

Research Article

Perceptions of Patient Safety Competence among Undergraduate Nursing and Nursing Associate Students: A Comparative Cross-Sectional Study

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Received 21 March 2024; Accepted 14 August 2024

Academic Editor: Sulaiman Al Sabei

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Background. Nursing professionals are pivotal in coordinating care and incorporating quality and safety strategies to enhance patient outcomes. Therefore, nursing education is paramount in preparing nurses to deliver safe care. **Aim.** In this study, we aimed to explore the self-reported patient safety competence acquired by undergraduate nursing students in classroom and clinical settings and to compare their perceptions of how broader patient safety issues are addressed in their programmes. **Methods.** We conducted a cross-sectional study in a public university in London, United Kingdom, and included Bachelor of Science nursing students from all fields of nursing and Nursing Associate students ($n = 250$, response rate 21.3%). Students completed the Health Professional Education Patient Safety Survey (H-PEPSS). Paired t -tests examined the differences in learning (classroom versus clinical setting). Analysis of variance was used to explore differences in self-reported patient safety competencies across programmes and to compare students' perceptions of how broader patient safety issues are addressed in their curricula. **Results.** Mean domain scores indicate high confidence levels in patient safety competence for learning gained in both classroom and clinical settings for all students ($>4.0/5.0$). Results also indicate a consensus among students from various programmes that broader patient safety issues are adequately addressed in the curricula. Self-reported confidence was highest in respondents enrolled in the Nursing Associate programme and students with prior experience in a clinical setting. Students were confident about their learnings of patient safety in their educational programmes. **Conclusions.** Greater patient safety competence indicates comprehension and familiarity with knowledge boundaries, which in turn acknowledges the limitations of autonomous practice. Our findings underscore the need for targeted educational interventions to enhance specific areas of patient safety competence and emphasise the shared responsibility of educators in fostering a culture of safety within healthcare.

1. Introduction

Patient safety (PS) has been prioritised in healthcare systems worldwide for over two decades [1]. It can be defined as “A framework of organised activities that creates cultures, processes, procedures, behaviours, technologies, and environments in healthcare that consistently and sustainably lowers risks, reduces the occurrence of avoidable harm, makes errors less likely, and reduces the impact of harm when it does occur” [2].

Despite global efforts to reduce harm, PS incidents remain a significant cause of death and disability [1], with an estimated 134 million adverse events occurring annually in hospitals worldwide [3] and an estimated three million deaths annually [4]. Moreover, unsafe practices lead to substantial financial and economic costs, reducing trillions of dollars in global economic output annually [5].

To reduce the incidence of adverse events, PS must be a shared responsibility among healthcare professionals, including nurses [6]. The role of nursing professionals in

ensuring PS cannot be overstated, as nurses form the majority of the healthcare workforce and spend the most time with patients [7]. Additionally, nurses are vital in coordinating care and participating in organisational, quality, and safety strategies to enhance patient outcomes [8]. Therefore, undergraduate nursing education must effectively train future nurses with the skills to deliver care based on safety principles, aiming to improve the quality of healthcare systems [9, 10].

Nursing education is paramount in preparing nurses to be confident and deliver safe care in accordance with best practices and established standards. Facilitators for acquiring PS competence and culture among undergraduate nursing students include a positive learning environment, active learning and use of learning technologies, application of skills and simulation methods, and more [11]. Clinical experience is also central in role modelling and provides opportunities for hands-on learning, allowing students to commit to and apply PS concepts in a real-world environment [12]. Conversely, barriers that impact their learning can result in a lack of fundamental knowledge and awareness of PS elements crucial in preventing errors [13]. This may be related to a reduced emphasis on essential aspects of PS in nursing curricula [14] and inconsistency in how its topics are taught and assessed, which suggest a need for improved standardisation of PS education [15–17].

Increased economic health constraints, new models of care, and new professional roles with skills mix to improve cost efficiency in the health systems [18] have raised additional concerns regarding the training of nursing students to ensure PS [19–21].

Researchers have demonstrated variations in undergraduate nursing students' PS education and assessment. Recently, two systematic reviews investigated nursing students' teaching strategies for PS and found several differences in course content across the included studies and mixed results concerning the effects of the educational interventions as well as the formal inclusion of PS courses in undergraduate nursing education [22, 23]. For these reasons, assessment of PS in academic and clinical settings is heterogeneous, with studies recommending the use of validated instruments to evaluate the acquisition of patient knowledge, skills, and attitudes [24]. Furthermore, it should be a continual learning process using a multi-method assessment, including formative opportunities, peer assessment, direct observation, practice, and oral and written evaluations [25].

Information on the extent to which PS is addressed in foundation degree courses are limited [26–28]. To our knowledge, in the UK, no studies have been published in this area involving both Bachelor of Science (BSc) nursing students in all fields and Nursing Associate (NA) students that can compare and identify gaps in their PS knowledge.

Therefore, in this study, we aimed to address this gap in the literature by examining the perceptions of BSc nursing and NA students regarding their self-reported PS competence, the differences in PS knowledge acquired in the classroom and in clinical setting, and across all fields of their academic programmes. In addition, the paper compares

students' perceptions of how broader PS issues are addressed in their programmes.

2. Materials and Methods

2.1. Study Design. This cross-sectional study followed Strengthening the Reporting of Observational Studies in Epidemiology–STROBE [29].

2.2. Recruitment and Study Sample. Data were collected from a School of Nursing in a public university in London, England, and included NAs and BSc nursing students in all years of study and all fields (adult, mental health, children, and learning disability nursing) who completed at least one practice placement. The students were invited to participate in the study via e-mail, by announcements on the module's virtual learning environment (VLE), and through brief presentations in the classroom.

2.3. Data Collection. Data were collected through an anonymous online questionnaire that was administered via Survey Monkey® between March 2023 and May 2023. Participants were informed about the study in detail; they were also assured that their participation was voluntary, the questionnaire was anonymous, and they had the right to withdraw from the study before submitting their responses. We tailored our design methods [30] to minimise the burden on the participants while increasing response rates. For example, four additional announcements were sent via the VLE, and students had the option to enter into a prize draw by completing a separate online form.

2.4. Study Instrument. The questionnaire included The Health Professional Education Patient Safety Survey (H-PEPSS) to assess students' knowledge regarding PS issues [31]. H-PEPSS comprised 38 items divided into three sections. The first section, "Learning about specific PS content areas," includes 27 questions categorised into seven PS learning domains: clinical safety (four questions), working in teams with other health professionals (six questions), communicating effectively (three questions), managing safety risk (three questions), understanding human and environmental factors (three questions), recognise, respond to, and disclose adverse events and close calls (four questions), and culture of safety (four questions). In this section, students were instructed to mark their agreement for each item regarding PS competencies learned in both classroom and clinical settings. The second section, "How broader PS issues are addressed in health professional education," comprises seven questions. The third section of the H-PEPSS addresses "Comfort speaking up about patient safety"; however, this was not included as it was not relevant to this study. All questions are presented in a 5-point Likert scale format, with answer options ranging from 1 (strongly disagree) to 5 (strongly agree). Higher scores denote higher levels of self-perceived students' knowledge about PS in specific areas.

The questionnaire also included demographic data such as programme of enrolment, gender, field of nursing (if applicable), year of study, and prior experience working in a healthcare setting.

The internal consistency reliability of the H-PEPPS is above 0.80 for all factors [31]. For this study, the internal consistency of the overall scale (Cronbach's alpha) demonstrated an excellent internal consistency index of 0.98.

On average, completing the questionnaire took the students 7 minutes and 35 seconds (SurveyMonkey insights report).

2.5. Ethical Considerations. Ethical approval was obtained from the university research ethics committee (Protocol number 3169). Permission to use the H-PEPSS was granted by its authors [31]. Consent was implied by completing the questionnaire. Anonymity and confidentiality were maintained, and the data were securely stored to comply with data protection regulations.

2.6. Analytical Methods. SPSS (version 28) and STATA (version 18) were used for data analysis. Descriptive statistics included means, standard deviation (SD), and frequencies. PS scores for each domain of sections one and two were calculated by computing an average of the items. Breusch–Pagan/Cook–Weisberg and Cameron and Trivedi's tests were performed to check if the assumption of homoskedasticity was violated, and no such evidence was found. Hence, paired *t*-test was used to identify differences in self-reported PS safety knowledge acquired in the classroom and clinical learning settings. To identify differences in self-reported PS safety competencies between students in different programmes and fields and prior experience working in a healthcare setting (both classroom and clinical), the analysis of variance (ANOVA) was conducted. To compare how broader PS issues are addressed in BSc versus NA professional education, ANOVA was performed. Statistically significant results were considered with *p* value <0.05.

3. Results

3.1. Response Rate. Of the 1,174 students, 250 participated in the study (21.3% response rate). An extra 22 questionnaires were incomplete and were therefore not included in the data analyses.

3.2. Description of the Sample. Of the students who responded to the questionnaire, 211 were female (84.1%), 34 were male (13.5%), and five did not disclose their gender (2.4%). Most students (86%) were enrolled in a BSc programme, of which 46.8% were studying adult nursing. The remaining 14% of the students were registered on the NAs programme. More than half of the students had prior experience working in the healthcare setting (58.8%), and most who completed the questionnaire were in the first year of the course (59%). The demographic data is presented in Table 1.

TABLE 1: Distribution of nursing students according to course information and gender (*n* = 250).

Course information	Percentage (%)	Frequency
<i>Programme</i>		
BSc adult nursing	46.8	117
BSc children	16.8	42
BSc mental health	16	40
BSc learning disability	6.4	16
NAs	14	35
<i>Year of course</i>		
Year 1	59	148
Year 2	19.1	48
Year 3	21.9	55
<i>Prior experience working in a healthcare setting</i>		
Yes	58.8	147
No	41.2	103
<i>Gender</i>		
Female	84.1	211
Male	13.5	34
Prefer not to say	2.4	5

3.3. Overall Students' Self-Reported Knowledge Gained in Classroom versus Clinical Settings. Overall, the average scores for self-reported PS competence gained by knowledge developed in the classroom or clinical settings were above 4.0.

Paired *t*-test analyses compared self-reported PS dimension scores between knowledge gained in the classroom and the clinical setting (Table 2). The results showed a statistically significant higher clinical knowledge mean score in managing safety risks gained in the clinical setting (*p* < 0.05).

Mean scores of specific PS content areas learned in the clinical setting were all greater than classroom knowledge mean scores, except for the dimension of communicating effectively; however, the differences were not statistically significant (Table 2). The highest mean scores for self-reported PS competence gained by knowledge developed in the classroom and clinical settings were related to the dimensions of clinical safety (classroom: *M* = 4.40; clinical setting: *M* = 4.40) and communicating effectively (classroom: *M* = 4.33; clinical setting: *M* = 4.30). The lowest mean scores for self-reported PS competence gained by knowledge developed as a result of classroom learning and clinical setting were in the dimensions of working in teams (classroom: mean = 4.01; clinical setting: mean = 4.02) and understanding human and environmental factors (classroom: mean = 4.03; clinical setting: mean = 4.08).

3.4. Comparison between Fields and Programmes. To compare PS dimension scores between the BSc nursing and the NA programmes, ANOVA was conducted. On average, NA students reported greater knowledge than BSc students for all the dimensions of learning in classroom settings. Regarding learning in the clinical setting, NA students scored higher in all PS domains, except for working in teams and managing risk, where mental health nursing students scored highest. The lowest mean scores were found for children and learning disability nursing students for learning in the

TABLE 2: Difference in students' self-reported patient safety knowledge acquired in classroom and clinical settings.

PS dimensions (all students combined)	Classroom knowledge* Mean (SD)	Clinical settings* knowledge Mean (SD)	<i>p</i> value**
Clinical safety	4.40 (0.829)	4.40 (0.773)	0.874
Working in teams	4.01 (0.820)	4.02 (0.825)	0.744
Communicating effectively	4.33 (0.779)	4.30 (0.796)	0.341
Managing safety risks	4.10 (0.853)	4.19 (0.809)	0.012
Understanding human and environmental factors	4.03 (0.905)	4.08 (0.855)	0.121
Recognise, respond to, and disclose adverse events and close calls	4.07 (0.849)	4.11 (0.823)	0.298
Culture of safety	4.15 (0.799)	4.16 (0.787)	0.709

PS: patient safety. SD: standard deviation. *Range 1–5. **Mean differences were obtained using Paired *t*-test, significance level <0.05.

classroom and clinical settings. The results of Table 3 indicate no statistically significant differences ($p > 0.05$) in any H-PEPPS mean score dimensions when comparing students in all fields of BSc nursing and NAs.

3.5. Students' Perceptions of How Broader PS Issues Are Addressed in the Curriculum. In addition to evaluating students' self-perception of their PS knowledge and competence across various dimensions, the H-PEPSS also examines how broader PS issues are addressed in their education. The survey includes specific items assessing the clarity of teaching regarding safe practices in the clinical setting, the consistency in handling PS issues by different preceptors, the opportunities for interaction with the interdisciplinary team, understanding the impact of reporting adverse events on driving change and reducing reoccurrence, the integration of PS within the overall program, the inclusion of clinical aspects like hand hygiene in the educational curriculum, and the thorough coverage of systems aspects of PS, such as policies and resources, in the program of study.

Students in all programmes agreed that their curriculum addressed broader PS issues, as evidenced by the high overall mean scores, ranging from 4.05 to 4.30. In addition, no statistically significant differences were observed in scores between the programmes (Table 3).

3.6. Students' Perceptions by Prior Experience Working in the Healthcare Setting. An additional comparison was performed to identify PS knowledge among students with and without prior experience working in the healthcare setting (Table 4). Students with prior experience working in the healthcare setting scored higher on PS knowledge related to the dimension of "recognise, respond to, and disclose adverse events and close calls" learned in the classroom and the clinical setting. Moreover, they scored significantly higher in the dimension of "working in teams with other health professionals" learned in the clinical setting.

4. Discussion

This study demonstrates that most students felt confident in what they learned regarding PS and generally reported high mean scores (>4.0/5.0) for learning PS in both classroom and clinical settings. This outcome aligns with the findings of

similar studies conducted with undergraduate nursing students in different countries [32, 33].

Students felt they gained the most confidence about almost all dimensions in the clinical settings rather than in the classroom. However, similar to some studies [32, 34], only the dimension of managing safety risks demonstrated a statistically significant difference. Conversely, there are mixed results in the literature, with studies demonstrating that students are generally more confident in their knowledge about PS gained in the classroom than in the clinical settings [35–38]. The characteristics of the sample in this study may explain these differences. Since most respondents were first-year students, they did not have prolonged exposure to classroom learning. As a result, the placement may have significantly impacted their learning. Additionally, it denotes how clinical placements help in the acquisition of essential knowledge and skills to ensure PS [39]. It suggests that optimising clinical placement and supervision for nursing students can be a central element of nursing education [40, 41].

This study's findings also revealed that BSc nursing students in all fields are less confident about their knowledge of PS gained in the classroom and clinical settings compared to the NA students, except for the dimensions of working in teams and managing risk learned in the clinical setting, which scored higher in the mental health nursing students. However, these differences were not statistically significant. These results diverge from similar research, which indicates that BSc students expressed better self-reported PS knowledge [32]. Children and learning disability nursing students had the lowest self-reported scores for the learning of PS acquired in classroom and clinical settings for most of the dimensions of the H-PEPPS questionnaire.

The aforementioned evidence highlights the need for higher education institutions (HEI) and nurse educators to address educational disparities in quality and safety among future nursing professionals and ensure that every graduate possesses optimal evidence-based knowledge, treatment, technical and nontechnical skills, and system-enhancement leadership abilities that can significantly contribute to achieving equity in PS culture and health [22, 42]. Additionally, diverse educational strategies using single and mixed teaching methods, such as lectures, online activities, problem-based learning, seminars, group and individual

TABLE 3: Difference in student's self-reported perceptions of knowledge in patient safety and broader aspects of patient safety between BSc nursing programmes (all fields) and nursing associates.

	BSc nursing programmes						Nursing associate* Mean (SD)	p value**
	Adult* Mean (SD)	Children* Mean (SD)	Learning disability* Mean (SD)	Mental health* Mean (SD)	Learning disability* Mean (SD)	Mental health* Mean (SD)		
<i>Learning in classroom</i>								
Clinical safety	4.40 (0.793)	4.35 (0.745)	4.28 (1.011)	4.29 (0.942)	4.56 (0.805)	4.25 (0.830)	0.641	
Working in teams	3.93 (0.803)	3.88 (0.593)	4.05 (1.115)	4.23 (0.828)	4.25 (0.830)	4.25 (0.830)	0.077	
Communicating effectively	4.28 (0.787)	4.32 (0.548)	4.19 (1.033)	4.46 (0.776)	4.49 (0.806)	4.49 (0.806)	0.490	
Manage risk	4.08 (0.801)	4.02 (0.560)	4.10 (1.016)	4.09 (1.093)	4.30 (0.810)	4.30 (0.810)	0.633	
Human and environmental factors	4.01 (0.878)	3.91 (0.725)	4.04 (1.101)	4.02 (1.105)	4.29 (0.843)	4.29 (0.843)	0.438	
Adverse events	4.05 (0.800)	3.95 (0.522)	3.86 (1.118)	4.16 (1.091)	4.34 (0.793)	4.34 (0.793)	0.199	
Culture of safety	4.06 (0.794)	4.17 (0.583)	4.14 (0.935)	4.19 (0.914)	4.37 (0.777)	4.37 (0.777)	0.364	
<i>Learning in clinical settings</i>								
Clinical safety	4.38 (0.696)	4.39 (0.729)	4.32 (0.994)	4.36 (0.862)	4.57 (0.801)	4.57 (0.801)	0.703	
Working in teams	3.96 (0.838)	3.91 (0.596)	4.04 (0.977)	4.33 (0.784)	4.15 (0.898)	4.15 (0.898)	0.099	
Communicating effectively	4.26 (0.784)	4.31 (0.538)	4.23 (1.009)	4.37 (0.924)	4.49 (0.769)	4.49 (0.769)	0.611	
Manage risk	4.12 (0.808)	4.19 (0.571)	4.00 (0.989)	4.30 (0.860)	4.29 (0.874)	4.29 (0.874)	0.413	
Human and environmental factors	4.07 (0.788)	4.02 (0.729)	3.94 (0.968)	4.10 (1.055)	4.24 (0.862)	4.24 (0.862)	0.748	
Adverse events	4.03 (0.763)	4.04 (0.713)	3.84 (1.087)	4.31 (0.896)	4.33 (0.831)	4.33 (0.831)	0.092	
Culture of safety	4.08 (0.746)	4.26 (0.598)	4.24 (0.994)	4.19 (0.896)	4.29 (0.827)	4.29 (0.827)	0.553	
<i>How broader PS issues are addressed in health professional education</i>								
	4.05 (0.68)	4.07 (0.50)	4.17 (0.99)	4.21 (0.80)	4.30 (0.80)	4.30 (0.80)	0.355	

PS: patient safety. SD: standard deviation. * Range 1–5. ** Mean differences were obtained using ANOVA, significance level <0.05.

TABLE 4: Difference in student's self-reported perceptions of knowledge in patient safety dimensions by prior experience working in the healthcare setting.

	Prior experience working in a healthcare setting		<i>p</i> value**
	No* Mean (SD)	Yes* Mean (SD)	
<i>Learning in classroom</i>			
Clinical safety	4.38 (0.836)	4.40 (0.821)	0.858
Working in teams	3.92 (0.786)	4.09 (0.823)	0.102
Communicating effectively	4.27 (0.774)	4.39 (0.767)	0.233
Manage risk	4.05 (0.773)	4.13 (0.876)	0.389
Human and environmental factors	3.98 (0.870)	4.07 (0.930)	0.447
Adverse events	3.95 (0.792)	4.18 (0.867)	0.036
Culture of safety	4.08 (0.806)	4.20 (0.783)	0.241
<i>Learning in clinical settings</i>			
Clinical safety	4.33 (0.775)	4.44 (0.754)	0.262
Working in teams	3.88 (0.863)	4.15 (0.770)	0.009
Communicating effectively	4.26 (0.806)	4.36 (0.771)	0.320
Manage risk	4.11 (0.799)	4.24 (0.806)	0.216
Human and environmental factors	4.01 (0.802)	4.14 (0.873)	0.234
Adverse events	3.98 (0.856)	4.20 (0.782)	0.038
Culture of safety	4.08 (0.784)	4.23 (0.773)	0.147

SD: standard deviation. *Range 1–5. **Mean differences were obtained using paired *t*-test, significance level <0.05.

discussions, clinical placements, skills laboratories, simulations, group work, and flipped classrooms, are recommended to enhance patient safety competence in undergraduate nursing students [23]. Other innovative methodologies using individual tutorials [43] and mobile web-based training [44] are also suggested to reinforce classroom learning in clinical settings. These approaches should cover key topics such as those recommended by various frameworks for PS education [25, 45, 46].

In this study, we observed that students with prior working experience in the healthcare setting demonstrated significantly greater PS knowledge acquired in the classroom and during placements for disclosing adverse events and close calls and for teamwork with other health professionals developed in clinical settings. They also scored higher in other dimensions, although these differences were not statistically significant. Healthcare experience before commencing nurse education programmes can be advantageous [47, 48]. However, the evidence is limited, and further research in this area using longitudinal research designs can track students over time to determine how prior working experience influences their knowledge and aspiration into the nursing profession.

Another key concept to consider in facilitating the hands-on experience of future nurses is the collaboration between HEI and healthcare organisations. These organisations can adopt a co-creation and user-centred design to co-create educational resources and training programmes to support individuals seeking to join the nursing profession and develop the values and behaviours of aspiring nurses [49]. Some strategies that could be implemented include the development of interactive digital educational resources [50], collaborative work between academics, service users and healthcare professionals for curriculum development, and skills session planning and delivery [51].

Students agreed that broader PS topics were well covered in their curriculum, which is a positive finding. This means that students can learn about their roles and develop teamwork skills through classroom instruction, collaboration with peers, and interactions with professionals. This knowledge helps them take responsibility for their actions, reflect on clinical experiences, and become effective contributors to a healthcare team [52]. However, since the study was conducted in a single institution, further research is needed to determine if the positive perceptions of PS education remain consistent across different nursing education institutions.

4.1. Limitations. This study has certain limitations, such as the low response rate and use of convenience sampling from only one university. Additionally, demographic data such as race and gender were not collected. These factors may limit the ability to generalise the results to other populations.

Response bias should be considered when interpreting the results of the study, as the H-PEPPS questionnaire used in the study relies on self-reported data. As a result, students may have rated their PS competencies higher than they actually were, possibly due to social desirability bias. This may be particularly true for students in apprenticeship programs and final-year students, who may feel that greater PS competence is more socially acceptable and expected.

Given the nature of the study design (cross-sectional) and limited data to adjust for, such as demographic data, the findings of this study do not necessarily imply a causal relationship.

5. Conclusions

This study highlights the importance of nursing education as a key determinant in shaping PS competence and PS awareness of nursing students in undergraduate

programmes. Clinical experience positively contributes to knowledge development through hands-on learning, role modelling, and shared responsibility among healthcare professionals to foster a safe culture. Notably, NA students demonstrated greater self-reported competencies in several dimensions, suggesting the effectiveness of the apprenticeship model.

We noted the influence of prior healthcare experience on students' PS knowledge, which emphasised the value of collaboration between educational institutions and healthcare organisations in shaping aspiring nurses. Additionally, continuous evaluation and standardisation is needed in PS education within nursing curricula. As the nursing profession continues to evolve, incorporating new roles like nursing associates, research, and evaluation remain crucial to understand and address the specific requirements and challenges of PS education.

This study serves as a foundation for future research, encouraging a continuous focus on enhancing PS competence among the next generations of healthcare professionals.

Data Availability

The data used to support this study's findings presented within the article are not available to maintain the confidentiality of the participants.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Authors' Contributions

Helena De Rezende conceptualized the study, proposed the methodology, performed formal analysis, investigated the study, wrote the original draft, reviewed the study, contributed to visualisation, performed project administration, and provided funding acquisition. Ann Ooms provided resources, contributed to data curation, and reviewed and edited the article. Guldane Damla Kaya wrote the original draft and reviewed and edited the article. Chao Wang performed formal analysis and reviewed and edited the article.

Acknowledgments

This research was supported by the Kingston University.

References

- [1] D. W. Bates and H. Singh, "Two decades since to err is human: an assessment of progress and emerging priorities in patient safety," *Health Affairs*, vol. 37, no. 11, pp. 1736–1743, 2018.
- [2] World Health Organisation, *Global Patient Safety Action Plan 2021-2030*, WHO, Geneva, Switzerland, 2021, <https://www.who.int/teams/integrated-health-services/patient-safety/policy/global-patient-safety-action-plan>.
- [3] World Health Organisation, *10 Facts on Patient Safety*, WHO, Geneva, Switzerland, 2019, <https://www.who.int/news-room/photo-story/photo-story-detail/10-facts-on-patient-safety>.
- [4] L. Slawomirski and N. Klazinga, "The economics of patient safety," *OECD Health Working Papers*, vol. 145, 2022.
- [5] L. Slawomirski, A. Aaraaen, and N. Klazinga, "The economics of patient safety: strengthening a value-based approach to reducing patient harm at national level," *OECD Health Working Papers*, vol. 96, 2017.
- [6] J. Farokhzadian, N. Dehghan Nayeri, and F. Borhani, "The long way ahead to achieve an effective patient safety culture: challenges perceived by nurses," *BMC Health Services Research*, vol. 18, no. 1, p. 654, 2018.
- [7] E. Oldland, M. Botti, A. M. Hutchinson, and B. Redley, "A framework of nurses' responsibilities for quality health-care—exploration of content validity," *Collegian*, vol. 27, no. 2, pp. 150–163, 2020.
- [8] J. Jackson, J. Maben, and J. E. Anderson, "What are nurses' roles in modern healthcare? a qualitative interview study using interpretive description," *Journal of Research in Nursing*, vol. 27, no. 6, pp. 504–516, Article ID 174498712110709, 2022.
- [9] M. J. Mansour, S. F. Al Shadafan, F. T. Abu-Sneineh, and M. M. AlAmer, "Integrating patient safety education in the undergraduate nursing curriculum: a discussion paper," *The Open Nursing Journal*, vol. 12, no. 1, pp. 125–132, 2018.
- [10] M. Vaismoradi, S. Tella, P. A. Logan, J. Khakurel, and F. Vizcaya-Moreno, "Nurses' adherence to patient safety principles: a systematic review," *International Journal of Environmental Research and Public Health*, vol. 17, no. 6, pp. 2028–2115, 2020.
- [11] Health Education England, *Improving Safety through Education and Training*, Health Education England, London, UK, 2016, <https://www.hee.nhs.uk/sites/default/files/documents/ImprovingSafetyThroughEducationAndTraining.pdf>.
- [12] G. R. Williamson, A. Kane, and J. Bunce, "Student nurses, increasing placement capacity and patient safety. A retrospective cohort study," *Nurse Education in Practice*, vol. 48, Article ID 102889, 2020.
- [13] H. Rezakhani Moghaddam, V. Aghamohammadi, M. Jafari, M. Absalan, and K. Nasiri, "Challenges faced by nursing students to work with nursing personnel: a qualitative study," *Advances in Medical Education and Practice*, vol. 11, no. 1, pp. 313–319, 2020.
- [14] L. R. Ginsburg, D. Tregunno, and P. G. Norton, "Self-reported patient safety competence among new graduates in medicine, nursing and pharmacy," *BMJ Quality and Safety*, vol. 22, no. 2, pp. 147–154, 2012.
- [15] M. Kirwan, O. Riklikiene, J. Gotlib, P. Fuster, and M. Borta, "Regulation and current status of patient safety content in pre-registration nurse education in 27 countries: findings from the Rationing - missed nursing care (RANCARE) COST Action project," *Nurse Education in Practice*, vol. 37, pp. 132–140, 2019.
- [16] A. W. Wu and I. M. Busch, "Patient safety: a new basic science for professional education," *GMS Journal for Medical Education*, vol. 36, no. 2, 2019.
- [17] H. De Rezende, A. M. F. Vitorio, A. S. Morais et al., "Effectiveness of educational interventions to develop patient safety knowledge, skills, behaviours and attitudes in undergraduate nursing students: a systematic review protocol," *BMJ Open*, vol. 12, no. 3, Article ID e058888, 2022.
- [18] C. A. Figueroa, R. Harrison, A. Chauhan, and L. Meyer, "Priorities and challenges for health leadership and workforce

- management globally: a rapid review,” *BMC Health Services Research*, vol. 19, no. 1, pp. 239–311, 2019.
- [19] T. Horton, A. Mehay, and W. Warburton, *Agility: The Missing Ingredient for NHS Productivity*, The Health Foundation, London, UK, 2020, <https://www.health.org.uk/publications/long-reads/agility-the-missing-ingredient-for-nhs-productivity>.
- [20] R. King, T. Ryan, E. Wood, A. Tod, and S. Robertson, “Motivations, experiences and aspirations of trainee nursing associates in England: a qualitative study,” *BMC Health Services Research*, vol. 20, no. 1, p. 802, 2020.
- [21] R. King, S. Laker, S. Alden et al., “Training and development experiences of nursing associate trainees based in primary care across England: a qualitative study,” *Primary Health Care Research & Development*, vol. 24, p. e32, 2023.
- [22] S. E. Lee, B. L. Morse, and N. W. Kim, “Patient safety educational interventions: a systematic review with recommendations for nurse educators,” *Nursing Open*, vol. 9, no. 4, pp. 1967–1979, 2021.
- [23] H. De Rezende, A. M. F. Vitorio, A. S. Morais et al., “The effectiveness of educational interventions to develop patient safety knowledge, skills, behaviours, and attitudes in undergraduate nursing students: a systematic review,” in *Proceedings of the 7th European Regional Sigma Conference 2024*, Bournemouth, United Kingdom, June 2024.
- [24] R. M. Epstein, “Assessment in medical education,” *New England Journal of Medicine*, vol. 356, no. 4, pp. 387–396, 2007.
- [25] World Health Organisation, *Patient Safety Curriculum Guide Multi-Professional Edition*, WHO, Geneva, Switzerland, 2011, https://apps.who.int/iris/bitstream/handle/10665/44641/9789241501958_eng.pdf.
- [26] J. Raymond, J. Medves, and C. Godfrey, “Perspectives on patient safety among practical nursing students,” *Canadian Journal of Nursing Research*, vol. 48, no. 2, pp. 41–47, 2016.
- [27] E. VanDenKerkhof, N. Sears, D. S. Edge, D. Tregunno, and L. Ginsburg, “Patient safety in practical nurses’ education: a cross-sectional survey of newly registered practical nurses in Canada,” *Nurse Education Today*, vol. 51, pp. 48–56, 2017.
- [28] M. Djukic, A. W. Stimpfel, and C. Kovner, “Bachelor’s degree nurse graduates report better quality and safety educational preparedness than associate degree graduates,” *Joint Commission Journal on Quality and Patient Safety*, vol. 45, no. 3, pp. 180–186, 2019.
- [29] J. P. Vandenbroucke, E. von Elm, D. G. Altman et al., “Strengthening the reporting of observational studies in epidemiology (STROBE): explanation and elaboration,” *PLoS Medicine*, vol. 4, no. 10, p. e297, 2007.
- [30] D. A. Dillman, J. D. Smyth, and L. M. Christian, *Internet, Phone, Mail, and Mixed-Mode Surveys: The Tailored Design Method*, Wiley, Hoboken, NJ, USA, 4th edition, 2014.
- [31] L. Ginsburg, E. Castel, D. Tregunno, and P. G. Norton, “The H-PEPSS: an instrument to measure health professionals’ perceptions of patient safety competence at entry into practice,” *BMJ Quality and Safety*, vol. 21, no. 8, pp. 676–684, 2012.
- [32] L. M. Rebesch, “Perceived patient safety competence of baccalaureate nursing students: a descriptive comparative study,” *SAGE Open Nursing*, vol. 6, Article ID 237796082093013, 2020.
- [33] M. Dimitriadou, A. Merkouris, A. Charalambous, C. Lemonidou, and E. Papastavrou, “The knowledge about patient safety among undergraduate nurse students in Cyprus and Greece: a comparative study,” *BMC Nursing*, vol. 20, no. 1, p. 110, 2021.
- [34] P. C. Colet and J. P. Cruz, “Patient safety competence of nursing students in Saudi Arabia: a self-reported survey,” *International Journal of Health Sciences*, vol. 9, no. 4, pp. 411–419, 2015.
- [35] K. Usher, C. Woods, G. Parmenter et al., “Self-reported confidence in patient safety knowledge among Australian undergraduate nursing students: a multi-site cross-sectional survey study,” *International Journal of Nursing Studies*, vol. 71, pp. 89–96, 2017.
- [36] N. N. Mbuthia and M. M. Moleki, “Preregistration nursing students’ perceived confidence in learning about patient safety in selected Kenyan universities,” *Curationis*, vol. 42, no. 1, pp. e1–e7, 2019.
- [37] F. F. Huang, X. Y. Shen, X. L. Chen, L. P. He, S. F. Huang, and J. X. Li, “Self-reported confidence in patient safety competencies among Chinese nursing students: a multi-site cross-sectional survey,” *BMC Medical Education*, vol. 20, no. 1, p. 32, 2020.
- [38] A. Sümen, A. Ünal, and S. Aksoy, “Nursing students’ self-reported experiences and attitudes regarding patient safety: a cross-sectional study comparing the classroom and clinical settings,” *Collegian*, vol. 29, no. 3, pp. 320–327, 2022.
- [39] S. Tella, N. J. Smith, P. Partanen, D. Jamookeeah, M. L. Lamidi, and H. Turunen, “Learning to ensure patient safety in clinical settings: comparing Finnish and British nursing students’ perceptions,” *Journal of Clinical Nursing*, vol. 24, no. 19–20, pp. 2954–2964, 2015.
- [40] K. E. Amsrud, A. Lyberg, and E. Severinsson, “The influence of clinical supervision and its potential for enhancing patient safety - undergraduate nursing students’ views,” *Journal of Nursing Education and Practice*, vol. 5, no. 6, 2015.
- [41] M. Garcia-Gámez, J. M. Morales-Asencio, S. Garcia-Mayor et al., “A scoping review of safety management during clinical placements of undergraduate nursing students,” *Nursing Outlook*, vol. 67, no. 6, pp. 765–775, 2019.
- [42] H. E. M. Haskins and L. Roets, “Nurse leadership: sustaining a culture of safety,” *Health SA Gesondheid*, vol. 27, no. 0, p. 2009, 2022.
- [43] L. Kent, G. Anderson, R. Ciocca, L. Shanks, and M. Enlow, “Effects of a senior practicum course on nursing students’ confidence in speaking up for patient safety,” *Journal of Nursing Education*, vol. 54, no. 3, pp. S12–S15, 2015.
- [44] J. W. Oh and J. E. Kim, “Effectiveness of a virtual reality application-based education programme on patient safety management for nursing students: a pre-test–post-test study,” *Nursing Open*, vol. 10, no. 12, pp. 7622–7630, 2023.
- [45] L. Cronenwett, G. Sherwood, J. Barnsteiner et al., “Quality and safety education for nurses,” *Nursing Outlook*, vol. 55, no. 3, pp. 122–131, 2007.
- [46] T. Levett-Jones, T. Dwyer, K. Reid-Searl et al., “Patient safety competency framework (PSCF) for nursing students,” 2017, https://psframework.wpengine.com/wp-content/uploads/2018/01/PSCF_Brochure_UTS-version_FA2-Screen.pdf.
- [47] C. J. Whiffin, D. Baker, L. Henshaw, J. J. Nichols, and M. Pyer, “Am I a student or a healthcare assistant? a qualitative evaluation of a programme of pre-nursing care experience,” *Journal of Advanced Nursing*, vol. 74, no. 11, pp. 2610–2621, 2018.
- [48] S. Cameron and B. Parkinson, “Nursing students’ experiences of working as healthcare support workers,” *Nursing Standard*, vol. 38, no. 5, pp. 32–37, 2023.
- [49] T. Janamian, A. True, P. Dawda, M. Wentzel, and T. Fraser, “Co-creating education and training programs that build workforce capacity to support the implementation of

- integrated health care initiatives,” *Medical Journal of Australia*, vol. 216, no. 10, pp. S9–S13, 2022.
- [50] K. A. Laugaland, K. Akerjordet, C. T. Frøiland, and I. Aase, “Co-creating digital educational resources to enhance quality in student nurses’ clinical education in nursing homes: report of a co-creative process,” *Journal of Advanced Nursing*, vol. 79, no. 10, pp. 3899–3912, 2023.
- [51] S. O’Connor, M. Zhang, K. K. Trout, and A. K. Snibsoer, “Co-production in nursing and midwifery education: a systematic review of the literature,” *Nurse Education Today*, vol. 102, no. 3, Article ID 104900, 2021.
- [52] M. H. Oermann and T. Shellenbarger, “Clinical education in nursing: current practices and trends,” *Clinical Education for the Health Professions*, pp. 1–20, Springer, Berlin, Germany, 2020.