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# Australian Nurses' Knowledge of Pressure Injury Prevention and Management

## *A Cross-sectional Survey*

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## ABSTRACT

**PURPOSE:** The aim of this study was to assess nurses' knowledge of pressure injuries in order to gather benchmark data, identify knowledge gaps, and based on results, implement educational strategies to improve practice.

**DESIGN:** Cross-sectional survey.

**SUBJECTS AND SETTING:** The study setting was a large Australian tertiary general hospital employing approximately 2500 nurses in both full-time and part-time roles. A proportional sample (25%) stratified by experience, preparation, and facility-generated categories (nursing grade) was generated. The sample included nursing students and nursing assistants. Three hundred six participants completing the survey.

**INSTRUMENT:** The Pieper-Zulkowski Pressure Ulcer Knowledge Test (PZPUKT) version 2, comprising 72 statements, with 3 subscales (prevention/risk, staging, and wound description) was used to measure pressure injury knowledge. Item responses are "True," "False," and "Don't know." For the purpose of analyses, correct responses were scored 1, and incorrect or "don't know" responses were scored 0. Generally accepted ranges of scoring for the original PZPUKT specify less than 70% as unsatisfactory, 70% to 79.9% as satisfactory, 80% to 89.9% as good, and 90% and greater as very good knowledge of pressure injury prevention.

**METHODS:** The survey was advertised throughout the hospital by strategically placed posters, computer screen savers within the hospital, and e-mails. Respondents completed paper-based questionnaires and data were manually entered online. Data were collected between September 2015 and October 2016. Descriptive and nonparametric inferential statistical tests (Mann-Whitney $U$, Kruskal-Wallis $H$) were used to analyze within sample differences in scores.

**RESULTS:** The overall mean knowledge score was 65%; approximately two-thirds of the sample (68%) scored 60% and greater, reflecting an unsatisfactory knowledge level of pressure injury prevention according to the original PZPUKT scores. The lowest mean scores were found in the "wound description" subscale. Participants who sought pressure injury information via the Internet or had read pressure injury guidelines scored significantly higher than those who did not ($P = .001$ and $P < .001$, respectively). Seventeen items were answered incorrectly by over half of participants, identifying important knowledge deficits, particularly within the wound description subscale.

**CONCLUSIONS:** When compared with results from studies using the PZPUKT, we contend that a cutoff score of 60% and greater (instead of ≥70%) should be used to indicate an overall satisfactory score. Our results identified deficits in pressure injury knowledge related to seating support and seated individuals and wound dressings as areas where nurses would benefit from focused education strategies.

**KEY WORDS:** Management, Nurse, Pressure injury, Pressure injury knowledge, Pressure ulcer, Prevention, Skin integrity, Survey.

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## INTRODUCTION

Hospital-acquired pressure injuries (PI) are potentially preventable; full-thickness ulcers increase hospital length of stay and healthcare costs.[1-3] In addition, PI impair health-related quality of life, cause additional morbidity and pain, and are linked to an increased risk for mortality.[4,5] Maintenance of skin integrity is primarily within the domain of nursing practice and, medicolegally, hospital-acquired PI may be considered a "nursing injury."[6(p283)]

In some jurisdictions, hospital-acquired PI may incur funding penalties or reimbursement adjustments.[7] For example, funding penalties for stages 3 and 4, and more recently, unstageable injuries, may apply in Queensland, Australia.[8] While there is broad consensus that some PI are unavoidable, most are considered preventable.[9,10]

The prevalence of PI within healthcare settings is considered an indicator of nursing care quality[11] because nurses are principally responsible for assessment of patient risk of PI and management of skin integrity. Although prevalence is not an absolute measure, it is used as an outcome indicator (rather than a process measure) to indicate quality of care.[11] Several international studies have examined nursing practice for PI prevention. Findings indicate that between 23.3% and 89.2% of "at-risk" patients are not receiving PI prevention devices such as pressure redistributing mattresses and between 17% and 57.5% are inadequately repositioned.[12-14] In China, where PI prevalence rates were reported at 1.6%, patient repositioning was the most frequently used preventative method.[15] Nurses' knowledge of PI prevention must be based in evidence and used in their clinical practice.[16] In a previous Australian study of nurses' PI knowledge, some gaps in knowledge relating to patient repositioning, PI staging, and equipment and strategies used for PI prevention were found.[16] Use of a valid and reliable instrument is important to assess nurses' PI prevention knowledge, identify gaps in knowledge, and tailor education.

The aim of this study was to the examine nurses' knowledge of PI prevention and management, using a contemporary evidence-based assessment tool, consistent with international guidelines.[1] In a previous study of nurse's PI knowledge across a health service district in Australia[16] using the Pressure Ulcer Knowledge Test (PUKT),[17] our hospital's overall knowledge mean score was 79.2% (n = 324).[16] In this follow-up study, we sought to learn whether our hospital nurses' knowledge was up-to-date with more recent international PI guidelines[1] and identify areas of deficit knowledge where educational strategies could be employed to reduce PI occurrence.

## METHODS

A cross-sectional survey design guided data collection. Permission to complete the survey during work time was given by the executive nursing director, and ethical approval was granted by The Prince Charles Hospital Human Research Ethics Committee (reference: HREC/15/QPCH/75). Participation was voluntary and anonymous, and consent to participate was implied by completion and submission of the survey. No compensation or remuneration was received for study participation.

The study setting was a large (630-bed) metropolitan tertiary hospital in Brisbane, Australia, located in the southeastern Queensland. At the time of data collection, the hospital employed a nursing workforce of around 1200 full-time equivalent positions (approximately 2500 full-time and part-time staff members). Based on this number, using 95% confidence level with a 5% margin of error, the sample size requirement for the survey was estimated at n = 291.[18] Therefore, we targeted a convenience sample of participants (n = 300), stratified proportionately by nursing grade (Table 1). Nurses in Queensland are employed for work based on a clinical grading system, determined mostly by academic qualification. Assistants in nursing (AINs) and undergraduate students in nursing are unlicensed and undertake work (personal hygiene patient care, equipment management) under direction and supervision of an RN. Enrolled nurses are a second-level nurse, qualified with an 18-month or 2-year diploma course from an accredited (technical college) education provider, working under the direction of an RN. Their clinical work includes patient care (except care planning) and delivering medications (except those delivered via vascular access). Registered nurses have completed a 3-year bachelor's degree at a university and take responsibility and accountability for direct and supervised patient care. Enrolled nurses and RNs are licensed by a national regulation agency. The proportional recruitment targets for each grade are shown in Table 2. The main inclusion criterion was employment in a nursing role providing direct clinical care, including clinical teaching, supervision, and management.

### Instrument

The Pieper-Zulkowski Pressure Ulcer Knowledge Test (PZPUKT) version 1 was used in this study.[19] The instrument was developed from the original Pressure Ulcer Knowledge Test,[17] which has been used widely both in the United States and internationally. The PZPUKT has 72 items with 3 subscales: prevention/risk (20 items), staging (25 items), and wound description (27 items), and takes 20 to 30 minutes to complete. Permission was obtained from the authors to slightly modify the wording of some items to better suit the Australian context (eg, use of the term "pressure injury"

**TABLE 1.**

**Queensland Clinical Grading System**

| Clinical Grade | Job Titles | Academic Qualification | License[a] |
|---|---|---|---|
| 1 | Assistant in nursing | None | Unlicensed |
| 2 | Undergraduate student in nursing | | |
| 3 | Enrolled nurse | Diploma | Enrolled nurse |
| 4 | Enrolled nurse advanced practice | | |
| 5 | Registered nurse | Bachelor's degree minimum | Registered nurse |
| 6 | Clinical nurse | | |
| 7 | Clinical nurse consultant, nurse unit manager, nurse educator, nurse researcher, public health nurse | | |
| 8 | Nurse practitioner | Master's degree | Nurse practitioner |

[a]Licensed with the Australian Health Practitioner Regulation Agency.

**TABLE 2.**
**Sample Stratification (n = 306)**

| | Minimum Academic Qualification | Target Sample, n (%) | Obtained sample, n (%) |
|---|---|---|---|
| AIN/student | None | 33 (11.0) | 33 (10.8) |
| EN | Diploma | 24 (8.1) | 30 (9.8) |
| RN5 | Bachelor's degree | 160 (53.3) | 171 (55.9) |
| RN6 | | 63 (20.8) | 60 (19.6) |
| RN7+ | | 20 (6.8) | 12 (3.9) |
| Total | | 300 (100) | 306 (100) |

Abbreviations: AIN, Assistant in nursing; EN, enrolled nurse.

instead of "pressure ulcer"). Each item has 3 possible responses: true, false, or don't know. Items are ordered randomly, and most have a correct response of true (57%, n = 41). Pieper and Zulkowski reported internal consistency of the PZPUKT as Cronbachα of 0.80, with α of .56, .67, and .64 for the prevention/risk, staging, and wound description subscales, respectively.[17] Due to discrepancies in the number of items in each subscale of version 1 of the PZPUKT, the instrument was modified by the instrument authors in version 2 and there are now 28 items in the prevention/risk subscale, 20 items in the staging subscale, and 24 items in the wound description subscale (K. Zulkowski, personal e-mail communication, December 15, 2017). These revised-item subscales were applied to version 1 for analysis in this study. For the purpose of assessment of internal consistency and scoring, the 3 responses were scored: correct = 1, don't know = 0, and incorrect = 0.

A cutoff point to determine "adequate" PI knowledge has not been established for the PZPUKT tool.[17] The designers of the original instrument suggested that a facility- or organization-wide mean 90% correct response for an item represented an "adequate" knowledge level because the content is basic to practice.[19] In our previous study,[16] we designated a mean score of 70% or greater as representing a satisfactory knowledge level, as have other authors,[20,21] indicating that scores below 70% are unsatisfactory. Scores have also been characterized by range,[22-26] with the most commonly used range being 70% to 79.9% as satisfactory; 80% to 89.9% as good; and 90% and greater as very good knowledge level.[16,21,23] Some researchers have suggested that scores below 59% indicate a low knowledge level,[22,23,26] whereas others have used 50% as a cutoff to indicate adequate knowledge.[24,27] However, other score ranges (60%-69.9% and <50%) remain undefined in terms of knowledge adequacy.

## Study Procedures
Data were collected using a paper-based version of the survey and were inputted manually online, using SurveyMonkey (https://www.surveymonkey.com). Basic nonidentifying demographic data (gender, nursing grade, and highest level of educational achievement) and information about respondents' access to PI educational resources (ie, workshop, accessing Internet PI information, reading an article or a book that focused on PI and their prevention) were collected. Knowledge of PI was surveyed using the PZPUKT version 1.[17] Data were collected from September 2015 until October 2016, until the target sample had been recruited.

## DATA ANALYSIS
Data were imported into SPSS version 23 (IBM, Chicago, Illinois) for cleaning and analysis. Descriptive statistics were used to describe the sample, and nonparametric inferential statistics (Mann-Whitney $U$, Kruskal-Wallis $H$) were used to analyze within-sample differences in scores. Significance was set at $P < .05$.

## RESULTS
Scores on the PZPUKT version 2 were coded so that a score of 1 indicated a correct response and incorrect or "do not know" responses were given a score of 0. The reliability of the PZPUKT scale (72 items) and its subscales was tested using the Kuder-Richardson reliability coefficient (KR20) for scales with dichotomous variables. The PZPUKT demonstrated good internal consistency with a KR20 coefficient of 0.86 (n = 306). Two of its subscales demonstrated moderate internal consistency (*Prevention* 28 items, KR20 = 0.67; *Staging* 20 items, KR20 = 0.65) with the Wounds subscale (24 items) demonstrating good internal consistency (KR20 = 0.76). Single-item deletion did not improve internal consistency of the whole PZPUKT scale or any of its subscales. When nonqualified nursing grades (see Table 1: AINs, students) (n = 33) were excluded from this part of the analysis, the internal consistency of the instrument did not improve (KR20 = 0.81, n = 273).

### Sample
Three hundred twenty surveys were completed, but 14 respondents did not complete the PZPUKT, giving a final sample size of 306 (including all qualified and nonqualified respondents). The stratification of the final sample was similar to the target population (nursing staff of the hospital, Table 2). Most proportions were similar, although the number of nurses who were grade 7 and above nurses was notably smaller than the target sample size. Nevertheless, a $\chi^2$ goodness-of-fit test indicated no significant differences in the proportions of our sample versus the target population ($\chi^2_4 = 5.43$, n = 306; $P = .246$).

The majority of respondents were female (86.3%, n = 264), Queensland Health grade 5 RNs (55.9%, n =171), and educated to at least bachelor's degree level (78.1%, n = 239). Approximately half of the respondents indicated attendance at a lecture or workshop on PI (48.7%, n = 149) or read an article or book about PI (47.7%, n = 146) within the previous year. Just over half (53.6%, n = 164) accessed the Internet to source information about PI but slightly less than 1 in 5 (19.3%, n = 59) had read the most recent guidelines (Table 3).

### Knowledge Scores
The overall PZPUKT knowledge and subscale scores were calculated as percentage values (Table 4). Inspection of the distribution of the overall score and subscale scores demonstrated that all were abnormally distributed (Kolgorov-Smirnov $P < .001$), with histogram inspection revealing scores skewed to the higher end. The overall mean score was 64.9% (95% confidence interval, 63.5-66.3). The highest mean score was for the Prevention subscale (68.6%), with the lowest for Wounds (59.0%). Although 95% confidence intervals were relatively narrow, there was a wide range of scores. In terms of cumulative knowledge scores, 1.0% (n = 3) of the sample scored 90% and greater, 8.5% (n = 26) scored 80% and greater, 35.0% (n = 107) scored 70% and greater, 68.3% (n = 209)

**TABLE 3.**

**Sample Characteristics**

| Characteristic | % (n) | | | | |
|---|---|---|---|---|---|
| Gender | Female 88.3 (264) | Male 13.7 (42) | | | |
| Nurse grade | AIN/EN student/undergraduate 10.8 (33) | EN/ENA 30 (9.9) | RN5 55.9 (171) | RN6 19.6 (60) | RN7+ 3.9 (12) |
| Highest education level | Diploma or lower 21.9 (67) | Bachelor's degree 69.9 (214) | Master's level or higher 8.2 (25) | | |

Abbreviations: AIN, assistant in nursing; EN, enrolled nurse; ENA, enrolled nurse (advanced) (see Table 1).

scored 60% and greater, and 92.5% (n = 283) scored 50% and greater.

Due to abnormal distribution of data, knowledge scores were compared between different groups using nonparametric tests. The Mann-Whitney $U$ test showed that nonqualified grades of nursing staff (see Table 1: AINs, students) scored significantly lower than qualified nurses (see Table 1: enrolled nurses, RNs) ($U = 1172$, $z = -6.949$, $P < .001$), as shown in Table 4. Analysis of ranked scores by nursing grade and education level, using the Kruskal-Wallis $H$ test, revealed that more senior nurses and better educated nurses scored significantly more highly overall ($H$ [3] = 60.55, $P < .001$, and $H$ [2] = 36.34, $P < .001$, respectively, Table 5).

When scores were compared by respondents' access to PI education materials, using the Mann-Whitney $U$ test, analysis indicated that respondents who had sought information via the Internet and those who had read the current PI guidelines scored significantly higher than those who had not reviewed these materials ($U = 9172$, $z = -3.21$, $P = .001$, and $U = 4853$, $z = -4.00$, $P < .001$; respectively) with small-medium effect sizes ($r = 0.18$ and 0.23; respectively). Statistically significant differences were found in all subscale scores. Overall and all subscale scores of respondents who had attended an educational event or read an article within the previous year were not significantly different from respondents who did not complete these activities (Table 6).

We also inspected individual items to identify those that were scored incorrectly by the majority, that is, by more than half of the respondents nearly a quarter of items fell into this category (23.6%, n = 17). The 2 lowest item scores (shifting weight when sitting; use of pressure redistribution surface for high-risk patients) were in the Prevention/risk subscale, and the next 4 lowest scored items (all referring to wound dressings) were found in the Wound description subscale (Table 7).

## DISCUSSION

The overall knowledge score of 65% is notably less than the score of 79% found in our previous study, also set in Australia.[16] However, it is important to note that the previous study used a modified version of the original Pressure Ulcer Knowledge Test,[17] which had significantly fewer items (n = 49). As such, the more comprehensive PZPUKT version 2 with 72 items may be a more accurate representation of organizational knowledge of PI and it may require a different score interpretation with 60% or greater representing satisfactory knowledge. As the PZPUKT version 2 is relatively new, we found only a few studies for comparison. A recent study based in the United States investigated knowledge levels of critical care nurses (n = 32) using the PZPUKT version 1, reporting an overall mean score of 72%.[22] They reported scores of

**TABLE 4.**

**Mean Knowledge Scores (n = 306)[a]**

| Scale | Respondents (n) | Score | | | Significance, *P* |
|---|---|---|---|---|---|
| | | % (SD) | 95% CI | Range | |
| Overall | All (306) | 64.9 (12.5) | 63.5-66.3 | 1.4-90.3 | |
| | Qualified grades (273) | 66.8 (10.7) | 67.6-70.2 | 35.0-95.0 | <.001 |
| | Nonqualified grades (33) | 48.9 (17.3) | 43.6-54.3 | 1.4-68.1 | |
| Prevention | All (306) | 68.6 (12.2) | 67.2-70.0 | 3.6-92.9 | |
| | Qualified grades (273) | 70.3 (10.6) | 70.0-71.5 | 32.1-92.9 | <.001 |
| | Nonqualified grades (33) | 55.0 (15.6) | 49.5-60.5 | 3.6-75.0 | |
| Staging | All (306) | 66.7 (15.6) | 65.0-68.5 | 0-95.0 | |
| | Qualified grades (273) | 68.7 (14.0) | 67.0-70.4 | 15.0-95.0 | <.001 |
| | Nonqualified grades (33) | 50.1 (18.2) | 43.7-56.6 | 0-75.0 | |
| Wounds | All (306) | 59.0 (16.9) | 57.1-60.9 | 0-95.8 | |
| | Qualified grades (273) | 61.2 (15.4) | 59.4-63.0 | 12.5-95.8 | <.001 |
| | Nonqualified grades (33) | 40.9 (17.5) | 34.7-47.1 | 0-70.8 | |

Abbreviation: CI, confidence interval.

[a]Qualified grades, enrolled nurse or above; nonqualified grades, assistant in nursing or student (see Table 1).

**TABLE 5.**
**Mean Knowledge Scores by Subgroups (n = 306)**

| Groups | PZPUKT Mean Score % (SD) | | | |
|---|---|---|---|---|
| | Overall | Prevention | Staging | Wounds |
| Nursing grade | | | | |
| Nonqualified | 49.0 (15.0) | 55.0 (15.6) | 50.2 (18.2) | 40.9 (17.5) |
| EN | 61.8 (9.2) | 67.6 (8.8) | 65.5 (12.6) | 51.8 (15.0) |
| RN5 | 66.4 (10.8) | 69.7 (11.4) | 68.6 (14.2) | 60.9 (14.9) |
| RN6+ | 69.7 (10.2) | 72.7 (8.9) | 70.3 (14.2) | 65.9 (15.3) |
| Significance p | <.001 | <.001 | <.001 | <.001 |
| Level of education | | | | |
| Diploma or below | 53.4 (14.4) | 61.7 (14.0) | 58.5 (17.6) | 48.4 (17.9) |
| Bachelor's degree | 67.1 (10.9) | 70.4 (10.8) | 68.8 (14.4) | 61.6 (15.6) |
| Grad Cert or above | 69.1 (9.7) | 71.0 (11.6) | 71.0 (12.8) | 65.2 (12.0) |
| Significance, P | <.001 | <.001 | <.001 | <.001 |

Abbreviations: EN, enrolled nurse (all); Grad Cert, postgraduate certificate at master's level; nonqualified, AIN or student; PZPUKT, Pieper-Zulkowski Pressure Ulcer Knowledge Test; RN5, registered nurse grade 5; RN6+, registered nurse grade 6 and above; (see Table 1).

70% and 81% for the prevention/risk (22 items) and staging (26 items) subscales, respectively, but did not report a score for the wound description subscale (24 items). The mean wound subscale score for our sample was 62%. Although it is difficult to make direct score comparisons with our results (due to the different number of items in each subscale as well as the different samples), findings indicate that the wound description subscale represented the weakest area of knowledge in both groups. In the original study reporting on the PZPUKT version 1, higher knowledge scores were reported (overall 80%, prevention/risk 77%, staging 86%, and wound description 77%; n = 95).[17] However, their sample was of RNs only, most (60%) of whom had more than 10 years of

practice. In addition, different numbers of items were used to calculate subscale scores (prevention/risk 20 items, staging 25 items, and wound description 27 items).

Al Shidi[23] investigated knowledge levels of 458 nurses from 7 hospitals in Oman, using the PZPUKT version 1, with the same item categories as those used by Miller's group.[22] A mean overall percentage score of 51%, with 55%, 57%, and 41% for the prevention, staging, and wounds scores, respectively, was reported. Although knowledge levels were lower in this study, the wounds subscale again emerged as the area of lowest knowledge. In Kenya, 80 nurses were surveyed using a 41-item modified version of the PZPUKT.[28] The authors included 8 items, which they categorized as "pressure ulcer risk assessment and

**TABLE 6.**
**Mean Knowledge Scores by PI Educational Access**

| PI Education | Response (n) | PZPUKT Mean Score % (SD) | | | |
|---|---|---|---|---|---|
| | | Overall | Prevention | Staging | Wounds |
| Attendance at PI lecture or workshop in previous year | No (157) | 64.3 (13.8) | 68.3 (13.5) | 66.0 (17.4) | 58.2 (17.2) |
| | Yes (149) | 65.5 (10.90) | 68.9 (10.7) | 67.5 (13.5) | 59.9 (16.5) |
| | Significance, P | .806 | .897 | .851 | .442 |
| Read PI article or book within last year | No (160) | 63.9 (12.5) | 68.5 (12.2) | 65.1 (16.3) | 57.5 (16.6) |
| | Yes (146) | 66.0 (12.4) | 68.8 (12.2) | 68.5 (14.6) | 60.7 (17.0) |
| | Significance, P | .143 | .779 | .119 | .058 |
| Sought information on PI via Internet | No (142) | 62.3 (12.9) | 66.5 (12.6) | 63.5 (16.6) | 56.6 (16.9) |
| | Yes (164) | 67.1 (11.7) | 70.5 (11.5) | 69.5 (14.1) | 61.1 (16.6) |
| | Significance, P | .001 | .004 | .001 | .026 |
| Read PI guidelines | No (247) | 63.5 (12.4) | 67.5 (12.0) | 65.0 (15.8) | 57.5 (17.0) |
| | Yes (59) | 70.7 (11.4) | 73.1 (11.9) | 73.8 (12.7) | 65.3 (15.0) |
| | Significance, P | <.001 | .002 | <.001 | .003 |

Abbreviations: PI, pressure injur; PZPUKT, Pieper-Zulkowski Pressure Ulcer Knowledge Test.

**TABLE 7.**
**Low-Scoring Items (Ranked, Lowest First) by Subscale (n = 306)**

| Subscale | Item Number | Item Statement | Correct, n (%) | Rank |
|---|---|---|---|---|
| Prevention | 50 | Persons who can be taught should shift their weight every 30 min while sitting in a chair | 8 (2.6) | 1 |
| | 26 | A pressure redistribution surface should be used for all high-risk patients | 9 (2.9) | 2 |
| | 25 | Donut devices/ring cushions help prevent pressure injuries | 101 (33.0) | 8 |
| | 33 | Staff education alone may reduce the incidence of pressure injuries | 106 (34.6) | 9 |
| | 43 | Massage of bony prominences is essential for quality skin care | 133 (43.5) | 13 |
| Staging | 20 | Stage 2 pressure injury may have slough | 100 (32.7) | 7 |
| | 41 | Dry, adherent eschar on the heels should not be removed | 113 (36.9) | 10 |
| | 37 | Bone, tendon, or muscle may be exposed in a stage 3 pressure injury | 134 (43.8) | 14 |
| | 71 | A stage 4 pressure injury never has undermining | 147 (48.0) | 16 |
| | 6 | A stage 3 pressure injury is a partial thickness skin loss involving the epidermis and/or dermis | 151 (49.3) | 17 |
| Wound | 72 | Bacteria can develop permanent immunity to both silver and honey dressings | 33 (10.8) | 3 |
| | 64 | Hydrocolloid dressings should not be used with a filler dressing | 42 (13.7) | 4 |
| | 17 | Honey dressings can sting when initially placed in a wound | 52 (17.0) | 5 |
| | 7 | Hydrogel dressings should not be used on granulating pressure injuries | 74 (24.2) | 6 |
| | 29 | Biofilms may develop in any type of wound | 116 (37.9) | 11 |
| | 66 | Pressure injuries can be cleansed with water that is suitable for drinking | 123 (40.2) | 12 |
| | 38 | Eschar in wounds above the ankle is good for wound healing | 146 (47.7) | 15 |

classification" and 33 items categorized as "pressure ulcer prevention." However, no clear rationale was provided for the subscale modifications and the wording was changed on many items, making it difficult to draw comparisons. They reported an overall mean knowledge score of 63%, which they regarded as inadequate. Previous studies using the PUKT (not PZ-PUKT) have reported mean knowledge scores between 63% and 79%.[16,19,20,24,25,29,30,31]

In our study, greater experience and higher qualifications were associated with higher levels of PI knowledge, which is consistent with the results of Al-Shidi.[23] Although this outcome might be expected, results from various international studies using the original Pressure Ulcer Knowledge Test[19,24,26,30,31] including the most recent study conducted in Turkey[21] did not report similar associations. In addition, Miller and colleagues[22] found that critical care nurses with 5 to 10 years' experience scored higher than nurses with 10 to 20 years' experience when using the PZPUKT version 2.

Several factors may account for variability in nurses' PI knowledge, including years of experience as a nurse and access to up-to-date sources of evidence. In our study, just over half of the sample (54%) had sought information about PI via the Internet and those who did were found to have a significantly better level of knowledge than others. Although there are many criticisms of the accuracy of Internet-based information, our results suggest that it can be a valuable source of up-to-date information. Although participants who had accessed the current PI guidelines had a better PI knowledge level than others, only a minority (19%) had accessed them. While current guidelines are available via the Internet, even the *Quick Reference* version[1] is lengthy, which may prohibit some nurses from referring to them.

The lowest scoring individual item queried whether patients should be taught to shift their weight every 30 minutes when sitting in a chair. Current guidelines[1] do not specify a time frame for weight shifts, and it is possible that many nurses believed this statement to be correct even if they were unsure of the recommended time frame. The second lowest scoring item queried whether pressure redistribution surfaces should be used for all high-risk patients. It is possible that nurses in our study setting found this question to be ambiguous, because they are taught that all at-risk patients, not just high-risk, should be placed on a support surface with pressure redistributing properties. Similarly, the statement that bacteria can develop permanent immunity to both silver and honey dressings could be ambiguous as the term "become resistant" is more commonly used in this context and there is disagreement in research literature about this issue.[32,33] We are concerned about an item that was frequently answered incorrectly related to recommendation against use of donut devices/ring cushions. There is a great emphasis on the use of individually prescribed support surface cushions in our study setting, so this is an area of need for education follow-up.

## LIMITATIONS

Our sample was drawn from a single hospital and may not be generalizable to other settings. Furthermore, our sample includes a small but significant proportion of non-licensed nursing grades of staff (AINs, students, see Table 1), whose knowledge levels were significantly lower, and thus skewed the overall results slightly. In terms of reliability, the PZPUKT version 2 was found to have a good level of internal consistency. However, the internal consistency of 2 of the subscales was moderate, suggesting that further work may be required to refine the tool.

## CONCLUSIONS

Comparing the average knowledge score (65%) of nurses in our hospital with published findings of others is difficult,

given the paucity of other studies that have used version 2 of the PZPUKT instrument and the absence of clearly defined cutoff points for the various knowledge levels. Given the significantly higher knowledge score (79%) reported for our hospital in our previous study, our results using the PZPUKT suggest that lower cutoff scores than those defined previously for the Pressure Ulcer Knowledge Test may better represent adequate knowledge levels. We contend that a PZPUKT cutoff score of 60% or greater should be used to indicate an overall satisfactory knowledge level. Further research is recommended to establish cutoff benchmarks. Further education for PI prevention should focus on wound dressings, sitting, and sitting support surfaces, while further research is needed to determine an appropriate repositioning time frame for seated individuals.

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