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ORIGINAL PAPER

Self-reported competencies in patient safety and influencing factors: a preliminary study among healthcare students

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Abstract

Aim: The study aimed to evaluate the self-reported competencies of healthcare students in patient safety within academic and clinical settings and to identify factors influencing these competencies. *Design:* A cross-sectional study. *Methods:* The study was conducted between February and June 2024 among 282 healthcare students (nursing, midwifery, and paramedicine) from two faculties in the Slovak Republic. The Health Professional Education in Patient Safety Survey (H-PEPSS) was used to measure six key dimensions of patient safety competencies. Data were analyzed using descriptive and inferential statistics, with correlations explored between competencies and sociodemographic or personality factors. *Results:* Students reported higher patient safety competencies in academic settings compared to clinical environments, with Managing Safety Risks receiving the highest ratings and Effective Communication the lowest. Significant differences were observed across disciplines, with nursing students generally reporting stronger competencies. Factors such as year of study, clinical placement type, previous healthcare experience, and personality factors influenced competency evaluations ($p \leq 0.05$). *Conclusion:* The findings highlight the need to enhance training in communication and teamwork, and to foster a safety culture, particularly in clinical settings. Expanding patient safety education to a broader range of healthcare disciplines and standardizing training across curricula are vital steps to ensuring comprehensive preparation for future healthcare providers.

Keywords: competencies, healthcare, patient safety, self-report, students.

Introduction

Patient safety (PS) is a global healthcare priority due to its profound impact on outcomes, efficiency, and costs. The World Health Organization (WHO, 2017) defines PS as "the prevention of errors and adverse effects to patients associated with healthcare". Its importance was brought to prominence by the Institute of Medicine's 2000 report, To Err Is Human, which revealed that medical errors caused approximately 98,000 deaths annually in the United States alone (Institute of Medicine, 2000). Since then, PS has been recognized as a cornerstone of healthcare quality, driving initiatives to reduce adverse events such as medication errors, hospital-acquired infections, and surgical complications. Additionally, more recent data has shown that over 200,000 patient deaths annually are due to preventable medical errors, with associated costs to the healthcare system reaching up to $20 billion each year (Rodziewicz et al., 2024). Nevertheless, errors persist at concerning rates, highlighting the ongoing need for enhanced PS competencies among healthcare professionals (Curry et al., 2018). Building these competencies is critical for mitigating risks and improving care quality (Kakemam et al., 2024).

Healthcare students – particularly those in nursing, midwifery, and paramedicine programs – play an essential role in PS as they transition from students to professionals. During clinical placements, students are often involved in direct patient care under the supervision of experienced healthcare professionals. These experiences provide valuable opportunities for students to apply PS knowledge

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in real-world settings but also to highlight gaps in their training (Usher et al., 2017). However, research indicates that many healthcare students feel underprepared or lack confidence in these competencies, which raises concerns about the preparedness of the next generation of healthcare professionals (Curry et al., 2018; Usher et al., 2017). Therefore, they must develop PS competencies to effectively manage care during clinical placements. Practical experience bridges theoretical knowledge to real-world application but often reveal gaps in preparedness for managing safety risks (Usher et al., 2017). To address the complexities of modern healthcare, educational programs should integrate practical learning methods such as simulations, case studies, and reflective practice. These strategies enable students to learn from mistakes in a safe environment, preparing them for real-world challenges while minimizing risks to patients (Kakemam et al., 2024; Usher et al., 2017).

In response to the global recognition of PS issues, educational institutions have begun incorporating PS training into healthcare curricula. These efforts aim to cultivate a culture of safety among students, ensuring that future healthcare professionals view PS as an integral part of care (Kakemam et al., 2024). Patient safety competencies encompass a wide range of skills, including understanding system errors, human factors, effective communication, teamwork, and error reporting (Kakemam et al., 2024). These competencies can be categorized into several key domains: systems thinking, human factors, communication, teamwork, and error reporting. Systems thinking focuses on understanding how healthcare systems work, particularly how processes and environmental factors contribute to PS (Alingh et al., 2018). Human factors, which include the cognitive and environmental conditions influencing healthcare workers' performance, are critical in preventing errors. Healthcare students must recognize the effects of fatigue, communication breakdowns, and cognitive overload, all of which can contribute to errors (Torkaman et al., 2020). Developing strategies to mitigate these risks isessential to promoting PS. Effective communication and teamwork are crucial to delivering safe care. Communication failures are a leading cause of errors in healthcare settings, particularly during handovers and emergency situations (Kakemam et al., 2024). Teaching healthcare students clear and concise communication skills is essential to preventing misunderstandings that could lead to adverse outcomes. Additionally, teamwork within multidisciplinary care teams requires collaboration, respect, and an understanding of each team member's role. Effective teamwork minimizes the risk of errors and ensures that critical decisions are made in the patient's best interest (Kakemam et al., 2024; Torkaman et al., 2020). One of the most important PS competencies is error reporting and learning from mistakes. Healthcare students must be trained to report errors in a non-punitive environment, where mistakes are viewed as learning opportunities rather than reasons for punishment (Torkaman et al., 2020). Encouraging a culture of open error reporting is essential for preventing future harm and improving patient care outcomes.

Despite progress in integrating PS education into healthcare curricula, significant variability persists across institutions and regions. While some nursing and midwifery programs offer comprehensive PS modules, others provide limited instruction on systems thinking and error reporting. Paramedicine students, operating in high-risk, fast-paced settings, particularly need enhanced training in teamwork and communication to maintain PS during emergencies (Strandås et al., 2024). This inconsistency underscores the need for standardized PS education across all healthcare disciplines to ensure graduates possess the competencies necessary for delivering safe care (Usher et al., 2017).

Aim

The aim of this study was to examine how healthcare students (nursing students, midwifery students, and paramedical students) in Slovakia perceive their PS competencies in both academic and clinical environments and to identify the factors that influence their perceptions.

Methods

Design

This cross-sectional study was conducted in line with STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines to ensure thorough reporting and methodological quality (von Elm et al., 2008).

Sample

Two nursing faculties in Slovakia, both offering bachelor's programs in healthcare (nursing, midwifery, and paramedics), were invited to participate in the study. A purposive sampling method was used to select targeted groups of respondents (nursing students, midwifery students, and paramedical students). The inclusion criteria required students: a) to have completed at least one

semester of clinical practice, and b) to have given informed consent. Students were excluded if they were on maternity leave or involved in an Erasmus exchange during the data collection period.

A total of 282 healthcare students (response rate of 74.96%) from two Slovak faculties completed the questionnaire, with an average age of 22.08 years (SD = 4.166). A total of 147 students participated from Faculty A, and 135 students participated from Faculty B. Most students were female (89.7%) and full-time students (86.5%). The majority had prior vocational healthcare education (59.9%), with nursing (56.0%), paramedicine (25.9%), and midwifery (18.1%) as their main study programs. Students were distributed across first (38.7%), second (40.4%), and third years (20.9%). Sample characteristics are described in Table 1.

Data collection

Data collection occurred between February and April 2024. To assess healthcare students' self-reported competencies in PS, the Health Professional Education in Patient Safety Survey (H-PEPSS) (Ginsburg et al., 2012) was used. In June 2021, permission was obtained from Professor Ginsburg to use the instrument in the Slovak context. The translational process involved translating the tool into Slovak, performing a back-translation by independent translators, and achieving consensus among the research team to finalize the Slovak version.

The H-PEPSS consists of 37 items organized into three sections. The first section focuses on clinical safety practices, such as hand hygiene, infection control, and safe medication procedures. The core section measures six key dimensions of PS competencies within both academic and clinical settings: Working in interprofessional teams (six items), Effective communication (three items), Managing safety risks (three items), Understanding human and environmental factors (three items), Recognizing, and responding to reduce harm (four items), and Fostering a safety culture (four items). The third section addresses students' comfort in speaking up about PS concerns (three items). A 5-point Likert scale, ranging from 1 (completely disagree) to 5 (completely agree), was used to gauge these competencies. Average scores were calculated for each dimension separately for academic and clinical settings, with a comparison of the overall scores between these two environments.

The questionnaire set also included the Slovak version of the Mini-IPIP (International Personality Item Pool) (Hullová & Duriš, 2017), which is a brief, 20-item questionnaire designed to measure the Big Five personality traits: Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness to Experience. Each trait is assessed with four items, making it a shortened version of the full International Personality Item Pool (IPIP). Respondents rate statements on a 5-point Likert scale, ranging from "strongly disagree" to "strongly agree". The Mini-IPIP is widely used due to its brevity and ability to provide reliable and valid assessments of personality in both research and applied settings.

Sociodemographic data were also gathered, including items from the original H-PEPSS, such as study program, year of study, age, gender, and previous PS education. Based on a literature review, additional variables were added, such as current clinical placement, mode of study (full-time or part-time), type of practice supervision, and prior nursing experience unrelated to clinical practice during the study.

Data analysis

Data analysis was conducted using SPSS version 25.0, employing both descriptive and inferential statistics. Missing data were minimal (0.3% to 0.4%) and addressed through listwise deletion, ensuring a sufficiently large sample size to maintain statistical power. The Kolmogorov-Smirnov test revealed non-normality ($p \leq 0.05$), leading to the use of non-parametric tests. The Mann-Whitney U test was applied for comparison of two independent groups, while the Kruskal-Wallis test was applied to assess differences across three or more groups. Spearman's correlation coefficient was used to analyze relationships between PS competency dimensions and variables like age, clinical environment satisfaction, and personality traits. Paired observations of PS competencies in academic and clinical settings were compared using the Wilcoxon Signed-Rank Test.

The internal consistency of the two instruments used for data collection was assessed using Cronbach's alpha coefficient (α). The Slovak version of the H-PEPSS demonstrated high reliability, with α values of 0.949 for the academic setting and 0.947 for the clinical setting. Similarly, the Mini-IPIP questionnaire showed acceptable reliability, with $\alpha = 0.861$.

Results

Evaluation of self-reported dimensions of PS competencies by healthcare students

Table 2 presents self-reported PS competencies among healthcare students in Slovakia. Students expressed the highest confidence in their knowledge

of Managing safety risks, with 79.16% in academic settings and 67.43% in clinical settings. Conversely, they reported lower confidence in Effective communication skills, at 69.16% in academic settings and 59.43% in clinical environments. A paired-samples t-test revealed statistically significant differences across all dimensions of PS competencies, with higher scores consistently observed in the academic setting.

Table 1 Characteristics of the sample (N = 282)

Variable		N	(%)
Gender	male	29	(10.3)
	female	253	(89.7)
Previous vocational education	healthcare program	169	(59.9)
	general program (gymnasium)	85	(30.1)
	other	28	(9.9)
Study program	nursing	159	(56.0)
	midwifery	51	(18.1)
	paramedics	73	(25.9)
Form of study	full-time	244	(86.5)
	part-time	38	(13.5)
Year of study	1st	109	(38.7)
	2nd	114	(40.4)
	3rd	59	(20.9)
Patient safety teaching	included in other clinical subjects (e.g., neurological nursing, surgical nursing)	171	(61.3)
	as an individual subject	41	(14.7)
	combination of both	67	(24.0)
Current clinical placement	outpatient care: day clinics, primary care and rehabilitation	17	(6.0)
	inpatient care: medical-surgical care units	128	(45.4)
	inpatient care: psychiatric care units	4	(1.4)
	critical-specialized services: anesthesiology department, intensive care units, emergency, and the operating room	61	(21.6)
	mother-child inpatient care: maternity and pediatrics, obstetrics, gynecology	68	(24.1)
	long-term care setting: residential care units, elderly homes, nursing homes	4	(1.4)
Supervision of practice	nurse educator or teacher (the nursing faculty employee)	74	(26.4)
	lecturer (healthcare facility employee)	65	(23.2)
	manager (e.g., nurse managers, midwifery manager, etc.)	37	(13.2)
	mentor with specific training in mentoring	48	(17.1)
	team of nurses (without individual supervision)	40	(14.3)
	nurse without specific training in mentoring	16	(5.7)
Previous experience in healthcare (provision of nursing care to patients)	no	125	(44.3)
	yes	157	(55.7)
Outcome expectations*	not at all (unmet expectations)	34	(12.1)
	enough	129	(45.7)
	greatly	91	(32.3)
	very greatly (met expectations)	28	(9.9)

	Mean	SD
Age	22.08	4.166
Satisfaction with clinical environment	6.59	2.089

**The student assesses the extent to which his / her expectations related to clinical practice have been met; SD – standard deviation*

Table 2 Dimensions of self-reported PS competencies by healthcare students (N = 282)

Self-reported PS dimensions	Academic setting		Clinical setting		Comparison between classroom and clinical settings
	M ± SD	% of positive responses	M ± SD	% of positive responses	p-value
Work in teams with other health professionals	3.90 ± 0.67	71.08	3.69 ± 0.70	61.05	≤ 0.001*
Communicating effectively	3.78 ± 0.77	69.16	3.58 ± 0.83	59.43	≤ 0.001*
Managing safety risks	4.05 ± 0.76	79.16	3.77 ± 0.86	67.43	≤ 0.001*
Understanding human and environmental factors	3.91 ± 0.69	73.26	3.74 ± 0.73	65.50	≤ 0.001*
Recognize and respond to reduce harm	3.94 ± 0.72	76.45	3.79 ± 0.74	66.93	≤ 0.001*
Culture of safety	3.79 ± 0.76	69.77	3.64 ± 0.77	60.70	≤ 0.001*

**p ≥ 0.001 (Wilcoxon Signed-Rank Test); % of positive responses – Agree / Strongly Agree; PS – patient safety; M – mean; SD – standard deviation*

Factors influencing the evaluation of dimensions of PS competencies in academic setting

Nursing students rated almost all PS dimensions significantly higher compared to midwifery or paramedical students ($p < 0.001$), except for Work in teams with other health professionals, which paramedic students rated more highly ($p < 0.001$). Full-time students achieved the highest scores in five out of six dimensions, as shown in Table 3, while first-year students rated the Recognize and respond to reduce harm dimension most highly ($p < 0.001$). Clinical placements influenced evaluations, with students in medical-surgical units scoring better in Managing safety risks ($p = 0.009$), Understanding human and environmental factors ($p = 0.010$), and Recognize and respond to reduce harm ($p < 0.001$) dimensions. Those in intensive care units (ICU) settings rated Culture of safety more highly ($p = 0.002$), while primary care students scored better in Work in teams with other health professionals ($p = 0.024$). Interestingly, students with no prior healthcare experience rated Communicating effectively ($p = 0.049$) and Managing safety risks ($p = 0.013$) more highly than their more experienced peers.

Factors influencing the evaluation of dimensions of PS competencies in clinical setting

Students with no prior healthcare experience scored more highly in Communicating effectively ($p < 0.001$). Paramedical students rated Work in teams with other health professionals ($p = 0.002$), Recognize and respond to reduce harm ($p = 0.044$), and Culture of safety ($p = 0.004$) most highly. Part-time students rated Communicating effectively more highly ($p = 0.025$). Supervision of practice played a role, with students under nurse managers scoring highest in Understanding human and environmental factors ($p = 0.012$), Recognize and respond to reduce harm ($p = 0.027$), and Culture of safety ($p = 0.010$). Furthermore, students whose clinical placement expectations were met to a great extent rated all PS dimensions most highly (Table 4).

Association between self-reported PS competencies and selected variables

Correlation analysis revealed statistically significant associations between the dimension Understanding human and environmental factors and students' age in the academic setting ($r = -0.123$, $p \leq 0.05$), with older students rating this dimension lower. Satisfaction with the clinical environment showed significant positive correlations with nearly all PS dimensions in both settings. Additionally, significant associations were observed between PS dimensions and personality traits. Students with higher scores in Extraversion, Agreeableness, Conscientiousness, and Openness to Experience also scored more highly in PS dimensions. Conversely, students with higher Neuroticism scores tended to score lower in specific PS dimensions (Table 4).

Clinical safety, broader PS issues and readiness to speak up about PS

When evaluating four general aspects of the clinical setting, healthcare students reported feeling most confident in hand hygiene within the academic setting (92.5%) and in safe medication practices within the clinical setting (89.6%). Among broader PS issues, the highest-rated aspect was related to clinical safety practices, such as hand hygiene, patient transfers, and medication safety, within the study program (83.4%). Conversely, the lowest-rated aspect was the opportunity to learn and collaborate with interdisciplinary team members (42.4%).

Table 3 Differences in the evaluation dimensions of self-reported PS competencies based on sociodemographic variables (p-values)

Self-reported PS dimensions		Faculty (M-W)	Previous vocational education (K-W)	Study program (K-W)	Form of study (M-W)	Year of study (K-W)	Patient safety teaching (M-W)	Current clinical placement (K-W)	Supervision of practice (K-W)	Previous experience in healthcare (M-W)	Outcome expectations (K-W)
PS1	Academic setting	0.061	0.229	< 0.001**	0.040*	0.752	0.954	0.024*	0.407	0.063	0.075
	Clinical setting	0.058	0.129	0.002*	0.143	0.280	0.417	0.051	0.798	0.295	< 0.001**
PS2	Academic setting	0.810	0.874	< 0.001**	0.582	0.098	0.441	0.067	0.461	0.049*	0.215
	Clinical setting	0.620	< 0.001**	0.067	0.025*	0.700	0.589	0.577	0.849	0.223	< 0.001**
PS3	Academic setting	0.112	0.774	< 0.001**	0.044*	0.348	0.494	0.009*	0.556	0.013*	0.054
	Clinical setting	0.347	0.129	0.541	0.072	0.464	0.214	0.951	0.597	0.871	< 0.001**
PS4	Academic setting	0.333	0.707	< 0.001**	0.049*	0.241	0.427	0.010*	0.734	0.057	0.087
	Clinical setting	0.173	0.855	0.303	0.486	0.489	0.222	0.175	0.012*	0.428	< 0.001**
PS5	Academic setting	0.581	0.637	< 0.001**	< 0.001**	< 0.001**	0.194	< 0.001**	0.538	0.082	0.246
	Clinical setting	0.077	0.859	0.044*	0.167	0.342	0.185	0.087	0.027*	0.950	< 0.001**
PS6	Academic setting	0.089	0.958	< 0.001**	< 0.001**	0.661	0.266	0.002*	0.580	0.067	0.095
	Clinical setting	0.051	0.398	0.004*	0.441	0.423	0.146	0.945	0.010*	0.738	< 0.001**

*PS1 – Work in teams with other health professionals; PS2 – Communicating effectively; PS3 – Managing safety risks; PS4 – Understanding human and environmental factors; PS5 – Recognize and respond to reduce harm; PS6 – Culture of safety; PS – patient safety; M-W – Mann-Whitney U test; K-W – Kruskal-Wallis test; *p > 0.05; **p > 0.01*

Table 4 Association between self-reported PS competencies and selected variables (Spearman)

Self-reported PS dimensions		Age	Satisfaction with clinical environment	Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness to Experience
PS1	Academic setting	-0.072	0.138*	0.195**	0.161**	0.130**	-0.069	0.130*
	Clinical setting	0.022	0.367**	0.252**	0.152*	0.109	-0.190*	0.104
PS2	Academic setting	-0.004	0.142*	0.206**	0.190**	0.118*	-0.128*	0.118*
	Clinical setting	0.092	0.337**	0.246**	0.154**	0.144*	-0.242**	0.096
PS3	Academic setting	-0.065	0.135*	0.241**	0.240**	0.195**	-0.096	0.200**
	Clinical setting	0.049	0.347**	0.234**	0.184**	0.124*	-0.172**	0.111
PS4	Academic setting	-0.123*	0.098	0.237**	0.196**	0.154**	0.031	0.165**
	Clinical setting	0.012	0.320**	0.237**	0.146*	0.078	-0.063	0.073
PS5	Academic setting	-0.108	0.073	0.228**	0.177**	0.149**	-0.022	0.126*
	Clinical setting	0.028	0.310**	0.259**	0.166**	0.140*	-0.086	0.061
PS6	Academic setting	-0.058	0.117	0.211**	0.123*	0.235**	-0.103	0.109
	Clinical setting	0.099	0.292**	0.230**	0.130*	0.135*	-0.145*	0.061

*PS1 – Work in teams with other health professionals; PS2 – Communicating effectively; PS3 – Managing safety risks; PS4 – Understanding human and environmental factors; PS5 – Recognize and respond to reduce harm; PS6 – Culture of safety; PS – patient safety; *p > 0.05; **p > 0.01*

Regarding willingness to voice PS concerns, only 45.3% of students felt secure when speaking up about unsafe care practices witnessed in the clinical setting. Alarmingly, over half (51.6%) believed that reporting a PS issue would result in negative consequences for the individual who reported it.

Discussion

Patient safety in the education of healthcare students has been a highly topical and widely discussed theme in recent years. This study aimed to investigate how healthcare students in Slovakia perceive their competencies related to PS and to identify the factors influencing their perceptions.

Patient safety is predominantly studied among nursing students using the H-PEPSS instrument (e.g., Sümen et al., 2022; Usher et al., 2017). Research on other healthcare students is limited; for example, midwifery students have been studied using the H-PEPSS (e.g., Jafari et al., 2024; Taşkiran Eskici & Sökmen, 2023). However, studies on paramedic students' PS competencies are scarce.

With regard to examining PS competencies, the Managing safety risks dimension has been rated the most highly in both academic and clinical settings in China (Huang et al., 2020), and within an academic setting in the Czech Republic (Bartoníčková et al., 2024). Globally, the Effective communication dimension tends to receive the highest ratings (e.g., Amilia & Nurmalia, 2020; Usher et al., 2017). Despite this, Effective communication was rated lowest by midwifery, nursing, and paramedic students in our study. Conversely, in the international context, the dimension Recognize and respond to reduce harm has generally been rated negatively (e.g., Amilia & Nurmalia, 2020; Usher et al., 2017). This pattern was also observed in research involving midwifery and nursing students in clinical settings; whereas, in academic settings, the lowest ratings were for Working in teams with other health professionals (Amilia & Nurmalia, 2020; Taşkiran Eskici & Sökmen, 2023). In our study, nursing students rated their PS competencies highest overall, contrasting with findings in Turkey, in which midwifery students rated their PS competencies more highly. Differences were observed across all dimensions except for Patient safety culture (Taşkiran Eskici & Sökmen, 2023).

At the dimensional level of our research, paramedic students scored highest in Working in teams with other health professionals across both academic and clinical settings. According to Strandås et al. (2024), the effectiveness of paramedics in promoting PS depends primarily on the recognition of their contributions to the safety culture. This includes training and educational initiatives aimed at strengthening their decision-making abilities, non-technical and technical skills, and improving collaboration between paramedics and other healthcare colleagues. Other contributing factors include fostering a supportive work environment. Year of study had the greatest influence on health students' assessment of PS competencies. First-year students scored highest in the Recognize and respond to harm dimension. However, the influence of year of study varies across the literature. Several studies have reported that students' self-reported scores decrease as they progress through their studies (e.g., Ramírez-Torres et al., 2023), a trend that is primarily attributed to increased exposure to unsafe practices. Nearly 50% of students considered the practice environment unsafe in terms of PS (Ramírez-Torres et al., 2023).

The impact of sociodemographic factors, particularly the form of study, has not been widely investigated in international literature. However, our study found it to have a significant influence in both academic and clinical settings, which is also supported by the results of a study conducted among Czech nursing students (Bartoníčková et al., 2024). Similarly, Sullivan et al. (2009) found that students in advanced study programs demonstrated higher levels of PS skills compared to those in undergraduate programs.

In terms of clinical practice settings, Slovak students practicing in medical-surgical care rated their academic competencies higher in Managing risks, Understanding factors, and Recognizing and responding to harm. Additionally, using the Hospital Survey on Patient Safety Culture for Nursing Students (HSOPS-NS) instrument, Slovak nursing students who conducted clinical practice in ICUs rated Teamwork on the Unit and Overall Perception of Patient Safety significantly better, while students practicing in primary care evaluated Supervisors' Expectations and Non-repressive Responses to Adverse Events more favorably (Kalánková et al., 2022). In our research, ICU students rated the dimensions Culture of Safety and Working in teams with other health professionals higher in academic settings, consistent with the findings of the study by Kalánková et al. (2022) in Slovakia and also Bartoníčková et al. (2024) in the Czech Republic.

Interestingly, students without prior healthcare experience scored more highly in selected dimensions of PS competencies in both academic and clinical settings, a finding that contrasts with international studies (e.g., Kong et al., 2019; Sullivan et al., 2009). Supervised practice also played a significant role: students under the supervision of managers in clinical settings scored higher in selected dimensions of PS competencies. Steven et al. (2014) noted that students often learn by observing mentors in clinical environments. However, due to the power imbalance created by mentors evaluating their practice, students may find it challenging to discuss safety concerns openly.

Other studies have identified additional influencing factors. Taşkiran Eskici & Sökmen (2023) demonstrated that variables such as age, grade, department, and PS competency level significantly affect PS knowledge and skills in nursing and midwifery students. Interestingly, older students' self-assessment scores tended to decrease, a finding that contrasts to those in international studies (e.g., Kong et al., 2019). Personality traits also played a role: students who scored more highly on traits such as Extraversion, Agreeableness, Conscientiousness, and Openness reported higher PS competency scores. Similarly, Lee & Kim (2020) demonstrated that moral sensitivity significantly affects students' safety assessments. De Miguel et al. (2023) identified notable correlations between nursing students' perceived safety climate and factors such as self-efficacy, perceived competence, and resilience. In contrast, students scoring more highly in Neuroticism reported lower PS competency scores, which may be linked to factors such as sleep quality. Sleep quality has been shown to be a significant predictor of PS competencies in nursing and midwifery students during clinical practice (Jafari et al., 2024).

Regarding general aspects, healthcare students consistently rated hand hygiene as the highest priority, a trend also observed in other countries (e.g., Usher et al., 2017). In terms of broader clinical safety practices, students rated clarity about the scope of their practice highly, nursing students in particular (e.g., Huang et al., 2020). Meanwhile, the opportunity to learn and collaborate with interdisciplinary team members was the lowest-rated aspect, which often reflects inconsistent attitudes among educators regarding PS (Huang et al., 2020; Usher et al., 2017).

Only 45% of students felt safe addressing unsafe practices in clinical settings, with defensiveness among students and staff discouraging them from voicing concerns (Ghasempour et al., 2023). Many described themselves as passive "observers" or witnesses to unsafe practices rather than active participants in addressing them. However, as their understanding grows, students increasingly recognize the importance of adhering to safety standards and express a desire to positively influence such situations (Lundell Rudberg et al., 2022). Over 50% of students fear that reporting adverse events could lead to negative repercussions for themselves. Canadian researchers identified a failure to report or tendency to downplay such events among nurses, noting that students exposed to these behaviors may later deny or conceal adverse events to gain workplace favor (Ghasempour et al., 2023).

To address this, fostering a no-blame culture and open communication is crucial for healthcare students in Slovakia. Gradišnik et al. (2024) highlight that learning from mistakes through situational analysis promotes caution and empowers students to report unsafe practices, improving patient safety outcomes.

Limitation of the study

This study has several limitations that require consideration. Since it was conducted at two nursing faculties in Slovakia, it may not be possible to generalize its findings to regions with differing healthcare education systems. Second, the small sample size, while adequate for a preliminary study, may not reflect the diversity of healthcare students, especially those from less common programs. Additionally, the self-reported data from the H-PEPSS instrument may introduce response bias, since participants could overestimate or underestimate their competencies out of social desirability or limited self-awareness.

Conclusion

This study highlights the vital importance of patient safety (PS) competencies among healthcare students, revealing notable differences between academic and clinical settings. While nursing students reported higher competencies, significant gaps were identified in midwifery and paramedicine students, emphasizing the need for targeted improvements in PS training across all disciplines. Future efforts should focus on broadening research to encompass a wider range of healthcare students, ensuring a more comprehensive and standardized approach to PS education. By addressing these gaps, educational institutions can better prepare future healthcare providers with the critical skills and competencies needed to deliver safe

and effective care in increasingly complex healthcare environments.

Ethical aspects and conflict of interest

Written consents were obtained from the heads of nursing faculties. Students participated voluntarily, providing informed consent after being assured of anonymity, research credibility, and their right to withdraw at any time. The study adhered to the Declaration of Helsinki and received approval from the Ethics Committee of Constantine the Philosopher University in Nitra, Slovakia (UKF/917/191013:002).

Authors declare no potential conflict of interest.

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Author contributions

Conception and design (DK, DB, AS, DZ), data analysis and interpretation (DK, DB, AS, CZ), manuscript draft (DK, DB), critical revision of the manuscript (AB), final approval of the manuscript (DK, DB, AS, DZ, AB).

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