

ORIGINAL ARTICLE

Pressure injury prevention practices among medical surgical nurses in a tertiary hospital: An observational and chart audit study

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Abstract

Pressure injuries are frequently occurring adverse events in hospitals, negatively impacting patient safety and quality of care. Most pressure injuries are avoidable if effective prevention strategies are used. However, the extent to which various settings influence their use of prevention strategies is unknown. The aim of this study was to describe and compare pressure injury prevention strategies used by medical and surgical nurses in the Chinese context. In this observational study, we used semi-structured observations with chart audits to collect data in two medical and two surgical wards in a tertiary hospital from June to December 2020. Observations were patient-focused; any prevention practices the patient received were recorded, and a chart audit was used to identify documented prevention strategies. The frequency of each prevention strategy was reported, and differences between medical and surgical wards were analysed using independent *t*-test or χ^2 test. A total of 577 patients (*n* = 294, 50.9% medical; *n* = 283, 49.1% surgical) were observed and their charts audited. Risk assessment was completed on admission for all patients. Repositioning was the most frequently used strategy, with about 84% (*n* = 486) patients being repositioned regularly. However, skin care, nutritional risk screening and the use of support surfaces were suboptimal. Patient education was not commonly observed but was documented in 75% (*n* = 433) of audited charts. More medical patients' skin was kept clean and hydrated, but more surgical patients received barrier creams, had a support surface and received more nutrition support and if a prone position was used, they were more likely to be turned after 2 hr and to be repositioned after sitting in a chair for an hour. Prevention strategies were more likely to be documented in surgical patients' charts. Despite pressure injury prevention guideline recommendations provided various prevention strategies for nurses to apply, the observed use of some strategies such as nutrition, skin care and support surfaces was not ideal. Nurses relied heavily on repositioning for pressure injury prevention. Most

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pressure injury prevention practices need improvement although surgical patients generally received better preventative care. These findings can facilitate clinicians and nurse managers when tailoring future pressure injury prevention work.

KEYWORDS

chart audit, nurse, observation, pressure injury/ulcer, prevention

Key Messages

- this study aimed at describing nurses' pressure injury prevention practices in a Chinese hospital context using patient-focused observation and chart audits
- repositioning and risk assessment were the most frequently used strategies by the nurse in this study, which may explain the low reported prevalence
- the use of skin care, nutritional risk screening and support surfaces was suboptimal
- surgical patients consistently received better pressure injury prevention than medical patients despite both groups being at similar risk albeit for different reasons
- understanding current practices favoured by nurses may allow pressure injury prevention training to be tailored to specific settings and patient population

1 | INTRODUCTION

Pressure injuries, also known as pressure ulcers, are a major patient safety issue that negatively impact on patient's quality of life¹ and adds costs to the healthcare systems.^{2,3} The burden of pressure injury is substantial. A meta-analysis of over 2.5 million hospitalised adults in 39 studies reported the pooled pressure injury prevalence of 12.8%.⁴ Large variations in prevalence existed among different countries and different geographic regions. The highest prevalence of 14.5% has been reported in Europe. Surprisingly, the lowest prevalence of 3.0% has been reported in Asia where 98% of the Asian sample were from China.⁴ This variability may reflect differing skin status and pressure injury risks, disease acuity in patient populations, policy of reporting and possibly the approach to pressure injury prevention.

International guidelines provide evidence-based recommendations for pressure injury prevention, which include risk assessment, skin assessment, preventive skin care, nutrition, repositioning, support surfaces and patient education.^{5,6} A recent review of 10 pressure injury guidelines found the International Guideline⁵ and three others to be of high quality.⁷ A recent systematic review has shown that the use of prevention strategies is effective in decreasing pressure injury occurrence.⁸

Risk assessment is the basis for pressure injury prevention activities. Undertaking a comprehensive risk assessment

is recommended by many clinical practice guidelines.^{5,6,9} Although there is no universally agreed way to conduct a comprehensive risk assessment, using a reliable and valid structured risk assessment tool such as Braden scale, Norton scales or Waterlow tool are recommended; however, some researchers reported that the completion rate of risk assessment for admitted patients was still low.¹⁰ Guided by risk assessment results, prevention plans should be developed, and appropriate prevention strategies implemented. Pressure relief, including repositioning and using support surfaces, is strategies strongly recommended by international clinical practice guidelines.^{5,6} For example, it had been reported that high specification static foam mattress help prevent pressure injury.¹¹ Other recommendations focus on good skin hygiene, incontinence management, nutrition status monitoring and support, and use of prophylactic dressings in at-risk patients.⁵ In addition, despite patient education being highly recommended in preventative care,^{6,12} its implementation in practice has been reported to be suboptimal.¹⁰

Evidence of uptake of recommended pressure injury prevention strategies from guidelines is mainly based on surveys^{13,14} and controlled trials,¹⁵⁻¹⁷ with most research being from western countries. Little is known about pressure injury prevention practices in China, yet their reported prevalence of pressure injury is lower than reported elsewhere.⁴ Contextual factors such as policy may influence the provision of prevention strategies. For instance, the 'Tertiary General Hospital Accreditation

Criteria' policy issued by the Ministry of Health of China¹⁸ lists pressure injury as a major quality of care indicator, which used to assess the performance and accreditation of hospitals. This policy may have resulted in increased attention on pressure injury prevention. For instance, there was 90% compliance to repositioning regimens in a multi-centre prospective Chinese study,¹⁹ which is much higher than those reported in Sweden (44%)²⁰ and Australia (60%).²¹ However, this policy may act as barrier for pressure injury reporting.⁴ Evidence on the implementation of other prevention strategies, such as risk assessment, skin care, nutrition, and patient education in China are rarely reported. Thus, the range of pressure injury prevention practices implemented in Chinese hospitals is unclear.

Contextual factors such as clinical settings and patient characteristics may also impact the occurrence of pressure injury.²² A recent systematic review found that the incidence of pressure injury can vary even within the same hospital²³; the highest incidence was reported in orthopaedics surgical wards (18.5%), and the lowest was in nephrology medical wards (2.9%). Surgical patients may be at increased risk of developing pressure injury because of prolonged periods of intra-/post-operative immobility, surgical/anaesthesia-related factors, and pre-existing medical conditions.²⁴ Meanwhile, many elderly patients and those at the end of their life are often admitted into medical wards and more vulnerable of pressure injury than other adult patients.²⁵ In addition, surgical patients may have more access to wound care specialists.²⁶ At present, the extent to which pressure injury prevention practices differ in settings among medical and surgical in the Chinese hospital context is rarely reported.

The overall aim of this study was to first describe the pressure injury prevention practices using direct observation with chart audit and then compare the practices between medical and surgical wards to better understand potential influences on preventative practices and explore possible reasons for the low reported prevalence of pressure injuries in China. The results of this study provide foundational information that will be used to inform future quality improvement and for tailoring pressure injury prevention training to specific context.

2 | METHODS

2.1 | Design and settings

This is a prospective observational study using direct observation and chart audit data collection technique.

This study was conducted in two medical wards (respiratory, neurology) and two surgical wards (orthopaedics surgery, general surgery) in an 1828-bed tertiary

hospital in Beijing, China. A pressure injury reporting system was established in 2008 in the study hospital, which require all pressure injury on admission or hospital-acquired pressure injury should be reported by nurses to a hospital-wide electronic database. A hospital-wide prevention and management protocol has been in use since 2015. Based on the protocol, pressure injury risk assessment and reporting were compulsory for nurses and the protocol components were embedded in the nurses' electronic documentation system. The prevention components included repositioning, using support surfaces, and/or prophylactic dressings for high-risk patients and educating patients. In 2019, the pressure injury prevalence in this hospital ranged from 0.2% to 1.2% (unpublished hospital data).

The four study wards had 40–53 beds each (usually two–four beds in one room) and almost 100% bed occupancy during data collection. Wards employed 19–26 registered nurses, all of whom worked full time. Four levels of care are commonly used in Chinese hospitals to describe the level of nursing care required by patients (Levels 1, 2, 3 and critical care). Levels 1 and 2 reflect patients with very limited (Level 1) or limited (Level 2) self-care ability and mobility reflecting patients who required monitoring by nursing staff every hour (Level 1) or 2 hr (Level 2). The four wards used in this study primarily admitted Level 1 and Level 2 patients. The registered nurse to patient ratio ranged from 1:8 to 1:5 during the daytime, and about one-third of the patients required Level 1 and the remainder requiring Level 2 care.

2.2 | Participants

As the aim of this study was to describe pressure injury prevention practices, the study population included patients who receive the prevention care (or participated in it), nurses who provide prevention care, and patient carers (usually a family member, or hired 'stay-in-hospital' caregiver) because they also deliver some of the basic/essential care in Chinese hospitals.²⁷ We conducted patient-focused observations to ensure any prevention care provided by nurses and/or carers were captured. Each patient was observed only once, while nurses could have been observed more than once during this study. If hired carers worked with multiple patients during data collection, they may have also been observed more than once (but providing care to different patients).

Patients were eligible if they were (a) ≥ 18 years; (b) admitted to the study wards; (c) with hospital length of stay ≥ 8 hr; and (d) receiving Level 1 or 2 care on the day of data collection; and (e) they or their proxy were able to provide informed consent. Patients receiving end-of-life

care or isolated because of high risk of infection were excluded. Carers were eligible if they provided any prevention care to the patient during hospitalisation. To ensure a representative cohort of patients, data were collected over four or 5 days per week including weekends in three to four consecutive weeks in one ward. Thus, data included at least 14 observation days and reflected 2 days for each day of the week in each ward. The target sample size was set at 8–10 patients per day, and a total of 560 patients in the 14 days in the four wards were considered feasible.^{10,28}

All nurses from the four study wards agreed to participate in the study. At the time of initial data collection, 90 nurses worked in the participating wards ($n = 50$ (55.6%) medical; $n = 40$ (44.4%) surgical). In total, 57% of these nurses held a bachelor's degree, 41% held a diploma and 1% were master's degree prepared nurses. All had various levels of clinical experience.

2.3 | Measures

Semi-structured observational tool and chart audit tool were developed based on pressure injury prevention recommendations in the recent international guideline⁵ and other strategies being used in the study hospital. Observation was planned to collect all implemented prevention practices; in the 29-item observational tool, seven guideline-based pressure injury prevention strategies, including the skin care (12-item, consisting of 7 skin care items; 4 continence management items and 1 prophylactic dressing item), nutrition (3-item), repositioning (8-item), support surfaces (2-item) and patient education (4-item)⁵ were examined. In addition, patients' position was observed and recorded hourly during an 8-hr observation period. Regular repositioning was defined in this study as a position change at least every 4 hr.¹⁰ Field notes were used to record additional information, such as the observer's feelings, behaviours or staff response to the situation being observed.

Medical charts of the observed patients were audited for all documented prevention strategies, including risk assessment results, skin assessment (3-item), nutritional support (1-item), repositioning regimen recorded (1-item), support surfaces in use (1-item), and patient education (1-item). They were also audited to collect demographic and clinical data of the sample, such as age, gender, diagnoses, height, weight, comorbidities, medications and level of care.

2.4 | Validity, reliability and rigour

The content of the observational and chart audit tool with a data dictionary to provide detailed operational definitions for each item was examined by an expert panel

including six PhD prepared experts in pressure injury prevention practice and research, three bilingual Chinese wound experts with postgraduate qualification, who were familiar with pressure injury care in Chinese hospitals and one PhD prepared methodological expert. The panel was invited to comment on tools including whether the questions were appropriate, accurate and relevant and if additional items should be added. Based on experts' feedback, 10 questions regarding friction and shear, pain, cognitive status, and medication were adjusted, and two questions were deleted. Prior to the use of this tool, it was rigorously piloted in the clinical setting by two trained observers relating to item clarity, and its overall flow and format. The pilot test was conducted in a sample of eight patients. Inter-rater reliability was established, with 93% agreement in the 29 observed prevention items achieved. For the five groups of observed strategies, the Spearman's coefficient r ranging from 0.7 to 1.0 ($P < .05$ except nutrition group), which was considered adequate for internal consistency.²⁹ One of the two observers conducted all observations for this study (the first author).

2.5 | Data collection

Observation took place between June and December 2020. Prior to the commencement of data collection, the observer spent 2 days in each study ward to familiarise themselves with the ward environment and staff to help reduce nurses' attention to modifying their behaviours (i.e., Hawthorne effect).³⁰

Observations occurred at 1-hr intervals for 8 hr on the observation day, ranged from 09:00 to 17:00 (break at 12:00–12:30). To try to prevent selection bias, the observer used a random number to choose the 'start' room when recruiting patients. Then, a consecutive sample up to 10 eligible patients from the next room(s) were drawn for observation.²⁸ Within each 1-hr observation session, the observer went into patient rooms for part of the time, recording the patients position in real time. For each session, the following data were recorded: the patient's current position and whether or not the patient had been repositioned or mobilised since the last observation; any sliding down in the bed or chair; number and type of staff involved in repositioning; checking of skin and pressure injury risk area; any mobility aids like wheelchair and walking aids; use of any support surfaces or any prophylactic dressing; and use of any medical devices such as nasogastric tube, indwelling catheter, and so forth. The observation was conducted unobtrusively from a discrete place where the observer did not interfere with but could observe pressure injury prevention activities. Patients and carers were asked questions to clarify prevention practices during observations.³¹

Patients' medical charts were audited after the day's observation was completed. Documented pressure injury prevention strategies such as pressure injury risk results, nutrition screening results, repositioning plan and skin care plan were recorded using the chart audit form.

In the six-month data collection, the observer collected data in a total of 65 observation days in four wards (30 days in medical wards and 35 days in surgical wards) for a total of 4536 patient-hour of observation. These additional days of data collection in the surgical wards occurred to ensure similar numbers of medical and surgical patients were recruited.

2.6 | Data analysis

Using IBM SPSS Statistics for Windows (version 26) (IBM Corp; Armonk, NY), descriptive analyses were conducted for all variables including demographics, clinical characteristics, observed and chart audited prevention strategies. Means and standard deviations (SDs) were calculated for normally distributed data and median and interquartile range (IQR) for non-normally distributed data. Categorical variables and yes/no items in observations and chart audits were described using frequency and percentages. Comparison of demographics and prevention strategies between medical and surgical wards was conducted using independent sample *t*-tests, Mann-Whitney *U*-test and χ^2 test. A significance value of .05 was used to determine statistical significance.

2.7 | Ethical considerations

The biomedical ethic committees of the participating hospital-Peking University First Hospital (No. 2020/003) and Griffith university (GU Ref No: 2020/466) approved this study. Written consent from nurses, patients and carers was obtained. While the observer was a registered nurse, she was not employed by the hospital, did not provide direct care to any patients, and did not have a direct working relationship with the nurses. She was prepared to report any safety issues if they had arisen.

3 | RESULTS

3.1 | Participant characteristics

A total of 942 patients were screened in the four wards, among which 633 were eligible and 577 patients consented to participate this study (consent rate: 91.2%). Table 1 outlines the demographic and clinical

characteristics of the total sample and the medical and surgical groups. About 50% of the sample was from medical wards ($n = 294$, 50.9%). Patients were aged between 18 and 95 years, with a mean age of 63.1 years, and just over a half were male. Diagnoses ranged widely. The most common diagnoses in medical wards were stroke (71/294, 24.1%) and lung cancer (64/294, 21.8%). In surgical wards, the most common diagnoses were colorectal cancer (56/282, 19.8%) and osteoarthropathy (54/283, 19.1%). Most patients of our sample with at least one comorbidity ($n = 485$, 84.1%), and more than half ($n = 390$, 55.5%) had two and more comorbidities. Patients admitted to surgical wards were relatively older, had longer hospital length of stay, and more frequently required level 1 of care (Table 1).

Two-thirds of patients had impaired mobility during observation and required some type of mobility aid. Patients admitted to surgical wards were more likely to have reduced mobility. Healthy skin was observed for just under half of patients (skin type category from Waterlow tool³² was used in the observational tool to describe patient skin). Pressure injury risk was assessed by nurses using the Braden scale for all patients on admission, with about 14% ($n = 83$) patients identified as being at some degree of risk (Braden score ≤ 18 points). Several drugs that potentially impacting patients pressure injury risk, such as steroids, sedatives, or narcotics were prescribed for about one-third of patients ($n = 163$, 28.2%). The majority of the patients had at least one medical device in situ ($n = 471$, 81.6%) and were more frequently used in surgical patients.

Five (0.9%) patients with 10 pressure injuries were recorded by nurses during the six-month observation in the four wards. One of these patients had five pressure injuries on admission, the worst which was Unstageable. Another patient had two hospital-acquired pressure injuries, the worst which was Stage 2. The remaining three patients each had one pressure injury, one was acquired in hospital. All three pressure injuries were classified as Stage 2.

3.2 | Observed preventive skin care

The median (IQR) use of seven general skin care items was 5.0 (4.0–5.0); there was no significant difference between medical and surgical patients ($P = .058$). Most patients had at least four skin care strategies in use (Table 2). Keeping skin clean and hydrated was the most commonly used skin care strategies. More medical patients' skin was kept clean and hydrated but more surgical patients received barrier products. Surgical patients' skin was also more likely to be vigorously rubbed than

TABLE 1 Patient demographic and clinical characteristics

Characteristics	Total sample (n = 577; 100%)	Medical (n = 294; 50.9%)	Surgical (n = 283; 49.1%)	P-value
Age (years), M (SD)	63.1 (14.7)	61.1 (13.7)	65.1 (15.4)	.001 ^a
Male, n (%)	326 (56.5)	185 (62.9)	141 (49.8)	.002 ^b
Duration from admission to the observation day (days), Md (IQR)	6.0 (3.0–9.0)	4.0 (2.8–8.0)	7.0 (4.0–10.0)	<.001 ^c
BMI, M (SD)	24.4 (3.8)	23.9 (3.7)	24.9 (3.9)	.005 ^a
Level of care, n (%)				<.001 ^b
Level 1	267 (46.3)	71 (24.1)	196 (69.3)	
Level 2	310 (53.7)	223 (75.9)	87 (30.7)	
Medical device(s) in situ (number), Md (IQR)	1.0 (1.0–3.0)	1.0 (0–2.0)	2.0 (1.0–4.0)	<.001 ^c
Mobility status n (%)				<.001 ^b
Independent	193 (33.4)	165 (56.1)	28 (9.9)	
Aid/Assistance required	384 (66.6)	129 (43.9)	255 (90.1)	
Carer presence, n (%)	129 (22.4)	88 (29.9)	41 (14.5)	<.001 ^b
Urine/faeces incontinence, n (%)	31 (5.3)	18 (6.1)	13 (4.6)	.070 ^b
Healthy skin, n (%)	262 (45.4)	168 (57.1)	94 (33.2)	<.001 ^b
Documented PI, n (%)	5 (0.9)	4 (1.4)	1 (0.4)	.199 ^c
At PI risk on admission ^d , n (%)	83 (14.4)	42 (14.2)	41 (14.5)	.945 ^b
Drugs potentially impact PI risk, n (%)	163 (28.2)	72 (24.5)	91 (32.2)	.041 ^b

Abbreviations: BMI, body mass index [Total sample: n = 534 (n = 43 missing), Med & Surg, 277 (17 missing) & 257 (26 missing)]; M(SD), mean (standard deviation); Md (IQR), median (interquartile ranges).

^aIndependent sample *t*-test;

^b χ^2 test;

^cMann-Whitney *U*-test;

^dPI risk: Braden total score \leq 18 points;

^eFisher's exact test.

medical patients, a practice that is recommended to be avoided in the guideline.

Forty-one (7.1%) patients required continence management strategies, and all received some form(s) of continence care (see Appendix A). Although only 31 patients were identified with urine, faecal or dual incontinence, we observed an additional 10 medical patients received some continence management due to immobility.

Prophylactic dressings were used for about one quarter of patients and more frequently in surgical patients. Foam dressings were the most commonly used dressing type and applied to the coccyx-sacrum (n = 122), heel (n = 5) and trochanter (n = 3).

3.3 | Observed nutrition care

The majority patients were independent in their eating and/or drinking (n = 466, 80.8%) (Table 2). About one-quarter of patients (n = 147, 25.5%) were receiving some type of nutritional support, including extra nutritional

supplements (n = 41, 7.1%), enteral nutrition (n = 21, 3.6%) or parenteral nutrition (n = 107, 18.5%). More surgical patients (n = 99, 35.0%) received parenteral nutrition care than medical patients (n = 8, 2.7%) ($P < .001$).

3.4 | Observed repositioning and mobilisation

Many patients (n = 245, 42.5%) were able to move independently in and out of bed on the observation day and did not require assistance with repositioning or mobilisation. Among the 556 (96.4%) patients with 8-hour position data, 84.2% (n = 486) had their position changed at least every 4 hr. Among 332 patients who required assistance for repositioning, 82.7% (267/323) were regularly repositioned (9 excluded due to missing data).

Use of specific repositioning strategies are displayed in Table 3, including repositioning regimen (should be tailored to the patient's clinical condition) and techniques (repositioned to offload of all bony prominences and

TABLE 2 Observed skin care and nutrition care strategies

Strategy	Total sample (n = 577; 100%) n (%)	Medical (n = 294; 50.9%) n (%)	Surgical (n = 283; 49.1%) n (%)	P-value
Strategies should be used				
Keep skin clean	404 (70.0)	239 (81.3)	165 (58.3)	<.001 ^a
Keep skin hydrated	304 (52.7)	179 (60.9)	125 (44.2)	<.001 ^a
Protect skin with barrier products	119 (20.6)	25 (8.5)	94 (33.2)	<.001 ^a
Strategies should be avoided but were received				
Alkaline soaps	33 (5.7)	21 (7.1)	12 (4.2)	.133 ^a
Vigorously rubbing skin	20 (3.5)	3 (1.0)	17 (2.9)	.001 ^a
Warming blankets	2 (0.3)	2 (0.7)	-	.496 ^a
Skin cream around the dressing edge ^c	2 (0.3)	1 (0.3)	1 (0.4)	.234 ^b
Prophylactic dressing use	134 (23.2)	6 (2.0)	128 (45.2)	<.001 ^a
Eating/drinking independently	466 (80.8)	249 (84.7)	217 (76.7)	.015 ^a
Nutrition support	147 (25.5)	26 (8.8)	121 (42.8)	<.001 ^a

^a χ^2 test;^bFisher's exact test;^cTotal sample: n = 5; Med: n = 2; Surg: n = 3; n = 572 was non-applicable.

TABLE 3 Observed repositioning practices and the use of support surfaces

Variables	Total sample (n = 577; 100%) n (%)	Medical (n = 294; 50.9%) n (%)	Surgical (n = 283; 49.1%) n (%)	P-value
Repositioning (5 items)				
Individualised repositioning schedule	250 (75.3)	74 (79.6)	176 (73.6)	.261 ^a
Frequency decided by patients' condition	293 (88.3)	78 (83.9)	215 (90.0)	.122 ^a
Pressure on bony prominence offloaded	182 (54.8)	51 (54.8)	131 (54.8)	.996 ^a
30° position used	28 (8.4)	10 (10.8)	18 (7.5)	.343 ^a
Prone position changed after 2 hr ^b	142 (24.6)	14 (19.4)	128 (54.0)	<.001 ^a
Repositioning seated patients (3 items)				
Repositioning after sitting 1 hour ^c	180 (83.7)	42 (66.7)	138 (90.8)	<.001 ^a
Legs elevated ^b	91 (42.3)	30 (47.6)	61 (40.1)	.312 ^a
Seat tilted ^b	1 (0.5)	1 (1.6)	—	.119 ^a
Support surfaces in use	84 (14.6)	30 (10.2)	54 (19.1)	.003 ^a

^a χ^2 test;^bTotal sample: n = 307; Med: n = 70; Surg: n = 237;^cTotal sample: n = 215; Med: n = 63; Surg: n = 152.

achieve maximum redistribution of pressure) when patients are in bed (five items) or seated (three items). Approximately one-third of patients (n = 216, 37.4%) required all eight repositioning strategies (in bed and seated). The median (IQR) use of these strategies was

4.0 (3.0–5.0); a statistically significant difference in the number of strategies used was found between medical (median 4.0 [IQR 3.0–5.0]) and surgical (median 5.0 [IQR 4.0–5.0]) patients ($P < .001$). About one-fifth patients (n = 116, 19.9%) were bedfast and required the

five repositioning strategies (in bed). There was no difference in the number of repositioning strategies used for medical (median 2.0 [IQR 1.0–3.0]) or surgical patients (median 2.0 [IQR 1.0–2.0]) ($P = .203$). If a prone position was used, surgical patients were more likely to be turned after 2 hr and to be repositioned after sitting in a chair for an hour. However, both groups were similar in terms of most other aspects of repositioning.

3.5 | Observed support surfaces use

Only a small number of patients ($n = 84$, 14.6%) used specialised support surfaces, and this was more frequent for surgical patients. The most frequently used support surfaces were alternating pressure air mattresses ($n = 55$), pillows as support device ($n = 31$), foam wedges ($n = 16$) and high specifically reactive foam mattresses ($n = 16$) (see Appendix A). Alternating pressure air mattresses were most frequently used in surgical wards, whereas high specification reactive foam mattresses were more common in medical wards.

3.6 | Observed patient education

The median of the four patient educational items was 0.0 (IQR 0–1.0). A significant difference in types of education provided was found for medical (median 0.0 [IQR 0.0–0.0]) and for surgical (median 1.0 [IQR 0.0–2.0]) patients ($P < .001$). Of the four specific pressure injury-related patient education, repositioning education was most commonly provided and observed more frequently in surgical patients. Skin hygiene education was also provided more frequently to surgical patients ($n = 112$, 39.6%). Education on the risk of pressure injury development and nutrition was lacking (Table 4).

3.7 | Documented pressure injury prevention strategies

In general, most prevention strategies were more likely to be documented in surgical patients' medical charts. Findings are presented in Table 5.

All patients had their Braden risk scores ($n = 577$, 100%), and most ($n = 487$, 84.4%) had their skin

TABLE 4 Observed patient education

Education	Total sample (n = 577; 100%) n (%)	Medical (n = 294; 50.9%) n (%)	Surgical (n = 283; 49.1%) n (%)	P-value
PI risk education	8 (1.4)	5 (1.7)	3 (1.1)	.763 ^a
Skin hygiene education	150 (26.0)	38 (12.9)	112 (39.6)	<.001 ^a
Repositioning education	247 (42.8)	49 (16.7)	198 (70.0)	<.001 ^a
Nutrition education	6 (1.0)	5 (1.7)	1 (0.4)	.111 ^a

^a χ^2 test.

TABLE 5 Documented pressure injury prevention strategies

Documented strategies	Total sample (n = 577; 100%) n (%)	Medical (n = 294; 50.9%) n (%)	Surgical (n = 283; 49.1%) n (%)	P-value
Skin care (3 items)				
Prophylactic dressing	167 (28.9)	5 (1.7)	162 (57.2)	<.001 ^a
Avoid friction and shear	423 (73.3)	166 (56.5)	257 (90.8)	<.001 ^a
Keep skin clean	491 (85.1)	221 (75.2)	270 (95.4)	<.001 ^a
Nutritional support (1-item)	87 (15.1)	17 (5.8)	70 (24.7)	<.001 ^a
Repositioning regimen (1-item)	234 (40.6)	63 (21.4)	171 (60.4)	<.001 ^a
Support surfaces (1-item)	62 (10.7)	25 (8.5)	37 (13.1)	.076 ^a
Patient education (1-item)	433 (75.0)	238 (81.0)	195 (68.9)	.001 ^a

^a χ^2 test.

assessments documented on admission (see Appendix B). Follow-up risk assessment was conducted for the majority of patients ($n = 399$, 69.2%) and mostly once a week (178/399, 44.6%). Similarly, follow-up skin assessment was conducted in most patients ($n = 309$, 77.1%). There was no difference between medical and surgical patients on risk and skin assessment documentation.

Among the three documented skin care strategies, the median for total sample was 2.0 (IQR 1.0–3.0); medical patients median 2.0 (IQR 1.0–2.0); and surgical patients median 3.0 (IQR 2.0–3.0), which was a significant difference. Surgical patients had more skin care strategies recorded than medical patients.

Nurses documented when they were aware that patients were receiving some form(s) of nutritional support, such as extra nutritional supplements, enteral nutrition or parenteral nutrition. In total, 15% ($n = 87$) patients had nutritional support documented, the number of patients who required this support is not known. The nutrition risk screening (NRS2002) tool³³ was only used in one medical ward ($n = 154$). Among them, only four patients (4/154, 2.5%) had malnutrition risk (NRS2002 ≥ 3 point).

Less than half of the patients had a documented repositioning regimen, and only 10% of patients record noted the use of a support surface. Patient education was recorded in more than two-thirds of patients in both medical and surgical wards.

4 | DISCUSSION

The results of this study provide a detailed understanding of the pressure injury prevention strategies in routine clinical practices in a Chinese hospital and in the differences in their use between medical and surgical settings. To our knowledge, this is one of the first prospective observational studies conducted to address the use and documentation of guideline-based prevention strategies in a Chinese hospital context.

4.1 | Risk assessment and skin assessment

Risk assessment is pivotal for pressure injury prevention.⁵ We found a high compliance of risk assessment on admission when comparing with previous studies.^{21,34–36} This high compliance may reflect some organisational or system supports. For example, these findings might be partly explained by the protocol used in this hospital included mandatory risk assessment for pressure injury on admission and that risk assessment scales were inserted into nurses daily used electronic medical record

system. However, the extent to which risk assessments are conducted routinely, without consideration of what the assessment means for that patient's care, and therefore their usefulness may be questionable.³⁷ In our study, despite 100% completion, pressure injury prevention strategies were not consistently used or documented.

Skin assessment was documented on admission for over 80% of patients, but about one-third of patients did not have their skin assessed during the follow-up risk assessment. This indicated a concerning gap between risk assessment and skin assessment. The international guidelines assert a comprehensive skin assessment is essential to risk assessment and should be conducted as a part of every risk assessment.⁵ Without proper skin assessment, some at-risk patients may not be identified. This gap might be explained that in order to complete mandatory tasks, some non-compliant behaviour may be occurring.³⁸ While, a head-to-toe skin assessment can be time-consuming when nurses are time pressured or have competing priorities, whether nurses undertake this activity properly might be questionable despite high documentation rate.

4.2 | Preventive skin care

Maintaining skin integrity is essential for pressure injury prevention. Both observed and documented skin care practices indicated that the majority of patients received some skin care, but more so in the surgical wards. This could be explained by surgical patients' clinical characteristics. For example, more patients were immobile and receiving Level 1 care; thus, nurses may have paid more attention to surgical patients' skin integrity. Basic skin care strategies are helpful in improving skin barrier in aged patients, and a structured skin hygiene regimen for incontinence patients was determined to be effective in reducing the incidence of pressure injury in previous studies.^{39,40} Despite only a small number of patients with incontinence, all received some continence management strategies in this study. We found a small number of patients used alkaline soaps or cleansers, and practices recommended to be avoided. This could be related to the fact that patients who were admitted to hospitals in China usually supply their own cleansers and soaps and they may not have been aware of the impact of alkaline products on skin pH and skin integrity.

Prophylactic dressings can help redistribute pressure and protect the skin from friction and shear (⁴¹; Moore et al.,⁴²). In this study, only a quarter patient received some type(s) prophylactic dressings, and this practice was most commonly observed in the surgical wards. The reason could be related to ward culture in that dressings in general are more commonly used in surgical wards.

However, dressings may have not been used in medical wards because they are not claimable items in the medical insurance reimbursement schemes for medical patients. Thus, medical patients, but not surgical, are required to supply their own prophylactic dressings.

4.3 | Nutrition care

Nutrition plays an important role in preserving skin, and malnutrition is closely related to loss of muscle and reduced mobility, which have been associated with pressure injury development^(5,19). Conducting a nutrition screening is the first step to assess patients' risk of malnutrition. However, we found that only a quarter of participants were screened for nutrition risk, which is lower than reported elsewhere. For example, in one Irish site, 62% of nutrition screening compliance rate was achieved³⁶ and 59% patients were screened for nutrition risk in an Australian study.⁴³ As for nutrition support, we found only about one-quarter of patients had some level of nutritional support implemented, similar to the findings reported by Chaboyer et al.²¹ Possible explanation for this might be that nutrition is considered low priority for nurses; dietitians tend to take this responsibility. However, dieticians are not common in many Chinese wards and Chinese nurses are not permitted to provide supplements to patients, therefore the lack of attention to nutrition assessment and support not surprising. But we do not know how many patients 'should have' received nutrition support. In other countries, nurses and dietitians often work collaboratively in assessing patients' nutritional risk and provide follow-up nutrition support based on the assessment.⁴³ It is likely that dieticians may have a positive impact on patients' nutrition care, but without information on patients who might require nutrition support, this claim remains a proposition only.

4.4 | Repositioning and mobilisation

Repositioning and mobilisation were the most predominant prevention strategies used in this study. In our study, over 80% of patients were repositioned regularly. This finding is consistent with a previous Chinese study among 23 935 immobile patients recruited from 25 general hospitals in six provinces that reported 89.9% patients received regular repositioning.¹⁹ In contrast, a Swedish national survey of over 35 000 residents in hospitals and nursing homes reported that only 47.0% of them had a repositioning regimen,⁴⁴ and in an Australian study, the repositioning schedule was implemented in only 64.0% of 799 patients.²¹ Perhaps this attention to repositioning can help to explain

why the prevalence of pressure injury was reported to be very low in hospitalised patients in China.^{4,45}

We also investigated the use of repositioning techniques and found the implementation was suboptimal. Repositioning is undertaken to reduce the duration and magnitude of pressure over vulnerable body sites;⁵ however, only about half patients had pressure offloaded from bony prominences while repositioning. A 30° angle for positioning patients has been shown to reduce the incidence of pressure injury significantly⁴⁶ yet less than 10 % of patients were in this position during observation. Nurses should pay attention on their manual handling techniques while turning patients. Besides, using equipment to reduce pressure and shear is recommended by current guidelines and manual repositioning can be time-consuming and even result in work-related musculoskeletal disorders.⁴⁷ A interface pressure monitoring can increase efficiency of repositioning and visual feedback provided by pressure mapping also improve proficiency in preventative repositioning.⁴⁸ However, relevant equipment such as turning device and pressure mapping were not observed as being available for nurses in our study.

Despite regular repositioning being observed as the most frequently used prevention strategy, only 40% of patients had a documented repositioning regimen. This is contrary to previous studies that reported more documented repositioning scheme than implemented repositioning.¹⁰ Others have noted a lack of consistency and standard reporting methods for documentation of prevention strategies.³⁷ This time-consuming practice becomes 'invisible' if it is not recorded; recognising the time it takes to reposition and mobilise patients is important to ensure adequate resources are available to provide high-quality care.

4.5 | Support surfaces use

Specialised support surfaces are an integral element in PI prevention because they inhibit tissue deformation and are usually combined in multifaceted interventions.^{8,49} Fewer than 15% of patients we observed received some types of support surfaces, less than reported in previous studies.^{10,21} It is possible there was poor access and insufficient supply of support surfaces. For example, nurses in one of 46-bed medical wards had access to only three air alternating mattresses.

4.6 | Patient education

All patients should receive education regarding pressure injury, yet the delivery of education was not commonly observed, a finding similar to that of previous studies.^{21,36}

But about three-quarters of patients had the provision of education documented in their medical charts. This could be explained by the limitation of observational design, where education may have been provided outside the period of observation. Pressure injury education is important to prepare patients to participant in their care, which is known to improve safety outcomes.⁵⁰ Patient education should include information about pressure injury, relevant risk factors and preventive strategies to gain the patients' prevention knowledge⁵). On the day patients were observed, they received more education or information about skin hygiene and repositioning than pressure injury-related risk or nutrition. Clearly, there is an opportunity for nurses to educate patients about the specific contribution these two factors have on pressure injury development.

4.7 | Limitations

This study has several limitations. First, it is possible that sampling bias may have occurred. We ensured data were collected every day of the week, and we used a consecutive sampling technique and randomly selected the 'room' that we started data collection each day to avoid bias. Second, prevention strategies were measured by direct observation and chart audit. Observation might be influenced by observer bias, and the Hawthorne effects might exist. Patients, nursing staff, and carers may have changed their actions as a result of being observed. To try to avoid this, the researcher spent time on each ward prior to data collection to help staff become more familiar with her and inter-rater reliability established consistency between observers.

The use of patient records as one method for data collection was another limitation of this study that we carefully considered. Others have identified various issues associated with nurses' documentation. For instance, information can be missing, incomplete or incomprehensible.⁵¹⁻⁵³ In relation to pressure injury practices specifically, Gunningberg et al found that the documentation of prevention practices was inaccurate such as the frequency of use of special support surfaces.⁵⁴ Therefore, we chose to use semi-structured observation as our primary method of data collection, with chart audits data complementing the observation to augment our understanding of current prevention practices. Finally, we only observed 8 hr each day during the daytime (0900-1700). Practices that occurred outside these hours were not recorded. However, with higher nurse to patient ratios occurring during the daytime hours, it is unlikely that more prevention was delivered in the evenings and at nights.

4.8 | Relevance to clinical practices

Prior to this study, little was known about the pressure injury prevention practices in medical and surgical patients in China. Our detailed findings show some strategies such as repositioning and risk assessment generally complied with the international guideline. But, other prevention practices such as skin care, nutrition and patient education were not ideal. These findings can form the foundation of quality improvement and implementation research efforts to improve the uptake of evidence-based guidelines into practice. But for these activities to be successful is a growing body of evidence highlights the importance of underpinning implementation strategies on a sound theoretical base.^{55,56} In addition, understanding nurses' beliefs and approaches to pressure injury prevention and the various factors that support or impede their use will help inform future work and help to target initiatives to overcome barriers to the update of various prevention strategies. Furthermore, understanding patients' and carers' knowledge of how to prevent pressure injury and their willingness to actively participate in pressure injury prevention is another area to research and one that could lead to future intervention research. Finally, study that provide a deeper understanding of the work structures, including the external policy environment, may inform future prevention planning in China and internationally. We also identified that surgical patients generally received better preventative care than medical patients, suggesting targeting efforts to improve care of latter group may be particularly beneficial. Thus, our findings provide a foundation for a wide range of future research and quality activities that ultimately have the potential to improve patient care and outcomes.

5 | CONCLUSION

In conclusion, this observational study reported on implemented and documented pressure injury prevention practices in two medical and two surgical wards in one Chinese tertiary hospital. Repositioning and risk assessment were the most frequently used prevention strategies. Suboptimal use of some guideline recommended strategies, such as nutrition risk screening, use of support surfaces and patient education, was identified. Documentation of prevention strategies was inconsistent with some observations and lacked standardised reporting format. Improving the uptake and application of guideline recommendations may improve quality of care and patient outcomes. Further research is needed to understand nurses' perception and their prioritisation when providing prevention care.

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CONFLICT OF INTEREST

The authors declare that they have no conflict of interests.

AUTHOR CONTRIBUTIONS


All authors conceived the study and were responsible for designing the study. Zhaoyu Li wrote the first draft of the article. Zhaoyu Li, Andrea P Marshall, Frances Lin, Yanming Ding, and Wendy Chaboyer critically revised successive drafts of the article for important intellectual content, gave final approval of the version to be published, and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.


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APPENDIX A. Results of observed continence management and support surfaces

Variables	Total sample (n = 577; 100%) n (%)	Medical (n = 294; 50.9%) n (%)	Surgical (n = 283; 49.1%) n (%)	P-value
Continence management (4 items)				
Individualised toileting regimen	7 (1.2)	6 (2.0)	1 (0.4)	.141 ^a
Wearing continence pads	39 (6.8)	29 (9.9)	10 (3.5)	.010 ^a
Continence pads changed	36 (6.2)	26 (8.8)	10 (3.5)	.012 ^a
Skin cleaned after incontinence	35 (6.1)	25 (8.5)	10 (3.5)	.011 ^a
Support surfaces (1 item)				
Foam wedge	16 (19.0)	16 (100)	—	<.001 ^a
Pillow (as PIP strategies)	31 (36.9)	8 (25.8)	23 (74.2)	.147 ^a
Alternating pressure air mattress	55 (65.5)	11 (20.0)	44 (80.0)	<.001 ^a
High specifically reactive foam mattress	16 (19.0)	14 (87.5)	2 (12.5)	<.001 ^a
Gel cushion	1 (1.2)	1 (100)	—	.764 ^a
Heel/elbow suspension device	4 (4.8)	3 (75.0)	1 (25.0)	.252 ^a
Other support device	3 (3.6)	2 (66.7)	1 (33.3)	.599 ^a

^a χ^2 test.

APPENDIX B. Documented PI risk assessment and skin assessment results

Variables	Total sample (n = 577) n (%)	Medical (n = 294) n (%)	Surgical (n = 283) n (%)	P-value
Braden scores on admission				.042 ^a
No risk (19 ~ 23)	494 (85.6)	252 (85.7)	242 (85.5)	
Mild risk (15 ~ 18)	59 (10.2)	26 (8.8)	33 (11.7)	
Moderate risk (13 ~ 14)	15 (2.6)	7 (2.4)	8 (2.8)	
High risk (10 ~ 12)	7 (1.2)	7 (2.4)	—	
Severe risk (≤ 9)	2 (0.3)	2 (0.7)	—	
Skin assessment on admission				.512 ^a
PI risk assessment follow-up				<.001 ^a
Daily	79 (13.7)	20 (6.8)	59 (20.8)	
Once a week	178 (30.8)	132 (44.9)	46 (16.3)	
Twice a week	10 (1.7)	4 (1.4)	6 (2.1)	
Change in pt's condition	130 (22.5)	2 (0.7)	128 (45.2)	
Prior discharge	1 (0.2)	—	1 (0.4)	
Other time point	1 (0.2)	—	1 (0.4)	
Most recent Braden scores				<.001 ^a
No risk (19 ~ 23)	234 (58.6)	133 (84.2)	101 (41.9)	
Mild risk (15 ~ 18)	136 (23.6)	13 (8.2)	123 (51.0)	
Moderate risk (13 ~ 14)	20 (3.5)	3 (1.9)	17 (7.1)	
High risk (10 ~ 12)	8 (1.4)	8 (5.1)	—	
Severe risk (≤ 9)	1 (0.2)	1 (0.6)	—	
Skin assessment follow-up				<.001 ^a
	309 (77.1)	132 (83.5)	177 (73.4)	

^a χ^2 test.