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Cross-Cultural Adaptation and Psychometric Validation of H-PEPSS in Indonesian Diploma-III Nursing Students

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ABSTRACT

In Indonesia, there is currently no standardized tool to evaluate patient safety competence among nursing students. This study aimed to culturally adapt and test the H-PEPSS for use with Indonesian nursing students. The participants were final-year diploma nursing students from Jakarta and West Java. The process included translation, expert validation, pilot testing, and cultural adaptation using cognitive interviews and student feedback. Items were developed through domain analysis and reviewed by experts to ensure relevance and clarity. The validity of the measurement model was examined using RMSEA, SRMR, and CFI indices, while internal consistency was tested to assess reliability. A total of 344 students from eight institutions in Jakarta and Bandung took part in the psychometric testing. The Content Validity Index (CVI) ranged from 0.73 to 1.00 across items. Pearson correlation coefficients varied by domain. The three-factor structure showed a good model fit, with standardized factor loadings above 0.4. All indicator variables exceeded the 0.30 significance threshold. The Indonesian version of H-PEPSS demonstrated a Cronbach's alpha of 0.795, indicating acceptable reliability. The results suggest that H-PEPSS is a suitable instrument for assessing patient safety competencies among Indonesian nursing students and can be successfully adapted for use in different cultural settings.

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Introduction

Patient safety continues to be a major concern in the Indonesian healthcare system. According to the Ministry of Health, a total of 7,465 safety-related incidents were reported in 2022, including 171 fatalities, 80 severe injuries, and over 5,600 minor or non-injury events [1]. What is particularly concerning is that only 12% of the country's 2,877 accredited hospitals documented these incidents, suggesting both widespread underreporting and potential shortcomings in professional competence and safety awareness. Additional evidence from a review involving 4,500 medical records across 15 institutions revealed stark differences in the frequency of adverse events, with misdiagnosis rates ranging from 8.0% to 98.2%, and errors in prescribing from 4.1% to 91.6% [2]. These findings underscore the need to strengthen patient safety competencies, especially among nursing students who are preparing to enter clinical roles.

Establishing patient safety competence during nursing education is essential. The Patient Safety Competency Framework (PSCF) emphasizes that competence is not limited to theoretical knowledge; it also requires the ability to apply such knowledge effectively in clinical environments [3]. However, various studies highlight that nursing students often lack sufficient hands-on experience, making them vulnerable to avoidable mistakes such as medication errors, incorrect patient identification, and communication breakdowns during care transitions [4–7]. Furthermore, Disch et al. found that more than half of nursing schools do not have clear protocols or systems in place for students to report incidents or reflect on errors, limiting opportunities for structured learning [8]. These issues reveal the urgent need for a reliable and contextually relevant instrument to evaluate the development of safety-related competencies in nursing education.

One promising tool for this purpose is the Health Professional Education in Patient Safety Survey (H-PEPSS). Developed by the Canadian Patient Safety Institute in collaboration with the Agency for Healthcare Research and Quality, H-PEPSS is based on the PSCF and measures students' perceived competence in six key domains: teamwork, communication, risk mitigation, human and environmental factors, response to safety incidents, and fostering a culture of safety [9,10]. The survey has been implemented and validated in multiple countries, demonstrating strong psychometric performance and wide international acceptance [11–14].

Despite its global utility, the H-PEPSS has not yet been culturally adapted or validated for the Indonesian context. This represents a significant gap, as cultural, linguistic, and systemic factors can influence how patient safety is understood, taught, and practiced within different healthcare education systems [15,16]. Without a culturally aligned tool, accurately measuring and improving safety competencies among Indonesian nursing students remains a challenge. This study aims to translate, culturally adapt, and evaluate the psychometric properties of the H-PEPSS instrument for use in Indonesian nursing education. The goal is to provide a standardized tool

that can inform curriculum development, support safety training, and ultimately improve clinical practice readiness. As the first known effort to localize H-PEPSS in Indonesia, this study offers a novel contribution to both national healthcare education and the broader international discourse on patient safety in pre-licensure training.

Material Methods

This study employed a mixed-method design with an iterative approach to translation, adaptation, and psychometric evaluation of the Indonesian version of the Health Professional Education in Patient Safety Survey (H-PEPSS). The process integrated quantitative analyses (validity and reliability testing) with qualitative feedback (cognitive interviews and expert panel input) to ensure cultural and linguistic relevance [15].

A. Sample

Participants had to be at least 18 years old, have a valid student ID, be enrolled in a diploma III nursing program, and indicate their desire to participate in the research in order to be eligible. When doing confirmatory factor analysis (CFA), the inclusion of additional factors and indicators complicates the sample size computations [16]. Research suggests that a sample size of 5 to 10 persons is adequate for each item [17]. A response rate of 90.4% was achieved among the 340 diploma III nursing students that were involved in the research. Diploma III nursing students from Indonesian nursing schools in Jakarta and West Java were a part of this study.

B. Instrument

To assess nursing students' self-perceived competence in patient safety, the Health Professional Education in Patient Safety Survey (H-PEPSS) was developed by the Agency for Healthcare Research and Quality, in alignment with the Canadian Patient Safety Institute's (CPSI) Competency Framework. The instrument evaluates six key domains of patient safety: (1) teamwork (6 items), (2) communication (3 items), (3) risk management (3 items), (4) human and environmental factors (3 items), (5) recognition and response to adverse events (4 items), and (6) safety culture (4 items). Responses are measured on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), with 3 representing a neutral option. An additional "I don't know" choice is available to accommodate respondents who are uncertain or unfamiliar with the content. Mean scores (± standard deviation) are calculated for each domain by averaging the corresponding item responses. In the original validation study, each of the six domains demonstrated acceptable internal consistency, with Cronbach's

alpha coefficients averaging around 0.80, supporting the reliability of the instrument for use among pre-licensure health professional students [18].

C. Data Collection

The proposal was approved by the IRB (0169/ETIK/III/2023). To make questionnaire distribution more accessible and easier, online surveys were utilized. In recognition of their efforts, each participant received a gift card. Members of the research team briefed them on the study's aims and methods.

D. Translation

The translation and adaptation process adhered to Beaton et al.'s cross-cultural adaptation framework [19]. Initially, two independent translators, including one nursing professor with a PhD and the other a professional medical translator who were both fluent in English and Indonesian, independently translated the original instrument into Bahasa Indonesia. These two translations were then reconciled through a collaborative review to form a single consensus version. Subsequently, two native English speakers, who were blinded to the original questionnaire, conducted the backward translation into English. An expert committee comprising five members with backgrounds in nursing education, patient safety, and linguistics then reviewed the original, translated, and back-translated versions to ensure conceptual, semantic, and cultural equivalence. To evaluate item clarity and contextual relevance, cognitive interviews were conducted with ten nursing students. These interviews revealed no major conceptual misunderstandings, although minor linguistic adjustments were made for improved clarity. A pretest was then conducted with 30 nursing students to assess usability and response consistency, leading to additional refinements to enhance overall comprehensibility.

E. Content Validity

The content validity of the adapted instrument was evaluated using the Item-Level Content Validity Index (I-CVI) and the Scale-Level CVI (S-CVI/Ave). A panel of five experts rated each item for relevance on a 4-point scale, where 1 represented "not relevant" and 4 indicated "highly relevant." In line with Polit and Beck, an I-CVI of 0.78 or higher is considered acceptable for a panel of this size [20]. All items met this threshold, with I-CVI values of 0.80 or greater. The average S-CVI for the entire instrument was 0.92, indicating strong overall content validity.

F. Construct Validity

Confirmatory Factor Analysis (CFA) was used to assess construct validity, utilizing SPSS AMOS version 26. The model tested was the original six-domain structure defined by the Canadian Patient Safety Institute framework. Several fit indices were employed to evaluate the model's adequacy, including the Root Mean Square Error of Approximation (RMSEA), the Standardized Root Mean Square Residual (SRMR), and the Comparative Fit Index (CFI). The resulting model showed an RMSEA of 0.083, SRMR of 0.065, and CFI of 0.902. While these values do not represent an ideal model fit, they fall within the generally accepted thresholds for adequacy [21]. The decision to retain the six-factor structure was grounded in theoretical consistency with the original H-PEPSS, rather than empirical simplification. To probe the interrelationships of the variables, the study employed Pearson correlation analysis [22].

G. Reliability Analysis

Reliability was assessed through Cronbach's alpha coefficients for each domain of the questionnaire. The internal consistency values ranged from 0.696 to 0.832. Although one domain exhibited a Cronbach's alpha slightly below the conventional threshold of 0.70, it remained within a tolerable range, warranting cautious interpretation. Item-total correlation analyses further supported the reliability of the instrument, indicating that each item contributed meaningfully to its corresponding domain [23].

Results

Nearly three hundred and forty nursing students from eight different schools in Jakarta and Bandung, Indonesia, took part in the psychometric assessment. There was a 2.15-year standard deviation from the mean age of 23.22. Most of the people who took part in the study were in the second year.

Table 1. Content validity index of Health Professional Education in Patient Safety Survey

Item	Examiner 1		Examiner 2		Examiner 3		Examiner 4		Examiner 5		∑s	V	
	Value (R)	S=R-Lo	Value (R)	S=R-Lo	Value (R)	S=R-Lo	Value (R)	S=R-Lo	Value (R)	S=R-Lo			
1	4	3	4	3	4	3	3	2	3	2	13	0.87	Valid
2	4	3	4	3	4	3	4	3	3	2	14	0.93	Valid
3	4	3	4	3	4	3	4	3	4	3	15	1.00	Valid
4	3	2	4	3	4	3	4	3	4	3	14	0.93	Valid
5	3	2	3	2	4	3	4	3	4	3	13	0.87	Valid
6	4	3	4	3	4	3	4	3	4	3	15	1.00	Valid
7	4	3	3	2	3	2	3	2	3	2	11	0.73	Valid

8	3	2	4	3	4	3	4	3	4	3	14	0.93	Valid
9	4	3	4	3	4	3	4	3	3	2	14	0.93	Valid
10	3	2	3	2	4	3	2	1	4	3	11	0.73	Valid
11	4	3	4	3	3	2	4	3	2	1	12	0.80	Valid
12	3	2	4	3	4	3	3	2	2	1	11	0.73	Valid
13	3	2	4	3	4	3	3	2	2	1	11	0.73	Valid
14	3	2	3	2	3	2	3	2	4	3	11	0.73	Valid
15	4	3	4	3	4	3	3	2	3	2	13	0.87	Valid
16	4	3	3	2	2	1	4	3	3	2	11	0.73	Valid
17	4	3	4	3	3	2	4	3	4	3	14	0.93	Valid
18	4	3	3	2	3	2	3	2	4	3	12	0.80	Valid
19	4	3	4	3	4	3	3	2	3	2	13	0.87	Valid
20	4	3	3	2	3	2	3	2	3	2	11	0.73	Valid
21	3	2	4	3	4	3	4	3	4	3	14	0.93	Valid
22	4	3	4	3	3	2	4	3	3	2	13	0.87	Valid
23	4	3	4	3	3	2	4	3	3	2	13	0.87	Valid

A. Content validity results

A range of 0.73 to 1.00 was seen for the CVI values. One item (item number five) had a CVI score as low as 0.73 and two items had scores as high as 1.00 (as stated in Table 1). The results of the content validity assessment showed that the used instrument was up to par.

B. Confirmatory factor analysis results

The CFA results indicated an RMSEA value of 0.083, an SRMR of 0.065, and a CFI of 0.902. While these indices suggest that the model does not achieve a perfect fit, they are within the acceptable range for model adequacy as proposed by Hu and Bentler (1999). Additional indices included a Chi-square (χ^2) of 146.42, degrees of freedom (df) of 103, yielding a χ^2/df ratio of 1.421, and NNFI and GFI values of 0.925 and 0.926, respectively. Based on these findings, the six-factor structure of H-PEPSS was retained due to its strong theoretical foundation and alignment with the original instrument framework.

Table 2. Confirmatory Factor Analysis Fit Indices for H-PEPSS (n = 340)

Fit Index	Value	Threshold for Acceptability
Chi-square (χ^2)	146.42	–
Degrees of Freedom (df)	103	–
Chi-square/df (χ^2/df)	1.421	< 2.0 (good fit)
RMSEA	0.083	≤ 0.08 (acceptable fit)
SRMR	0.065	≤ 0.08 (acceptable fit)
CFI	0.902	≥ 0.90 (acceptable fit)

Fit Index	Value	Threshold for Acceptability
NNFI (TLI)	0.925	≥ 0.90 (acceptable fit)
GFI	0.926	≥ 0.90 (acceptable fit)

The CFA path diagram of the H-PEPSS shows six core domains: Teamwork, Communication, Risk Management, Human & Environmental Factors, Adverse Events Response, and Safety Culture. Each domain is measured by several observed items with standardized factor loadings ranging from 0.64 to 0.75, indicating moderate to strong relationships. All domains are interrelated, as shown by the bidirectional arrows between them, reflecting the integrated nature of patient safety competencies. The structure confirms that each domain is reliably measured and theoretically aligned. This supports the validity of the Indonesian version of H-PEPSS as a tool for evaluating nursing students' perceived competence in patient safety (Figure 1).

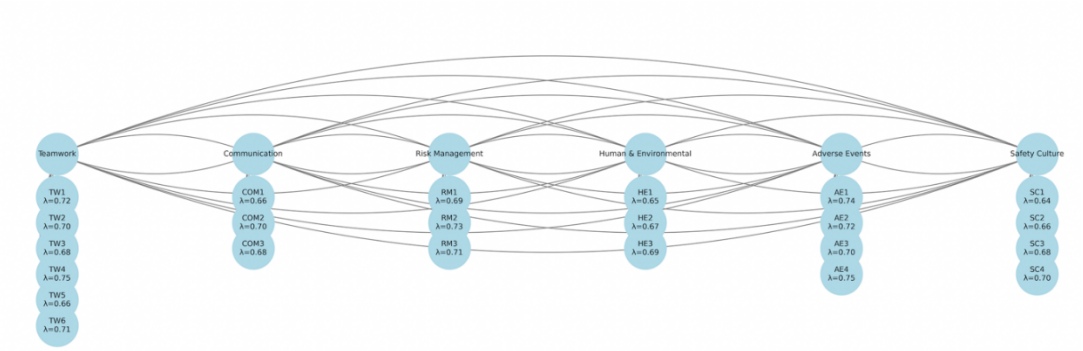


Figure 1. Path Diagram with Standardized Factor Loadings - H-PEPSS

In addition to CFA, Pearson correlation analysis was conducted to evaluate the interrelationships among the six H-PEPSS domains. Correlation coefficients ranged from 0.412 to 0.611 ($p < 0.05$ to $p < 0.001$), indicating moderate positive correlations and supporting the conceptual distinction between domains (Table 3). These results are consistent with previous validation studies and provide additional evidence for the construct validity of the Indonesian version of the H-PEPSS (Calvache et al., 2021).

Table 3. Empirical Data Correlation Matrix of Health Professional Education in Patient Safety Survey (n=340)

Items	1	2	3	4	5	6
Teamwork	0.453**					
Communication	0.458**	0.533**				
Risk management	0.437*	0.422**	0.561**			
Human and environmental factors	0.501**	0.439*	0.405*	0.450*		
Recognition and response to adverse events	0.437**	0.537**	0.367*	0.565**	0.452**	
Safety culture	0.611**	0.425**	0.621*	0.439**	0.554*	0.424**

Note: Correlation between raw survey scale score values using the Pearson correlation coefficient. * p<0.05; **p<0.001.

C. Reliability

The Indonesian H-PEPSS had a positive result with a Cronbach alpha coefficient of 0.795. Results for the domain's Cronbach's alpha ranged from 0.696 to 0.832, as seen in Table 4.

Table 4. Cronbach's alpha: total scale and sub-scale (n=340)

	Total item	Cronbach alpha
Teamwork	6	0.721
Communication	3	0.762
Risk management	3	0.696
Human and environmental factors	3	0.819
Recognition and response to adverse events	4	0.756
Safety culture	4	0.832
Total	23	0.795

Discussion

The findings confirm that the Indonesian version of H-PEPSS retains the theoretical structure and psychometric integrity of the original instrument. The standardized loadings and acceptable model fit indices indicate that each domain was reliably measured. Compared to previous validation studies in other countries, these results are consistent with the multidimensional nature of patient safety competence [24]. A number of desirable psychometric features were demonstrated by H-PEPSS, including good internal consistency and construct validity examined through component/factor analyses [25,26].

An independent identification of a six-factor model was carried out in the current investigation. Prior work likewise delineated domains covering teamwork, effective communication, safety risk management, human and environmental factors, recognition and

response to adverse events, and contributions to a culture of patient safety [24]. Within these domains, items typically map as follows: six items for teamwork; three for communication and three for risk management; and four each for adverse event response, safety culture, and related areas of practice education [27]. Perceptions of patient safety competence can vary across samples and contexts, which may produce differences in measured structures; systematic comparison helps identify and correct disparities.

However, the communication domain's borderline alpha (0.696) suggests the need for further investigation. This may reflect cultural nuances in how clinical communication is interpreted by students or be influenced by the limited number of items. Future work could refine or expand this domain to improve reliability. Retaining the six-domain structure aligns with the CPSI framework; while some studies explore reduced models for parsimony, theoretical comprehensiveness and international alignment justified preserving the original structure in our data.

Given its strong psychometric performance, H-PEPSS is a practical tool for research and program development in Indonesian settings [28,29]. It can be used to evaluate impacts of interventions that aim to strengthen nursing students' safety competencies, including digital or smartphone-based initiatives and systems-strengthening strategies [30,31]. Accordingly, establishing and monitoring patient safety competence among students is essential to improving care quality; when paired with adequate resources and targeted educational design, such measurement can support better outcomes.

Limitations

This research is subject to several noteworthy limitations. The participant pool consisted solely of Diploma III nursing students from select institutions in Jakarta and West Java, which may limit the extent to which these findings can be applied to broader populations, including those enrolled in undergraduate or professional nursing programs across different Indonesian regions. Additionally, the use of convenience sampling rather than a randomized approach restricts the representativeness of the sample, thus limiting the external validity of the results. Another limitation concerns the exclusive use of self-administered questionnaires (H-PEPSS) as the primary data source. This method carries the inherent risk of response bias, particularly social desirability effects, where students might overstate their competence in ways they believe are more acceptable or favorable. Although measures were taken to minimize such bias, such as conducting the survey in private, maintaining respondent anonymity, and ensuring that enumerators' identities were not disclosed in advance, such efforts may not completely eliminate the influence of perceived expectations. Trained enumerators were present to clarify any

confusing items to ensure consistency, yet the subjective nature of self-reporting remains a challenge when measuring complex competencies. Furthermore, this study did not utilize multiple forms of assessment, such as direct clinical observations, simulations, or peer feedback, which could have strengthened the evaluation of student competence. As a result, some dimensions of patient safety competency, especially those tied to behavior, application in practice, and situational awareness that may not be fully represented in the findings. To address these limitations, future studies are encouraged to engage more diverse samples from a wider range of academic levels and geographic locations. In addition, integrating mixed-method approaches or longitudinal designs could offer a more nuanced and comprehensive understanding of how patient safety competencies develop over time within nursing education contexts.

Conclusion

This study provides preliminary evidence that the culturally adapted Indonesian version of the H-PEPSS is a reliable and valid tool for assessing nursing students' patient safety competence. The instrument demonstrates strong content and construct validity, as well as acceptable reliability across all domains. Nonetheless, future research should include more diverse nursing populations and clinical assessments to confirm these findings and strengthen generalizability. Moreover, the approach used may also provide the groundwork for future improvements in situations with limited resources. H-PEPSS has robust psychometric properties, making it a valuable tool for gathering pertinent information to assess the effectiveness of intervention programs or smartphone applications designed for Indonesian nursing students.

Conflict of interest

No conflict of interest is disclosed by any of the writers.

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