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Original research article

Psychometric properties and nursing students' perceptions of patient safety using the Health Professional Education in Patient Safety Survey: a cross-sectional validation study

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Abstract
Introduction: Despite increasing emphasis on patient safety in nursing education, valid culturally adapted instruments in Central Europe remain scarce. Nursing students' perceptions of safety competencies is essential for enhancing patient-centred care.
Aim: The study aimed to evaluate the psychometric properties of the Czech version of the Health Professional Education in Patient Safety Survey (H-PEPSS) and to assess nursing students' self-reported competencies in patient safety.
Methods: A purposive sample of 496 nursing students participated. Psychometric properties included face and content validity, confirmatory factor analysis, and internal consistency. Descriptive and inferential statistical methods were applied to examine differences across settings and sociodemographic variables.
Results: After ensuring face and content validity, the six-factor structure of H-PEPSS demonstrated good model fit (CMIN/df < 2.0; CFI, TLI, NFI > 0.90; RMSEA < 0.10). Internal consistency was high (α = 0.939 academic; α = 0.935 clinical). The highest-rated competencies were in "Effective Communication" (≥80%), while the lowest-rated were in "Safety Risk Management" (70.9%) in the academic setting and in "Teamwork" (72.67%) in the clinical setting. Significant differences between individual settings were mainly associated with variables related to education ($p \leq 0.01$).
Conclusion: The Czech version of the H-PEPSS is a valid and reliable instrument for assessing patient safety competencies in nursing education. The results highlight persistent challenges in sociocultural safety domains and call for stronger support for students' learning in both academic and clinical settings. These findings contribute to the ongoing international challenges on fostering a culture of safety and accountability in patient-centred nursing care.

Keywords: Competence; Nurse; Patient safety; Perception; Student; Validation Study

Introduction

Ensuring patient safety has become a central priority of healthcare systems worldwide, not only in a clinical setting but also in the education of future healthcare professionals (e.g., Lee et al., 2020; Mansour et al., 2018). The integration of patient safety competencies into nursing curricula is widely recognised as a fundamental element for developing a safety culture and preventing adverse events (Bedgood and Mellott, 2021; Morey et al., 2021; Ramírez-Torres et al., 2023). The education of nursing students must address both clinical and academic sociocultural aspects of patient safety to enable them to provide care that is not only clinically effective but also safe, responsive, and system-oriented (e.g., Bedgood and Mellott, 2021; Dissanayake et al., 2024); Farokhzadian et al., 2024; Kirwan et al., 2019).

Although patient safety has been increasingly recognised as a core component of nursing education, the evaluation of students' knowledge, attitudes, and competencies in this field remains challenging in the European context (e.g., Kirwan et al., 2019; Lee et al., 2020; Lukewich et al., 2015). Various self-report instruments have been developed and validated in different countries to address this need, based on educational frameworks. Among these tools, the Health Professional Education in Patient Safety Survey (H-PEPSS), developed by Ginsburg et al. (2012), has been most frequently validated and used internationally. Validation studies confirmed its relevance and strong psychometric properties in different countries, including Italy (Bressan et al., 2016), Belgium (Bergs et al., 2021),

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Turkey (Taskiran et al., 2020), China (Chen et al., 2019), Canada (VanDenKerhof et al., 2017), and Australia (Stomski et al., 2018). In addition, many cross-sectional studies have confirmed its appropriate internal consistency (e.g., Alquwez et al., 2019; Lee and Dahinten, 2022; Suliman, 2019; Torkaman et al., 2022; Usher et al., 2017). Despite its broad international use, a psychometric evaluation of H-PEPSS has yet to be conducted in the Czech Republic.

Numerous international studies have demonstrated that nursing students generally perceive themselves as competent in various dimensions of patient safety, particularly in areas such as teamwork, effective communication, and clinical safety practices (e.g., Stevanin et al., 2015; Sümen et al., 2022; Usher et al., 2017). However, challenges persist in the sociocultural dimensions of patient safety, including the ability to identify and report adverse events, understand system-level contributors to harm, and communicate safety concerns in clinical settings (e.g., Raymond et al., 2016; VanDenKerkhof et al., 2017). Evidence also suggests that students' perceptions of their competencies often differ significantly between academic and clinical settings, with academic settings frequently rated more favourably (e.g., Amilia and Nurmalia, 2020; Colet et al., 2015). These differences may be influenced by various sociodemographic and contextual factors, such as year of study, age, gender, previous nursing experience, or type of clinical supervision (e.g., Dimitriadou et al., 2021; Ghasempour et al., 2023; Kalankova et al., 2022).

This study therefore aimed to validate the Czech version of H-PEPSS and explore Czech nursing students' perceptions of patient safety competencies across academic and clinical contexts.

Materials and methods

Study design

A cross-sectional validation study.

Data collection and sampling

Data were collected through the web-based survey between January and August 2023 using the Google Forms® platform. Thirteen of sixteen Czech nursing faculties participated. Students were contacted through faculty coordinators via shared email addresses. A purposive sampling method was used. Inclusion criteria required participants to (a) be enrolled in a Nursing study program at faculties/universities in the Czech Republic, and (b) have completed at least one semester of clinical practice. Exclusion criteria included (a) enrolment at a different type of institution (e.g., higher vocational school), and (b) being in the first year of the bachelor's degree program without clinical placement experience. Informed consent was a part of the online survey. After confirming consent and completion of one semester of clinical practice, participants were automatically redirected to the questionnaire. Of 512 responses, 496 complete questionnaires were analysed, satisfying the recommended sample size for confirmatory factor analysis (Hair et al., 2010).

Instrument

H-PEPSS (Ginsburg et al., 2012) comprises 37 items across three sections: (1) clinical safety practices; (2) 23 items covering six sociocultural dimensions – *Working in teams, Communicating effectively, Managing safety risks, Understanding human and environmental factors, Recognising and responding to reduce harm, and Culture of safety*; and (3) items on the quality of patient safety education. All items are rated on a five-point Likert scale for both academic and clinical settings.

Sociodemographic data collected included gender, age, year of study, prior safety education, clinical placement, prior experience in nursing care, and type of clinical supervision.

Linguistic validation process of HPEPSS

Following Wild et al. (2005), the survey was forward- and back-translated by bilingual experts, reviewed for conceptual equivalence, and pre-tested with six doctoral nursing students for face validity. Minor wording adjustments were made to reflect Czech terminology.

Content validity of the HSOPS-NS

The content validity of the Czech version of the H-PEPSS instrument was evaluated by a panel of experts from ten Czech faculties/universities. Each expert rated the relevance of the translated items on a five-point Likert scale, ranging from 1 ("Not relevant") to 5 ("Highly relevant"). In accordance with the methodology proposed by Polit and Beck (2006), responses scored as 4 or 5 were considered relevant. The content validity index was computed using SPSS 29.0 software.

The scale-level content validity index (S-CVI) for the core part of the instrument reached a value of 0.97, indicating excellent overall agreement. The item-level content validity index (I-CVI) ranged from 0.80 to 1.00. Since all items exceeded the recommended threshold (≥0.78; Polit and Beck, 2006), none of them were excluded from the instrument, and the full version was used for further psychometric testing.

Data analysis

Analyses were performed using SPSS and AMOS (v29). Descriptive statistics summarised demographics and competency scores. Normality was confirmed (Kolmogorov–Smirnov, $p \geq 0.05$), permitting parametric tests. Paired-sample t-tests assessed setting differences, while independent *t*-tests and ANOVA explored associations with sociodemographic variables. Significance was set at $p \leq 0.05$.

Psychometric evaluation included face and content validity, confirmatory factor analysis (CFA), and internal consistency (Cronbach's $\alpha \geq 0.70$). Model fit was assessed using CMIN/df, CFI, TLI, NFI, and RMSEA, following Kline (2023).

Ethical aspects

This study was approved by the Ethics Committee of the Faculty of Health Sciences, Palacký University Olomouc (UPOL-18644/FZV-2023). Informed consent was integrated into the online survey. Participation was voluntary and anonymous, adhering to GDPR and the Declaration of Helsinki.

Results

Sociodemographic data

Of 496 students, 94.8% were female. Most were aged ≤25 years (86.5%) and in the first year of study (63.5%). Nearly 80% had prior education in patient safety, and 65% were placed in medical–surgical units. Half had previous experience in nursing care. During clinical practice, 50% were supervised by nurses without mentoring training, and 35% by trained mentors (Table 1).

Table 1. Sociodemographic variables of enrolled nursing students (*N* = 496)

Baseline characteristics of nursing students		*N*	%
Gender			
Female		470	94.8
Male		26	5.2
Age			
<21 years		224	45.2
21–25 years		205	41.3
26–30 years		29	5.8
31–40 years		20	4.0
41–50 years		16	3.2
>50 years		2	0.4
Year of study			
Bachelor's degree	1	302	63.5
	2	109	60.9
	3	72	22.0
Master's degree	1	1	14.5
	2	12	0.2
Prior experience in patient safety education			
Yes		393	79.2
No		103	20.8
Form of study			
Full-time		380	76.6
Part-time		116	23.4
Current clinical placement			
Outpatient care: Day clinics, Primary Care and Rehabilitation		43	8.7
Medical-surgical inpatient care: Medical and surgical inpatient units		322	64.9
Critical-Special Services, Intensive Care, Accident and Emergency and the OR		44	8.9
Mother-child inpatient care: Maternity and Pediatrics, Obstetrics, Gynecology		34	6.9
Residential care units, Elderly homes		34	6.9
Other areas		19	3.8
Previous experience in providing nursing care			
Yes		249	50.2
No		243	49.0
Clinical practice management / Supervision			
Lecturer/teacher (employee of nursing faculty)		73	14.7
Mentor with specific training in mentoring		173	34.9
Nurse without specific training in mentoring		250	50.4

Note: N – number of participants; % percentage

Psychometric evaluation of the Czech version of H-PEPSS

Results of face and content validity are described in the methodology section. Below are presented the results of CFA and reliability of the instrument.

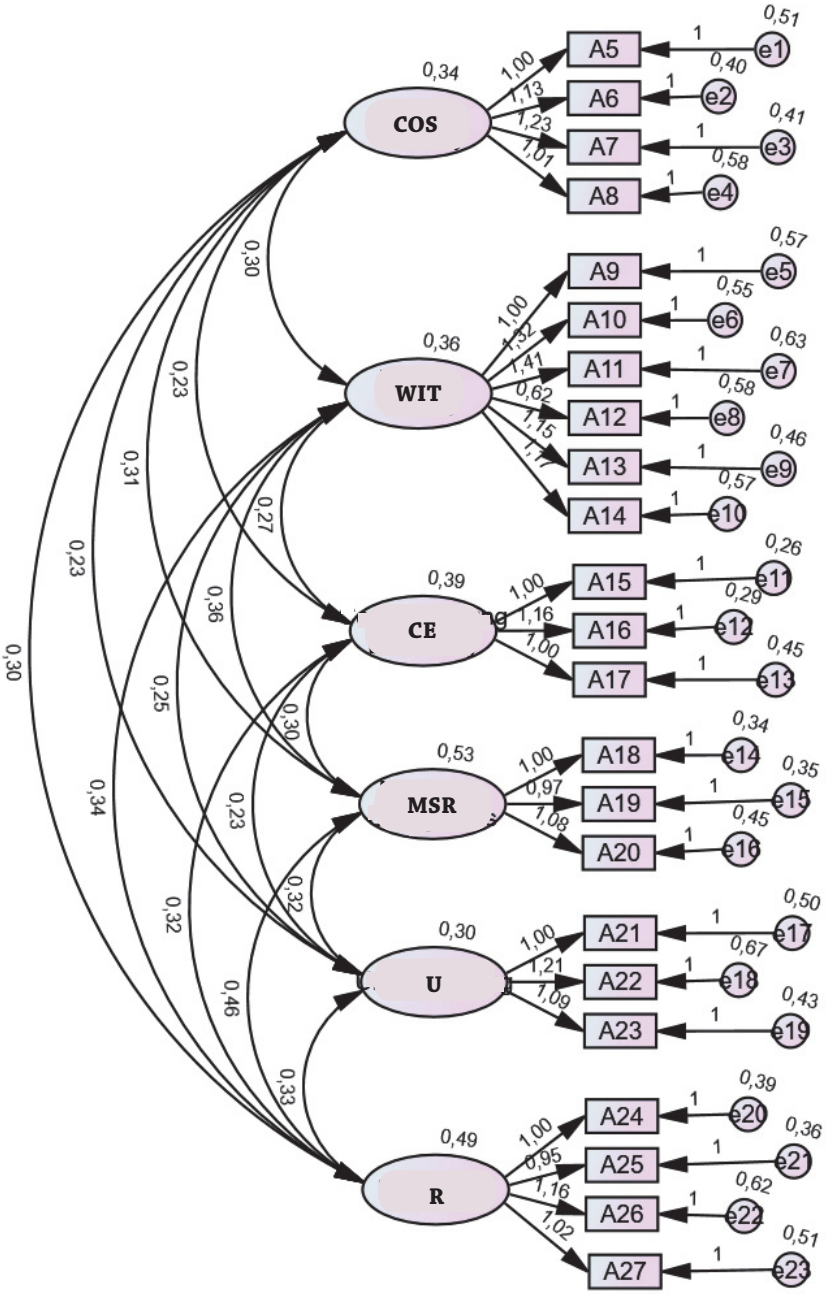
Confirmatory factor analysis

CFA confirmed the original six-factor model in both academic and clinical contexts. Fit indices were satisfactory: CMIN/df < 2.0, CFI, TLI, and NFI > 0.90, and RMSEA < 0.10, confirming structural validity without modification (Table 2). Graphical visualisation (Path diagrams) of both models is provided in Diagram 1 and 2.

Table 2. CFA Fit indices for the Czech version of H-PEPSS in academic and clinical settings

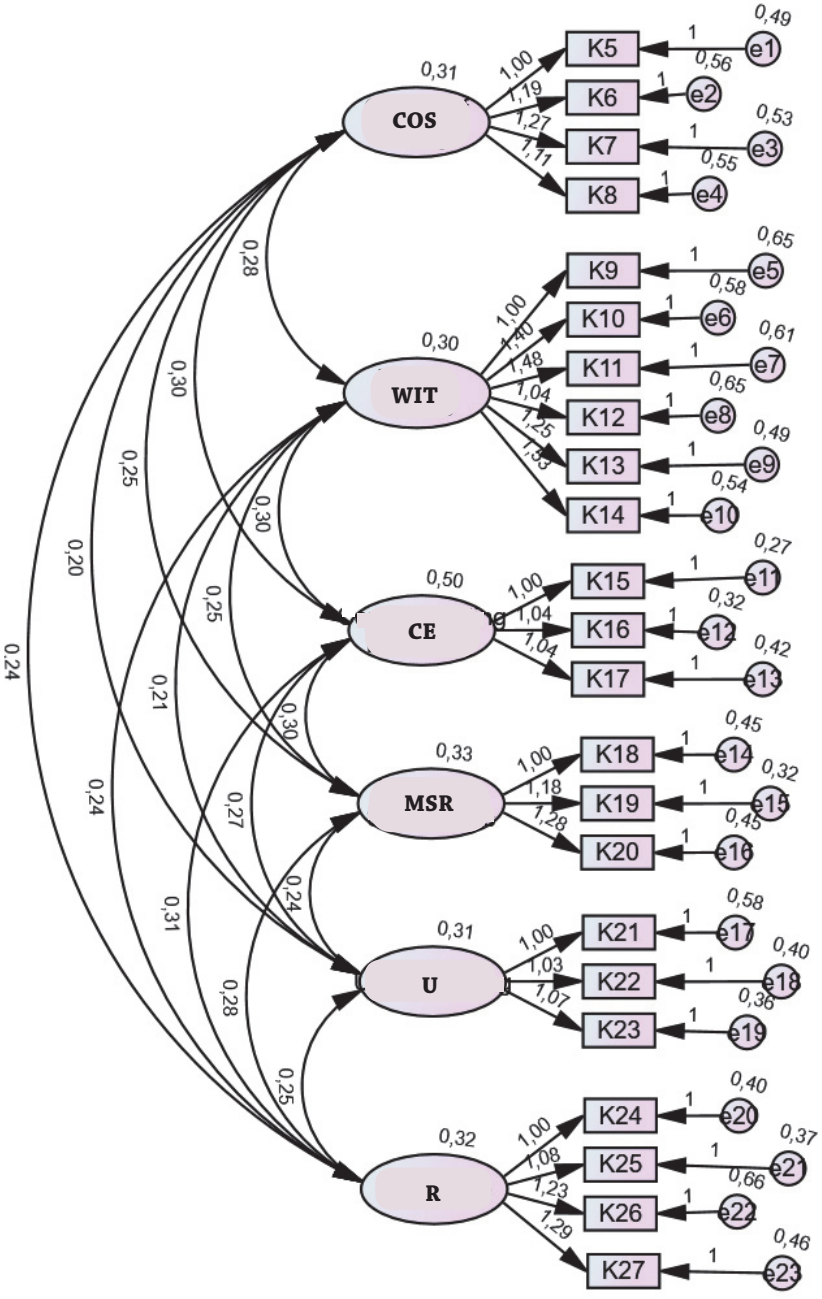
Fit indices	Thresholds	Academic setting	Clinical setting
CMIN/df	<2	1.910	1.886
CFI	>0.9	0.940	0.961
TLI	>0.9	0.930	0.954
NFI	>0.9	0.904	0.921
RMSEA	<0.1	0.054	0.042

Note: CMIN/df – Minimum discrepancy per degree of freedom; CFI – Comparative Fit Index, TLI – Tucker–Lewis Index, NFI – Normed Fit Index, RMSEA – Root Mean Square Error of Approximation



Legend: COS – Culture of safety; WIT – Work in teams with other health professionals; CE – Communicating effectively; MSR – Managing safety risks; U – Understanding human and environmental factors; R – Recognise and respond to reduce harm

Diagram 1. Path diagram of CFA for the Czech version of H-PEPSS in the academic setting



Legend: COS – Culture of safety; WIT – Work in teams with other health professionals; CE – Communicating effectively; MSR – Managing safety risks; U – Understanding human and environmental factors; R – Recognise and respond to reduce harm

Diagram 2. Path diagram of CFA for the Czech version of H-PEPSS in the clinical setting

Reliability
Internal consistency was excellent: α = 0.939 (academic) and α = 0.935 (clinical). Dimension-specific alphas ranged from 0.669–0.816 (academic) and 0.679–0.830 (clinical). Item-total correlations exceeded 0.40, and removing any item did not improve reliability, supporting retention of all items.

Evaluation of self-perceived patient safety competencies among nursing students

Students rated "Communicating effectively" highest (82.2% academic; 80.2% clinical), and "Managing safety risks" (70.9%) and "Working in teams" (72.7%) lowest. All differences between academic and clinical settings were statistically significant ($p < 0.01$; Table 3).

Students expressed strong agreement with clinical safety aspects (e.g., hand hygiene 91.8%) but less confidence in system-level issues: only 48.8% felt patient safety was addressed consistently by preceptors, and 22.9% felt safe speaking up about unsafe care (Table 4).

Table 3. Self-reported dimensions of patient safety competencies and the differences among nursing students

Patient safety dimensions	Academic setting		Clinical setting		Comparison between academic and clinical settings		
	M ± SD	% of positive responses	M ± SD	% of positive responses	Paired sample *t*-test		
					t	*p*	95% CI
Culture of safety	3.93 ± 0.72	78.59	3.62 ± 0.76	76.8	11.42	<0.001**	0.26–0.36
Work in teams with other health professionals	3.70 ± 0.73	74.04	3.97 ± 0.69	72.67	43.57	<0.001**	0.99–1.08
Communicating effectively	4.11 ± 0.73	82.24	3.71 ± 0.77	80.23	54.04	<0.001**	1.53–1.64
Managing safety risks	3.55 ± 0.82	70.90	3.78 ± 0.70	74.27	38.11	<0.001**	0.99–1.11
Understanding human and environmental factors	3.85 ± 0.74	76.96	3.52 ± 0.89	79.29	52.26	<0.001**	1.48–1.59
Recognise and respond to reduce harm	3.61 ± 0.81	72.16	3.69 ± 0.72	73.32	–2.86	0.004*	–0.15–0.03

Note: * $p \leq 0.01$; ** $p \leq 0.001$; % of positive responses – Agree / Strongly Agre; CI – confidence interval

Table 4. Additional aspects of patient safety perceived by nursing students

Clinical safety		M ± SD	% of positive responses
Safe clinical practice in general	Academic setting Clinical setting	4.11 ± 0.8 4.09 ± 0.77	82.14 81.85
Hand hygiene	Academic setting Clinical setting	4.59 ± 0.64 4.38 ± 0.8	91.81 87.66
Infection control	Academic setting Clinical setting	4.11 ± 0.8 4.06 ± 0.85	82.18 81.25
Safe medication practices	Academic setting Clinical setting	4.28 ± 0.92 4.26 ± 0.81	85.65 85.24
How are broader patient safety issues addressed in health professional education?		M ± SD	% of positive responses
As a student, the scope of what was 'safe' for me to do in the practice setting was very clear to me		3.88 ± 0.95	76.0
There is consistency in how patient safety issues were dealt with by different preceptors in the clinical setting		3.42 ± 0.94	48.8
I had sufficient opportunity to learn and interact with members of interdisciplinary teams		3.52 ± 1.1	60.0
I gained a solid understanding that reporting adverse events and close calls can lead to change and can reduce reoccurrence of events		4.01 ± 1.00	78.6
Patient safety was well integrated into the overall program		3.83 ± 0.93	71.8
Clinical aspects of patient safety (e.g., hand hygiene, transferring patients, medication safety) were well covered in our program		4.14 ± 0.86	86.8
"System" aspects of patient safety were well covered in our program (e.g., aspects of the organization, management, or the work environment including policies, resources, communication, and other processes)		3.57 ± 0.95	56.6
Comfort speaking up about patient safety		M ± SD	% of positive responses
In clinical settings, discussion around adverse events focuses mainly on system-related issues, rather than focusing on the individual(s) most responsible for the event		3.33 ± 0.88	43.8
In clinical settings, reporting a patient safety problem will result in negative repercussions for the person reporting it		3.24 ± 0.02	46.0
If I see someone engaging in unsafe care practice in the clinical setting, I feel safe to approach them		2.43 ± 1.25	22.9

Note: % of positive responses – Agree / Strongly Agree

Differences in patient safety competencies according to sociodemographic variables

Significant associations were found for study phase and prior safety education across all six dimensions ($p \leq 0.05$). Age, form of study, and prior nursing experience also showed notable differences. In total, 26 significant differences were observed in clinical settings and 21 in academic settings ($p \leq 0.05$; Table 5).

Table 5. Differences in self-reported patient safety competency dimensions according to sociodemographic variables

Patient safety dimensions		Age	Gender	Form of study	Phase of study	Prior experience in patient safety education	Current clinical placement	Clinical practice management / Supervision	Previous experience in providing nursing care
Culture of safety	AS	0.066	0.351	**0.007***	**<0.001****	**<0.001****	0.513	0.067	0.655
	CS	0.069	0.531	**0.004***	**<0.001****	**<0.001****	0.228	0.094	**0.005***
Work in teams with other health professionals	AS	0.173	0.505	**0.010***	**<0.001****	**<0.001****	0.387	0.149	**0.010***
	CS	0.251	0.882	0.083	**0.004***	**<0.001****	0.687	0.122	0.354
Communicating effectively	AS	0.381	0.802	0.599	**0.008***	**0.032***	0.945	0.116	0.552
	CS	**0.004***	0.451	**0.033***	**<0.001****	**<0.001****	0.335	**0.016***	0.062
Managing safety risks	AS	**0.004***	0.179	**<0.001****	**0.020***	**<0.001****	0.309	0.362	**0.022***
	CS	0.117	0.461	**0.019***	**0.007***	**<0.001****	0.546	0.116	**0.050***
Understanding human and environmental factors	AS	0.071	0.176	0.34	**0.007***	**<0.001****	0.651	**0.017***	0.88
	CS	**0.011***	0.868	**0.017***	**<0.001****	**<0.001****	**0.007****	**0.042***	**0.026***
Recognise and respond to reduce harm	AS	0.058	0.626	**0.013***	**0.002***	**<0.001****	**0.015***	**0.022***	**0.034***
	CS	**0.039***	0.101	**0.021***	**<0.001****	**<0.001****	0.173	0.416	0.28

Note: * $p \leq 0.05$; ** $p < 0.001$; AS – academic setting; CS – clinical setting

Discussion

The aim of this study was to examine the psychometric properties of the Czech version of the Health Professional Education in Patient Safety Survey (H-PEPSS). Specifically, face validity, content validity, internal consistency, and confirmatory factor structure were performed. The study also aimed to evaluate nursing students' perceptions of their patient safety competencies in both academic and clinical settings, and to explore differences between these environments as well as across selected sociodemographic variables.

Psychometric properties

Face and content validity were confirmed through pre-testing and expert review, comparable to international adaptations in Belgium (Bergs et al., 2021) and Turkey (Taskiran et al., 2020). High CVI values (S-CVI = 0.97) indicated excellent expert consensus.

CFA supported the six-factor structure originally proposed by Ginsburg et al. (2012), with all indices meeting recommended thresholds. This contrasts with studies that required model adjustments (Taskiran et al., 2020) and reinforces the cross-cultural stability of the H-PEPSS. Internal consistency was strong, aligning with studies from Italy (Bressan et al., 2016), China (Chen et al., 2019), and Korea (Lee and Dahinten, 2022). The lowest reliability appeared in "Understanding human and environmental factors" ($\alpha \approx 0.67$), a recurring finding across cultures (Bergs et al., 2021), suggesting that this construct may require further refinement.

Students' perceptions of patient safety

Czech nursing students perceived themselves as competent in communication and clinical safety skills but less so in managing risks and teamwork, echoing patterns found internationally (Sümen et al., 2022; Usher et al., 2017). Academic settings were rated more positively, consistent with studies from Cyprus, Greece, and Jordan (Dimitriadou et al., 2021; Suliman, 2019).

Sociocultural dimensions – such as raising concerns or analysing system failures – remained weaker areas. These findings mirror international evidence of hierarchical barriers and inconsistent mentorship (Raymond et al., 2016; Weatherford and Viveiros, 2015). Students' limited confidence to "speak up" (22.9%) suggests that Czech nursing education, like other contexts, still faces challenges in embedding open communication and non-punitive safety culture.

Influence of sociodemographic factors

Significant differences across age, study year, and prior education indicate that exposure and maturity shape safety perceptions (Firat Kılıç and Cevheroğlu, 2023; Fisher and Kiernan, 2019). Older or more experienced students rated managing risks higher, suggesting experiential learning fosters systems awareness. Prior education in patient safety consistently improved scores across all dimensions (Kong et al., 2019; Ramírez-Torres et al., 2023), reinforcing the need to formalise patient safety within curricula.

Differences by form of study (full-time vs. part-time) and supervision highlight the role of mentorship and clinical culture (Kalankova et al., 2022; Steven et al., 2014). Gender dif-

ferences were negligible, contrasting with some studies reporting higher scores among females (Sümen et al., 2022).

Overall, the variability between academic and clinical environments underscores the influence of local organisational cultures and the importance of consistent mentoring and feedback structures (Steven et al., 2014).

Limitations

The cross-sectional design limits causal interpretation and excludes longitudinal development of competencies. Self-report measures may be subject to social desirability bias, though anonymity and the validated tool mitigate this risk. The sample, while large and geographically diverse, was predominantly female (94.8%), limiting gender generalisability. Variability in clinical environments and supervision could also affect perceptions; additionally, differences related to the year and level of study may influence students' perceptions of competence, as students in the first year of a bachelor's programme may differ from those in the first year of a master's programme. However, data were not sufficient to allow for this comparison. Future research should include mixed-methods or longitudinal designs and broader cultural samples.

Conclusion

The Czech version of H-PEPSS proved to be a valid, reliable instrument for assessing nursing students' patient safety competencies in both academic and clinical contexts. CFA confirmed the six-factor model without modification, and internal consistency was high across dimensions.

Students demonstrated strongest confidence in communication and clinical safety, but lower self-perceived competence in managing risks, teamwork, and system-level safety factors. Significant differences between settings and sociodemographic groups highlight the need for curricular reform, enhanced mentorship, and stronger integration of patient safety principles into practical training.

The validated Czech H-PEPSS provides educators and researchers with a robust tool for evaluating patient safety learning outcomes and promoting a culture of safety and accountability in nursing education.

Ethical aspects

This study was approved by the Ethics Committee of the Faculty of Health Sciences, Palacký University Olomouc (UPOL-18644/FZV-2023). Prior to participation, informed consent was obtained from all respondents as an integrated part of the electronic survey conducted via Google Forms®. Participation in the study was entirely voluntary, anonymous, and based on a full understanding of the research objectives. Sociodemographic data was handled in compliance with the General Data Protection Regulation (EU Regulation 2016/679). The study was performed using the ethical principles of the Declaration of Helsinki.

Author contribution

Conception and design (*DB, LM*), data collection (*KB, LM*), data analysis and interpretation (*DB, ER*), manuscript draft (*DB*), critical revision of the manuscript (*PJG, AM, DK*), final approval of the manuscript (*DB, LM, ER, KB, PJG, AM, DK*).

Data availability statement

Data are available from the author upon request.

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Declaration of generative AI and AI-assisted technologies in the writing process

The research team declares that there was no artificial intelligence or AI-assisted technology used during any point of this study.

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Conflict of interest

The authors have no conflict of interest to declare.

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