

Knowledge, Practices, and Influencing Factors of Pressure Ulcer Prevention and Management in Selected Hospitals in China

Shaomei Cui^{1,a}, Evelyn Feliciano^{1,b,*}

¹Graduate School, Angeles University Foundation, Angeles, Pampanga, 2009, Philippines

^acui.shaomei@auf.edu.ph, ^bfeliciano.evelyn@auf.edu.ph,

*Corresponding author

Abstract: To understand the current state of knowledge and practice level of stress injury nursing in tertiary care hospitals in China, and to analyze the differences between the characteristics of practicing nurses. We conducted a cross-sectional study. A questionnaire was administered to practicing nurses in a tertiary general hospital in Zhejiang Province. The Chinese version of the Stress Injury Knowledge Assessment Tool and the Stress Injury Nursing Behavior Questionnaire were used to assess the nurses' knowledge and practice of stress injuries, and one-way analysis of variance and t-test were used to analyze the differences, and Pearson's correlation test was used to analyze the correlation between the knowledge of stress injuries and practice. 214 nurses participated in this study. The mean score of knowledge of stress injury nursing was (12.79±2.37), which was statistically analyzed to be statistically significant in terms of gender of the respondents ($t=1.979$, $p=0.049$), years of experience ($t=2.298$, $p=0.023$), and number of times attending stress injury training ($t=2.854$, $p=0.005$). Stress injury nursing practice score (147.01±16.079). After statistical analysis, stress injury nursing practice was statistically significant in terms of the number of years the respondents had worked ($t=2.371$, $p=0.019$), and the number of stress injury trainings attended ($t=2.961$, $p=0.003$). There was a significant positive correlation between stress injury nursing knowledge and practice ($r = 0.669$, $p < 0.001$). 214 practicing nurses had inadequate knowledge and practice of stress injury care. A stress injury training program for junior nurses is necessary.

Keywords: Pressure Ulcer, Knowledge, practice, Patients safety

1. Introduction

Ensuring patient safety is a task of the healthcare team and a right that patients should enjoy, and high-quality nursing care is based on patient safety^[1,2]. Pressure ulcers are localized injuries to the skin and/or subcutaneous tissues caused by pressure or shear forces, usually occurring on bony prominences^[3]. Pressure ulcers may occur in all healthcare settings such as hospitals, nursing facilities, and the community, and they can have a negative impact on patients, healthcare professionals, and healthcare organizations, seriously affecting patient safety and the quality of care, which cannot be ignored^[4].

Pressure ulcers are a common adverse event among hospitalized patients, and despite advances in prevention and treatment, the prevalence remains high, increasing the economic burden on patients and healthcare providers. A worldwide meta-analysis of pressure ulcers showed that the overall prevalence of pressure ulcers among adult inpatients was approximately 12.8%^[5]. The prevalence of pressure ulcers varies from country to country; Moore et al. showed that the prevalence of pressure ulcers in Europe ranged from 4.6% to 27.2%^[6], and that the cost of pressure ulcer prophylaxis and treatment per patient was approximately €1.71- 470.49/day^[7]. The prevalence of pressure ulcers in the United States ranges from 9.2% to 17%^[8,9], and the average cost of a single pressure ulcer treatment per patient is \$10,708^[10]. In China, the disability-adjusted life years for pressure ulcers for people aged 55 years and older in China in 2019 were 41,140,000 person-years, and the number of deaths was 0.255 million^[11]. Meanwhile, pressure ulcers are associated with adverse outcomes such as pain, infection, chronic inflammation, and malignant transformation, prolonging the length of hospitalization and seriously affecting the quality of life of patients and their caregivers^[12,13].

Pressure ulcers are a preventable complication and a potential patient safety issue that healthcare professionals tend to overlook. Despite technological advances in the prevention and management of

pressure ulcers, it remains a common challenge for both patients and caregivers^[14]. Assessing whether a patient is at risk for pressure ulcers and the management of pressure ulcers is one of the responsibilities of nurses in the workflow of healthcare organizations^[15], and at the same time, pressure ulcers are also one of the evaluation indicators of the quality of nursing care^[16], therefore, it is important for nurses to have adequate knowledge of pressure ulcer care in clinical practice. Nurses with sufficient knowledge of pressure ulcer nursing is conducive to improving the quality of pressure ulcer nursing care, shortening the length of hospital stay of patients, and reducing the incidence of pressure ulcers. Pressure ulcer nursing knowledge is the foundation of clinical practice, so it is necessary to assess the level of clinical nurses' pressure ulcer nursing knowledge and practice. Currently, there is insufficient research on pressure injury nursing knowledge and practice in China; therefore, by surveying clinical nurses in tertiary-level hospitals, this study aimed to understand the status of the level of pressure injury nursing knowledge and practice in tertiary-level hospitals in China and to analyze the differences between the characteristics of registered nurses.

2. Methods

2.1. Study Design and Setting

This is a descriptive-comparative study. It is a non-experimental quantitative study. In this study, the researcher will determine the knowledge and practice of pressure ulcer care among nurses in a tertiary hospital investigated in each period.

The study will be conducted at the Fourth Affiliated Hospital of Zhejiang University School of Medicine, a tertiary hospital with 1,141 beds. The hospital adheres to high-quality development and adheres to the core values of "seeking truth, innovation, humanity, and excellence". Pressure ulcers, as an adverse event that jeopardizes patient safety, is one of the indicators that hospitals focus on monitoring, the incidence of pressure ulcers in our hospital was 1.6% in 2023, the level of knowledge and practice of pressure ulcer prevention in the researcher's region has not yet been adequately recognized, the researcher's hospital is a tertiary care general hospital, which is representative of the study area, and the hospital has more than 1,200 registered nurses, which is sufficient sample size to ensure that the study is There are more than 1200 registered nurses in the representative hospitals in the study area.

2.2. Study participants

The Kendall sample estimation design principles of the International General Scale will be used, and 5-10 samples were selected for one item of the scale. Because there are two initial scales in this study, the pressure injury Knowledge Assessment tool has 21 items, and the Pressure Injury Nursing Behavior questionnaire has 36 items. Therefore, the sample size is between 180 and 360, and considering 10% invalid questionnaires, the study is expected to include at least 200 nurses. There are more than 1200 registered nurses in this research center, which has a sufficient sample size. The investigator will engage participants by convenience sampling.

The respondents are nurse practitioners in the Fourth Affiliated Hospital of Zhejiang University School of Medicine who worked in the hospital during the study period and had at least two years of clinical experience, regardless of work experience. Respondents must have been approved for nurse practitioner licensure. Investigators gave informed consent to those willing to participate in this study. Registered nurses who are on vacation during the study period will be excluded. In this study, ward nurses are the main focus of the study with the special departments such as the emergency department, outpatient clinic and operating room being excluded.

2.3. Research Instruments

The general demographic data of the participants will be collected, including age, gender, Nurse Position Level, working experience, education level, Affiliated Department, Employment Status, the number of units beds, the bed-to-nurse ratio, and the number of sessions attended for pressure ulcer training with the follow-up questions, "Have you attended training related to Pressure Ulcer Management? If yes, how many since then?"

The Chinese version of the pressure injury Knowledge Assessment tool was translated and translated into Chinese by Wang^[17]. The Source Scale was developed by Manderlier^[18] and the scale was used to measure clinical nurses' knowledge of stress injuries. The scale included six dimensions: etiology (4

items), classification and observation (3 items), risk factor assessment (2 items), nutrition (3 items), pressure injury prevention (7 items), and special patients (2 items), with a total of 21 items. The total score ranged from 0 to 21. The higher the score, the higher the pressure injury knowledge score. The Cronbach's α of the scale was 0.814, indicating that the Chinese version of C-PUKAT was appropriate as an assessment tool for pressure injury knowledge of nurses in China^[17].

The pressure injury nursing behavior questionnaire developed by Li will be used in this study^[19]. The questionnaire included five dimensions (35 items), including risk assessment (5 items), risk awareness (7 items), preventive measures (8 items), health education (4 items), and wound assessment and treatment (11 items). Each item was scored on Likert 5-point scale, and the score ranged from 36 to 180. The higher the score, the better the nursing behavior of the nurses on pressure injuries. The internal validity of the questionnaire was 0.952, Cronbach's α coefficient was 0.931, and the test-retest reliability was 0.938^[19].

2.4. Data collection

In this study, a WeChat group was established, and nurses who agreed to participate in the study voluntarily would scan the QR code to join the WeChat group. The researchers shared the questionnaire two-dimensional code in the group, and the subjects scanned the two-dimensional code to fill in the questionnaire, and the questionnaire star option was set as a mandatory option. The research assistant was responsible for answering respondents' queries and reviewing the quality of questionnaire completion and communicating with team members in a timely manner. The questionnaire was completed in about 20 minutes.

2.5. Ethical considerations

The researcher submitted a medical ethical review to the Human Research Ethics Committee of the Fourth Affiliated Hospital of Zhejiang University School of Medicine to protect the rights and interests of the participants (NO.: K2023125). Participants gave informed consent to participate in the study voluntarily and had the right to withdraw from the study at any time. The investigator was responsible for protecting the privacy and confidentiality of the participants. The questionnaires were completed anonymously, and the stored data did not include the names of the participants, which means that the data analyses that will be published cannot be traced back to the participants.

2.6. Statistical Analysis

All questionnaire data were analyzed using SPSS 20.0 statistical software. For descriptive statistics, continuous variables were expressed as mean \pm standard deviation and categorical variables were expressed as frequency and percentage. Independent samples t-test and one-way ANOVA were used to compare the differences in knowledge and practice for general information, and Pearson correlation test was used to analyze the correlation between knowledge and practice of pressure ulcer care, and the difference was considered statistically significant at $P < 0.05$.

3. Results

227 nurses participated in the study. However, 13 nurses were excluded due to less than 2 years of service and the findings were based on the responses of 214 nurses with a questionnaire validity rate of 94.27%. The mean age of the study population was (28.57 \pm 3.69) years with minimum age of 23 years and maximum age of 42 years. The number of beds in all the departments was 45 and the bed to nurse ratio was in the range of 1:0.4-1:0.6. See Table 1 for details.

The total pressure ulcer nursing knowledge score of 214 nurses ranged from 4-18, with a mean score of (12.79 \pm 2.37) and a median score of 13. See Table 2. More than 80.18% of the subjects scored between 10-16. The 3 entries with the highest percentage of correct responses were questions 3, 6, and 9, which were mainly related to the staging and assessment of stress injuries. In contrast, the 4 lowest-scoring items were items 4, 10, 13, and 17, which were mainly related to the prevention and management of stress injuries and body position.

All respondents had a pressure ulcer nursing practice score (146.86 \pm 16.104). Pressure ulcer nursing practice lowest score 71, the highest score 180. The health education dimension scored the lowest (15.79 \pm 1.958), and the wound assessment and management dimension scored the highest (49.50 \pm 5.827). The total pressure injury practice scores and the scores for each dimension are shown in Table 2.

Table 1: General information on the study participants (n=214).

Variable	Mean±SD/n (%)
Age	28.57±3.69
Working experience	5.87±3.42
Gender	
	Male
	30(14.02)
	Female
	184(85.98)
Nurse Position Level	
	Primary title
	143(66.82)
	Middle title
	71(33.18)
Education level	
	Specialist qualifications
	4(1.87)
	Bachelor's degree and above
	210(98.13)
Employment Status	
	staffing of government affiliated institutions
	153(71.5)
	Non-staffing of government affiliated institutions
	61(28.5)
Affiliated Department	
	Internal medicine
	99(46.26)
	Surgical department
	115(53.73)
Accessibility of training	5.85±3.94

Table 2: Stress Injury Nursing Practice Score.

Variable	Minimum	Maximum	Mean±SD
Risk assessment	9	25	20.72±2.892
Risk awareness	14	35	28.65±3.571
Preventive measures	16	40	32.34±3.891
Health education	8	20	15.79±1.958
Wound assessment and treatment	24	60	49.50±5.827
Pressure Ulcer Nursing Practice Total scores	71	180	146.86±16.104
Pressure Ulcer Nursing Knowledge Total scores	4	18	12.79±2.37

Table 3: Differential Analysis of pressure ulcer Nursing Practices and knowledge Regarding Respondent Characteristics (n=214).

Variable		Practices			Knowledge		
		Mean±SD	Statistical value	P	Mean±SD	Statistical value	P
Age	23-28	145.43±16.148	1.437	0.152	12.52±2.336	1.823	0.07
	29-42	148.6±15.963			13.11±2.389		
Working experience	2-6	144.85±17.576	2.371	0.019	12.25±2.376	2.298	0.023
	7-18	150.17±12.766			13.26±2.306		
Gender	Male	143.8±14.452	1.125	0.262	12.00±1.875	1.979	0.049
	Female	147.36±16.339			12.92±2.425		
Nurse Position Level	Primary title	146.23±16.125	0.816	0.415	12.60±2.386	1.654	0.1
	Middle title	148.14±16.1			13.17±2.318		
education level	Specialist qualifications	151.50±18.376	0.51	0.644	12.60±2.386	1.654	0.1
	Bachelor degree and above	146.78±16.095			13.17±2.318		
Employment Status	staffing of government affiliated institutions	146.47±15.886	0.782	0.435	12.73±2.265	0.475	0.636
	Non-staffing of government affiliated institutions	148.37±16.607			12.91±2.703		
Affiliated Department	Internal medicine	146.09±13.591	0.779	0.437	12.56±2.143	1.246	0.214
	Surgical department	147.8±17.968			12.97±2.583		
Accessibility of training	1-6	144.63±17.017	2.961	0.003	12.47±2.344	2.854	0.005
	7-21	151.46±12.986			13.44±2.313		

* $P < 0.05$

After statistical analysis, knowledge of pressure ulcer care was statistically significant in terms of respondents' gender ($t=1.979$, $p=0.049$), years of experience ($t=2.298$, $p=0.023$), and number of pressure ulcer trainings attended ($t=2.854$, $p=0.005$) (Table 3). Statistical analysis showed that pressure ulcer nursing practice was statistically significant in terms of the number of years the respondents had worked ($t=2.371$, $p=0.019$), and the number of pressure ulcer training attended ($t=2.961$, $p=0.003$) (Table 3). Statistical analysis showed a significant positive correlation between knowledge and practice of pressure ulcer nursing ($r=0.669$, $p < 0.001$). The findings suggest that the higher and more knowledge nurses have, the better their pressure ulcer practice behaviors are.

4. Discussion

This was a cross-sectional survey study that investigated the knowledge and practice of stress injury nursing in a tertiary hospital in China. According to the WHO age classification criteria^[20], all respondents in this study were young people (23-42 years old), and the reason considered was that the researcher's hospital was established in 2014, and the group of nurses tended to be younger; therefore, most nurses had fewer years of working experience and fewer times of attending stress injury training, with 52.8% ($n=113$) of the respondents in this study having less than 6 years of working experience, and 57% ($n=122$) of the respondents had participated in less than 6 stress injury trainings.

The results of this study indicate that nurses' knowledge of stress injuries is deficient, which is consistent with the findings of Emami^[21]. The entries with a high percentage of correct responses indicate that nurses are familiar with the staging and clinical manifestations of stress injuries and can assess the risk of stress injuries in their patients in a timely manner. The entries with lower correct response rates focused on knowledge related to the prevention and management of pressure injuries, and clinical nurses had insufficient knowledge related to the standards for the prevention and management of pressure injuries. Implementing standards of care related to the prevention and management of pressure ulcers in nursing practice can provide adequate and high quality care to patients, and standardized care can significantly prevent pressure injuries^[22]. Only 43.2% of nurses correctly answered the correct position that reduces pressure on the surface of the patient's skin, and worldwide, knowledge of pressure injuries from changing the patient's position is often incorrectly answered. Knowledge of stress injury nursing differed between respondents' gender, years of experience, and the number of stress injury trainings attended. Females scored higher than males in knowledge of stress injuries and the reason considered was that the nursing profession is still dominated by females, with a relatively small proportion of males (14.02%). Nurses with more years of experience and more stress injury training had higher stress injury knowledge scores. The reason considered was that nurses' knowledge related to stress injuries stacked up as they gained work experience and attended more stress injury training. Källman et al. showed that nurses with many years of nursing experience had a positive effect on stress injury knowledge^[23]. Several studies^[24,25] have shown that nurses with higher levels of education have higher stress injury knowledge. The educational composition of nurses in the researcher's hospital was predominantly undergraduate, with only 1.87% specialized, so there was no difference in educational qualifications between nurses' knowledge of stress injuries in this study.

The results of this study indicate that nurses' level of stress injury practice is unsatisfactory and that there are variations in assessment tools across studies, hence the lack of comparisons between similar studies. Stress injury nursing practice differed between respondents' years of experience, and the number of stress injury trainings attended, with nurses with >6 years of experience and >6 stress injury trainings attended possessing a higher level of stress injury practice, consistent with the findings of Feng^[26] and others. As the number of years of working experience increases, the number of stressful injury trainings attended increases, and the increase in the number of trainings is a continuous process of superimposing the amount of knowledge, which can improve the behavior over time, thus improving the nurses' stressful injury practice, which is in line with the study of Kim and Cho^[27] in Korea. There is an interaction effect of the number of years of working experience and the number of trainings on the nurses' stressful injury practice behaviors interacted, with nurses with more years of work and more training on stressful injuries having better practice behaviors.

This study showed a significant positive correlation between nurses' knowledge of stressful injuries and practice, and Ghorbani Vajargah showed a significant positive correlation between nurses' knowledge of stressful injuries and practice in a systematic review^[28]. Educational interventions can improve nurses' knowledge and attitudes towards stressful injuries^[2], and studies such as Kim^[29] have shown that conducting stressful injury training programs can improve clinical nurses' knowledge, visual

discrimination and clinical judgement. Therefore, it is recommended that future research focus on innovative stress injury training program options to increase nurses' motivation to participate in the training and to encourage lower seniority nurses to participate in stress injury programs. Consideration should be given to using stress injury training as a continuing education program to improve nurses' knowledge and increase their practical skills. At the same time, targeted and appropriate tools to assess nurses' stress injury practice behaviors need to be considered.

Inevitably, there are several limitations to this study. Firstly, the research design was cross-sectional and failed to explore the causal relationship between variables. Secondly, the sample size of this study was small and needs to be expanded for future validation. Thirdly, this study was based on a questionnaire survey of nurses' knowledge and practice behaviors in relation to stress injuries, which inevitably led to collection bias, and data need to be collected in the future by combining patients' clinical performance and other assessment methods.

5. Conclusions

We assessed 214 practicing nurses in tertiary hospitals in China and found that nurses' knowledge and practice of stress injuries were lower than expected. We suggest that healthcare organizations should actively engage in educational interventions and stress injury continuing education programs to improve the competence of practicing nurses and ensure patient safety.

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