (Miles et al 2013).

This surveys rates for HAPIs (6.3%) remains unchanged from a previous survey in 2011 (Mulligan et al 2011). The survey had identified a 17.5% increase in the prevalence of HAPIs compared with 2009. State-wide prevention and management strategies were subsequently implemented in accordance with the national standards. This surveys prevalence of HAPI was slightly above New South Wales rates (2015: 6% and 2016: 5.3%), and over two times higher than for Queensland (2014: 3%) (Coyer et al 2017; Clinical Excellence Commission 2016; Clinical Excellence Commission 2015).

Jull et al (2016) reported an average prevalence rate of 6.3% for HAPIs over a three-year period between 2012-13 and 2014-15 in New Zealand. Over 97% of their patients were reported to have stage 1 or 2 HAPIs, which is higher than in this survey (93%).

This survey found that HAPIs were significantly higher amongst adults aged 65 years and older and longer stay patients; this would be consistent with decreased mobility associated with advanced age and extended bed rest (Rondinelli et al 2018; Coleman et al 2013). The main sites of pressure injuries were consistent with the most frequent sites reported in the literature. With the use of logistic regression to identify key risk factors

patients with additional diagnoses of either acute renal failure or volume depletion were also significantly more likely to have pressure injuries. Impaired renal function is associated with poor wound healing and co-morbidities increasing the risk of pressure injuries, and volume depletion also reduces skin turgor (Maroz and Simman 2013). This identifies a group of patients whom it may be important to ensure pressure injury strategies are in place. Table 3 estimates the attributable burden of each significant risk factor for pressure injuries. By identifying the factors with high numbers of patients affected, interventions can be focused to potentially prevent hundreds of pressure injuries.

In addition, increased focus on prevention in patients with medical devices is required. 18% (49) of the pressure injuries were identified as being medical device related. This is within the range from published studies of 12%-35% (Dyer 2015; Black et al 2010), in which medical device related pressure injuries are not always considered as preventable. Whilst the risk factors for developing a medical device related pressure injuries are the same as for traditional pressure injuries, medical devices increase the risk of a pressure injury by more than 2.4 times (Black et al 2010) and develop faster than traditional pressure injuries - often on the face and head region, linked with tubing and masks (Kayser et al 2018).

The literature identifies the value of early assessment and prevention (National Pressure Ulcer Panel 2014). This current survey highlighted variations in rates of skin inspections and the use of a pressure injury risk assessment tool within the first 8 hours of presentation. Documented skin inspection rates by hospital ranged from 38 to 90%, and the use of a risk assessment tool ranged from 42 to 95% by hospital. Long-term patients were significantly less likely to have a documented initial skin inspection. The reason for this could not be identified, and needs further investigation.

The odds ratio of a patient having documented evidence of an initial skin inspection were almost ten times lower for birthing mothers. Both groups are at risk of pressure injuries due to reduced mobility and the use of anaesthesia in some birthing mothers (Milne et al 2009; Prior 2002).

This audit identified gaps in practices: just over two thirds of patients (70.3%) were reviewed with a pressure injury risk assessment tool within 8 hours of presentation; and of those identified at risk, 71.3% had a pressure injury management plan in place. In comparison, in New South Wales only 58% of patients had a risk assessment within 8 hours of presentation to a hospital or community nursing service and 44% of patients with a pressure injury were reported to have a wound management plan (Clinical Excellence Commission 2015). This wide variation in rates between hospitals for all of the measures highlights hospital wide differences in adherence to best practice.

The main risk assessment tool used (92.3%) was the Braden Scale for predicting pressure injuries. 36% of patients were identified as at risk. This is considerably different to surveys across New South Wales, with rates of 65% (Clinical Excellence Commission 2016; Clinical Excellence Commission 2015). The Braden scale in this audit was found to have 65% sensitivity, in contrast to other studies with 83% (Chen et al 2017). Only two thirds of adults (62.5%) and older adults (66.4%) with HAPI's were identified as at risk, therefore, one third of adults who develop pressure injuries are not being detected with current screening tools in this population. This may relate to either the tool or its application, or a combination of these factors.

CONCLUSION

The overall prevalence of pressure injuries and HAPIs for WA was comparable to previous state surveys and higher than published for other Australian states. The analysis of compliance with the national standards revealed variability in clinical practice across the 20 hospitals. Significantly higher rates of pressure injuries were found in: the elderly; long-term patients; patients with acute renal failure; or volume depletion.

The audit findings also showed that although pressure injury risk assessment tools were being used, the outcome of these assessments was not always being translated into management plans. Subsequently, the importance of ensuring that high risk groups are reviewed, processes support expertise in the application of skin assessments, is vital to reduce preventable HAPIs.

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