

Exploring The Research of Interprofessional Education and Collaboration for Patient Safety: A Bibliometric Analysis

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ABSTRACT

Background: Patient safety is a critical priority in healthcare, aiming to prevent harm and ensure optimal care delivery. Despite the inherent risks in health services, the 'to err is human' paradigm suggests that errors often stem from systemic issues rather than individual failings. Effective patient safety relies heavily on improved system design and the education of healthcare professionals with a focus on safety readiness. Integrating patient safety education into interprofessional education (IPE) frameworks is essential for fostering effective communication and teamwork, which are crucial for reducing structural system errors and enhancing care quality.

Aims: To map the research landscape on patient safety and IPE, examining trends, countries, and thematic relationships within the field specifically focusing on how IPE addresses structural system errors in patient safety.

Methods: This study conducts a bibliometric analysis using VOS viewer software, the analysis covers publications from January 2000 to July 2024, focusing on data from SCOPUS.

Results: Results reveal a growing body of research on patient safety with IPE, highlighting notable simulation-based training and interprofessional collaboration trends. The analysis demonstrates an evolution from individual-focused approaches to system-based interventions. However, there is a clear need for more systematic and culturally nuanced studies, particularly in Southeast Asia, where research is limited.

Conclusion: The findings underscore the importance of incorporating patient safety principles within IPE curricula and highlight research gaps, especially in contexts such as Indonesia and other Southeast Asian countries. Future research should address these gaps, explore the impact of IPE on structural system errors across diverse settings, and foster international collaboration to standardize and enhance educational practices in healthcare.

Keywords: Bibliometric analysis, interprofessional collaboration, interprofessional education, medical education, patient safety.

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PRACTICE POINTS

- Research on patient safety with IPE from 2000-2024 shows evolution from skill-based to system-based safety education approaches
- IPE research demonstrates potential for addressing structural system errors through multi-level interventions.
- Future research needs to explore culturally-responsive IPE models on patient safety across diverse settings and foster international collaboration to standardize and enhance educational practices in healthcare.

INTRODUCTION

Patient safety is a crucial priority in health services, serving as one of its main outcomes.¹ It can be defined as the absence of unwanted events and the measures taken to prevent them from occurring.² Unsafe health service practices have the potential to cause severe harm to patients, including accidents, death, or disability.³ The World Health Organization (WHO) reports that one in ten patients experiences a medical incident that compromises safety in hospital settings, leading to 134 million adverse outcomes and an estimated 2.6 million deaths annually.⁴ Due to this significant impact, patient safety is a fundamental component of the strategic objectives of the global healthcare system.⁵

The idea that 'to err is human' emphasizes that errors are typically not due to the incompetence of healthcare workers.⁶ Rather, they are often linked to deficiencies in the prevention structure. The issue lies not with individuals but with a system that needs to be designed to be safer. A change in basic assumptions is essential, along with increased awareness of the systems that cause errors and the factors contributing to critical events.⁷ Therefore, it is important to prepare healthcare workers with 'patient safety readiness.' By prioritizing patient safety in medical education, a solid foundation can be built to better prepare students for future practice.⁸

In the context of patient safety, it is important to distinguish between Interprofessional Education (IPE) and Interprofessional Collaborative Practice (IPCP). IPE is defined as a learning process in which

students from two or more healthcare professions learn together (with, from, and about each other) to improve collaboration and the quality of patient care. Meanwhile, IPCP refers to actual clinical practice in which practitioners from multiple healthcare professions work collaboratively with patients, families, and communities to provide high-quality care.⁹

While both are interconnected within the healthcare workforce development continuum, this study specifically focuses on IPE as an educational intervention designed to prepare healthcare students with the collaborative competencies necessary for patient safety. The IPE was chosen because education serves as an upstream foundation that can prevent errors in structured systems by developing a collaborative mindset and competencies from the preclinical stage, before professionals enter clinical practice.¹⁰

Globally, the healthcare system is facing growing challenges caused by escalating global health concerns and demands, escalating healthcare expenses, shortages in the healthcare workforce, and insufficient recognition and appreciation for the valuable contributions made by healthcare professionals.^{9,10} In addressing the ongoing problems of enhancing healthcare quality in the 21st century, the establishment of a collaborative healthcare team is crucial for achieving better health results. Recent studies in the field of IPE have shown that health professionals have been collaborating in teams to effectively manage complex practice circumstances

that demand systematic and informed cooperation among many professions and professional specialties.¹¹

Effective communication and teamwork are essential requirements for ensuring patient safety.¹² Effective communication and teamwork are core components of interprofessional collaboration. Therefore, it is crucial to teach healthcare professional students to learn together, enhancing their cooperation and communication skills to support patient safety. The significance of this approach is widely recognized by national and interprofessional accreditation bodies. The WHO strongly recommends integrating interprofessional competencies into the curriculum for each health profession. Patient safety education within the context of interprofessional education (IPE) enhances patient outcomes, improves safety culture and teamwork climate, and elevates the quality of health services.¹³

The development of diverse learning approaches in patient safety education and interprofessional collaboration has led to a substantial body of research from various perspectives, significantly advancing studies related to patient safety education within the context of IPE.^{14,15} As the volume of scientific publications on this subject gradually increases, capturing a comprehensive overview of the literature on patient safety and interprofessional education (IPE) becomes challenging. While IPE continues to evolve, and patient safety values differ across institutions, education and training remain a priority.¹⁶ There is a need for a systematic review and synthesis within an interprofessional context to provide researchers with a thorough understanding of patient safety education from an interprofessional perspective, as well as a comprehensive summary of available research.

This study conducted a Bibliometric analysis to provide insights into patient safety research, with a focus on interprofessional education.¹⁷ It examined various aspects such as countries, years of publication, authors, and the most-cited journals. The analysis aimed to determine and explain the structure of subject areas related to patient safety and their interrelationships within the context of

interprofessional education, specifically focusing on how structural systems errors can be addressed through IPE research.¹⁶

This study aims to analyze the evolution of the Interprofessional Education (IPE) research landscape in the context of patient safety from a bibliometric perspective and to identify aspects of the patient safety system that have and have not been adequately explored through the IPE approach. Specifically, this study aims to examine the temporal trends in the volume and focus of IPE-patient safety research during the period 2000-2024, identify the geographic distribution of countries and regions that dominate IPE research for patient safety, and detect existing geographic gaps. In addition, this study also aims to analyze the research themes most frequently explored in the context of IPE-patient safety and identify emerging themes. Furthermore, this study aims to identify aspects of the patient safety system that still require further exploration through the IPE approach, thereby providing directions for the development of future research in this field.

METHODS

A bibliometric study was conducted to create a comprehensive knowledge map of interprofessional education and collaboration in relation to patient safety.

Data from SCOPUS was retrieved and analyzed using VOS viewer, a software tool for constructing and visualizing bibliometric networks. This study focuses on research trends related to patient safety and interprofessional collaboration among medical and health science students. The time range of the extracted data spans from January 1, 2000, to July 23, 2024, which is the date of data download.

Searching strategy and data collection

Based on the title of the article, abstract, and keywords—"patient safety" AND ("interprofessional" OR "collaborator*") AND ("student*" OR "learner*")—724 documents were obtained. Furthermore, the data were cleaned using inclusion criteria. The articles included in the bibliometric

analysis are those that discuss topics in the field of medicine and health and are written in English. The types of documents included in the data source are research articles, reviews, and conference papers. Articles outside the fields of medicine and health were excluded from the data sources.

The search formula used was as follows: TITLE-ABS-KEY ("patient safety" AND ("interprofessional" OR collaborat*) AND (student OR learner)) AND (LIMIT-TO (SUBJAREA , "MEDI") OR LIMIT-TO (SUBJAREA , "HEAL") OR LIMIT-TO (SUBJAREA , "NURS") OR LIMIT-TO (SUBJAREA , "PHAR")

OR LIMIT-TO (SUBJAREA , "PSYC") OR LIMIT-TO (SUBJAREA , "DENT") OR LIMIT-TO (SUBJAREA , "NEUR") OR LIMIT-TO (SUBJAREA , "MULT")) AND (LIMIT-TO (DOCTYPE , "ar") OR LIMIT-TO (DOCTYPE , "re") OR LIMIT-TO (DOCTYPE , "cp")) AND (LIMIT-TO (SRCTYPE , "j")) AND (LIMIT-TO (LANGUAGE , "English")).

Data analysis

The results yielded 535 documents, consisting of 306 articles related to "medicine," 224 articles on "nursing," 39 articles on "health professions,"

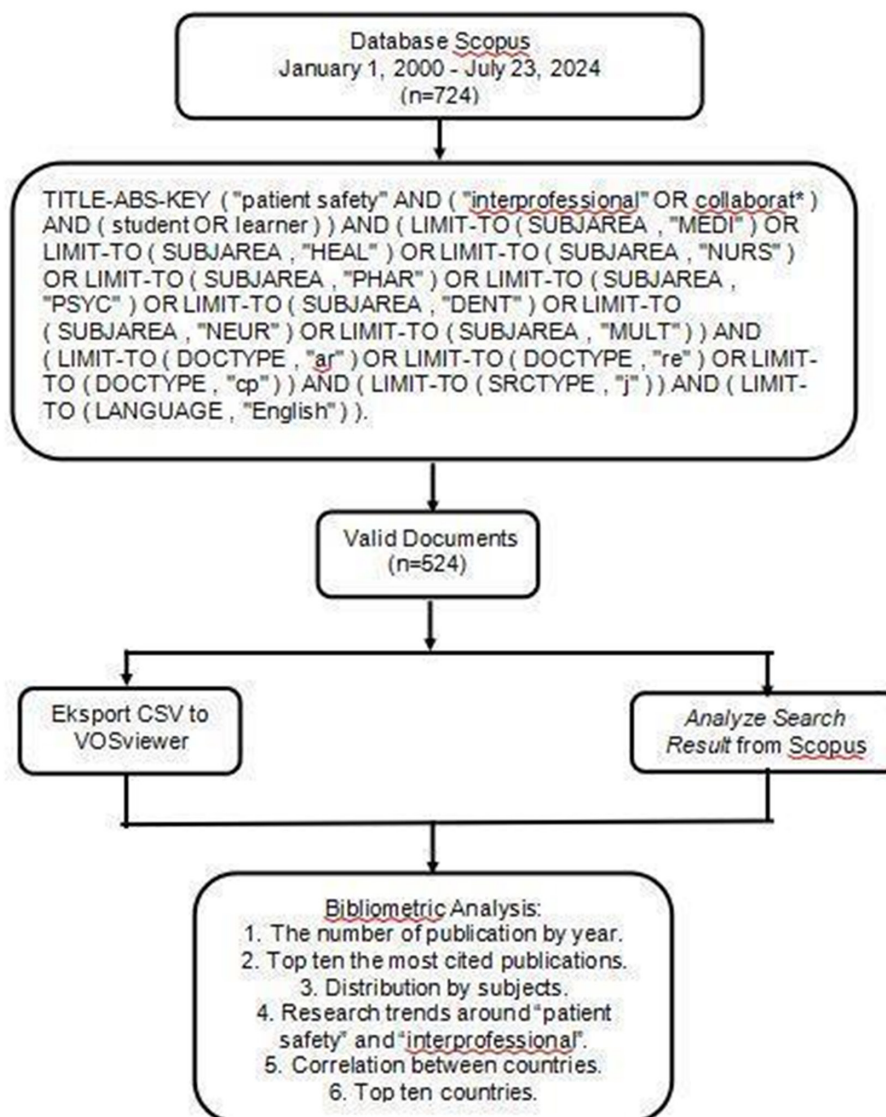


Figure 1. Research Flow

33 articles on "pharmacology, toxicology, and pharmaceuticals," 7 articles related to "dentistry," 7 articles related to "psychology," 3 articles related to "neuroscience," and 2 articles on "multidisciplinary" topics. Of the 535 documents, 469 are articles, 60 are reviews, and 6 are conference papers.

The data analysis employs bibliometrics to generate visual representations using VOS viewer software. This tool creates maps showing the frequency of co-occurrence and connections between keywords. The mapping results highlight current research trends and suggest areas for further exploration. Data from Scopus is exported in CSV format for visualization in VOS viewer. The analysis uses a descriptive method, where circles represent country and author keywords. The distance between circles reflects the strength of the relationship between terms, with greater distances indicating weaker connections. Assorted colors in the visualization denote various term clusters, while the size of the circles corresponds to term frequency. The thickness of the lines indicates the strength of the relationships, with larger circles representing higher term frequencies.¹⁸

The analysis began by providing information related to the study, including the number of publications recorded in the Scopus database by year, the top ten most-cited articles, document types, subject areas, the country of origin, and the network between countries in publications related to patient safety research and interprofessional collaboration among medical and health profession students. VOS viewer emphasizes topics that have become trending and developing in recent years, such as interprofessional education (IPE), patient safety, interprofessional teamwork, quality of care, primary care, and co-authorship, which have the potential to become key areas for research collaboration. The research flow is illustrated in Fig 1.

Ethical clearance

Ethical clearance is not required in this study.

RESULTS AND DISCUSSION

Analysis of the Evolution of IPE Research : Publication Trends and the Transformation of the Patient Safety Paradigm

Publication on this topic began in 2000 (see Fig. 2). The first article published was "Student nurses' lived experience of preceptorship. Part 2-The preceptor-preceptee relationship," which was published in the International Journal of Nursing Studies and has been cited 40 times.¹⁹ Although the article does not directly address patient safety and interprofessional education, it has implications for patient safety in the context of the nursing student's experience with their supervisor. Specifically, it explores how the relationship between the supervisor and the preceptee can impact safe nursing learning and practice. While interprofessional education is not explicitly mentioned, the importance of collaboration and communication in safe nursing practice is implied. The article focuses more on the nursing students' experiences and the dynamics of their relationship with the supervisor within a clinical learning environment.⁽¹⁹⁾ Time-based analysis shows a significant paradigm shift from an individual approach to a structured systems approach, especially after 2012. This surge in publications is in line with the growing awareness that errors in healthcare are more often rooted in system failures than individual failures, as emphasized in the philosophy "to err is human."

Publications have surged from 2012 to the present. This indicates an increased interest of researchers in the topics of patient safety and Interprofessional Education and Interprofessional Collaboration. The COVID-19 events that occurred in 2019-2020, which prompted collaborative practices around the world, are likely to contribute to increasing research on interprofessional collaboration.

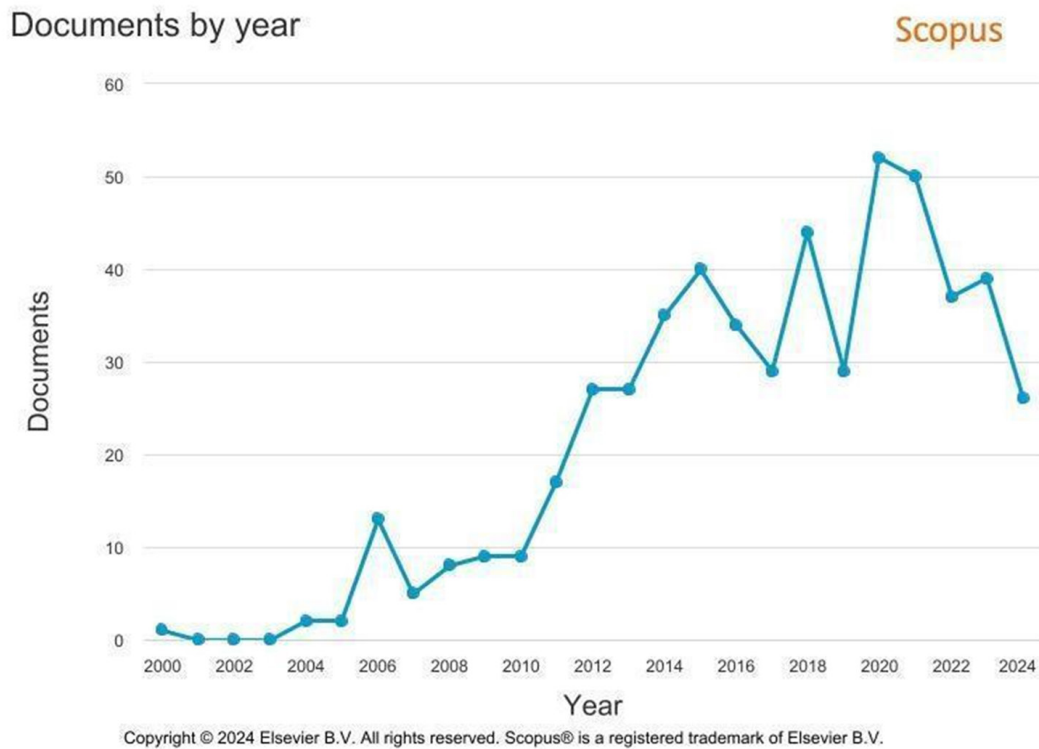


Figure 2. Publication trends by year related to Interprofessional and patient safety

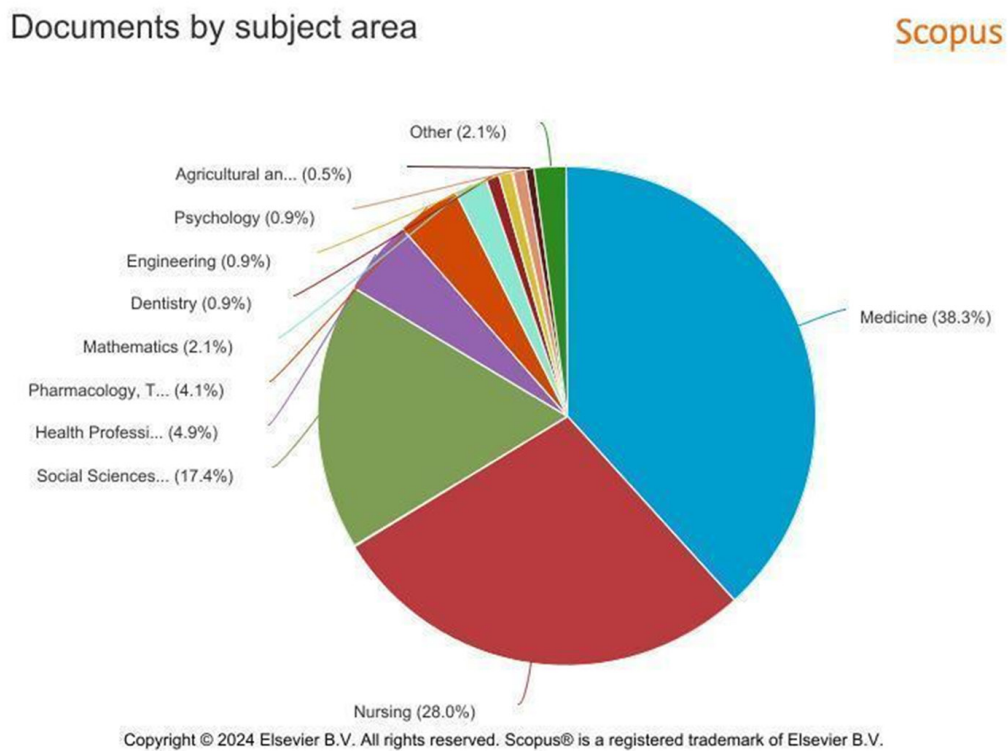


Figure 3. Distribution of publications by subject area

Top ten most cited publications

Table 1 shows the ten most-cited articles based on the SCOPUS database. One of the most cited articles is "Training and Simulation for Patient Safety," published in 2010 in *Quality & Safety in Health Care*.²⁰ This article explicitly advocates for a systemic approach through interprofessional simulation. It emphasizes that patient safety can be improved through restructuring education and training systems, not simply through improving individual competencies. This indicates the evolution of IPE research from a focus on general interprofessional collaboration to structured, systems-based interventions to address the root causes of patient safety problems.

Interprofessional education is essential as a strategy for improving patient safety. By prioritizing teamwork among different health disciplines, interprofessional education helps reduce errors and improve patient care outcomes. For example, the Crew Resource Management (CRM) model, originally used in the aviation industry, has been adapted to enhance patient safety in hospitals by training healthcare teams to work together effectively.²⁰ In its development, patient safety is not only researched in the field of medicine but also in other health-related fields. The subject area that has been published about patient safety and interprofessional collaboration is shown in Fig 3.

Table 1. Top 10 most cited publications

Rank	Document Title	Authors	Source	Year	Cited by
1	Training and simulation for patient safety.	Aggarwal, R., Mytton, O.T., Derbrew, M., Ziv, A., Reznick, R.	Quality & safety in health care, 19 Suppl 2	2010	457
2	Interprofessional education in team communication: Working together to improve patient safety.	Brock, D., Abu-Rish, E., Chiu, C.-R., Liner, D., Zierler, B.	BMJ Quality and Safety, 22(5), pp. 414-423	2013	197
3	Teaching residents the two-challenge rule: A simulation-based approach to improve education and patient safety.	Pian-Smith, M.C.M., Simon, R., Minehart, R.D., Walzer, T., Raemer, D.	Simulation in Healthcare, 4(2), pp. 84-91	2009	191
4	Is high-fidelity simulation the most effective method for the development of non-technical skills in nursing? A review of the current evidence.	Lewis, R., Strachan, A., Smith, M.M.	Open Nursing Journal, 6(1), pp. 82-89	2012	157
5	The teaching of a structured tool improves the clarity and content of interprofessional clinical communication.	Marshall, S., Harrison, J., Flanagan, B.	Quality and Safety in Health Care, 18(2), pp. 137-140	2009	157
6	An interprofessional communication training using simulation to enhance safe care for a deteriorating patient.	Liaw, S.Y., Zhou, W.T., Lau, T.C., Siau, C., Chan, S.W.C.	Nurse Education Today, 34(2), pp. 259-264	2014	139
7	A history of simulation-enhanced interprofessional education.	Palaganas, J.C., Epps, C., Raemer, D.B.	Journal of Interprofessional Care, 28(2), pp. 110-115	2014	108
8	A systematic review of teamwork training interventions in medical student and resident education.	Chakraborti, C., Boonyasai, R.T., Wright, S.M., Kern, D.E.	Journal of General Internal Medicine, 23(6), pp. 846-853	2008	108

Rank	Document Title	Authors	Source	Year	Cited by
9	Improving teamwork: Impact of structured interdisciplinary rounds on a medical teaching unit.	O'Leary, K.J., Wayne, D.B., Haviley, C., Lee, J., Williams, M.V.	Journal of General Internal Medicine, 25(8), pp. 826–832	2010	106
10	Interprofessional education in team communication: Working together to improve patient safety.	Brock, D., Abu-Rish, E., Chiu, C.-R., Liner, D., Zierler, B.	Postgraduate Medical Journal, 89(1057), pp. 642–651	2013	104

Source: SCOPUS database (2024)

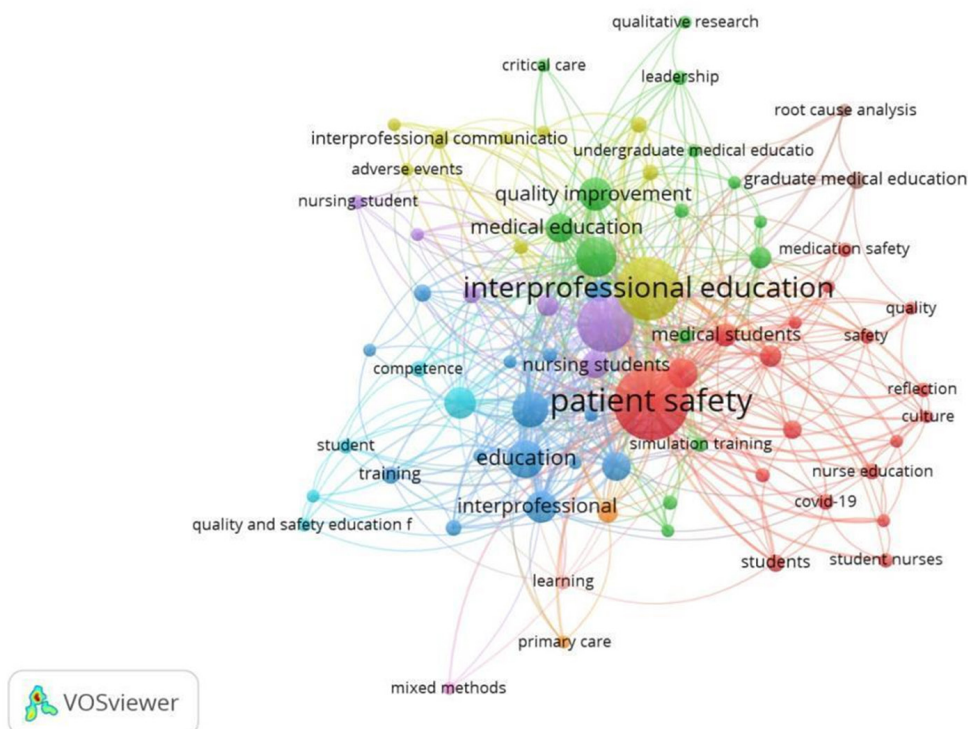


Figure 4. Most popular research themes on patient safety

Analysis of publications by subject area

Figure 3 shows that the most researched area is medicine (38.3%), followed by nursing (28.0%) and social sciences (17.4%). The next positions are occupied by other health professions like pharmacology, dentistry, psychology, and others, each in a percentage of less than 5%. This indicates that opportunities to develop research on IPE and patient safety are still incredibly open in the field of health, other than medicine and nursing. Meanwhile, the research theme that has been studied is shown in fig 4.

Research Keywords related to patient safety in the context of IPE/IPC

Figure 4 illustrates the research themes related to “patient safety.” Using VOS viewer, the network of keywords associated with patient safety and interprofessional education is visualized. Among these themes, interprofessional education demonstrated the most substantial relationship with patient safety. Furthermore, several topics, such as culture, quality care, leadership, quality and safety education, and primary care, have been understudied, suggesting potential areas for addressing structural system flaws through IPE interventions.

Keyword co-occurrence analysis in this study revealed clusters of themes that could be categorized based on the system level of intervention, reflecting the complexity of the IPE approach to improving patient safety. At the micro-system level, focusing on individuals and teams, the study demonstrated the dominance of interprofessional communication and teamwork themes, indicated by the large circle size in the network visualization, which indicates a high frequency of occurrence in the literature. This theme was reinforced by the development of simulation-based training to improve non-technical skills and the implementation of structured communication tools, which have proven effective in reducing communication errors between healthcare professionals.

At the meso-system level, operating at the organizational level, the study identified a focus on quality improvement initiatives and the development of a safety culture as essential foundations for creating a work environment that supports safe interprofessional practice. Leadership in the context of patient safety emerged as a crucial theme linking IPE initiatives to patient safety outcomes, while competency-based education integrated with institutional standards demonstrates a systematic effort to ensure consistent interprofessional competency across the organization.

Meanwhile, at the macro-system level encompassing the broader health system, the analysis shows the emergence of primary care collaboration as an emerging trend, highlighted in yellow in the network visualization, indicating a shift in research focus toward primary care settings. Health policy and standardization of interprofessional practice reflect systemic efforts to create a regulatory framework that supports IPE implementation, while cross-cultural collaboration in a global context demonstrates an awareness of the importance of cultural adaptation in implementing IPE approaches for patient safety across various international settings

The trend research related to interprofessional education and patient safety

The VOS viewer visualization depicts primary care in yellow, indicating that it is a new research topic related to interprofessional and patient safety (see

Fig. 5). The primary care landscape has undergone a significant transformation, with increasing recognition of the critical role that collaboration between professionals plays in improving patient safety and healthcare outcomes.²¹ This emerging trend represents an opportunity for IPE to address system-level interventions in primary care settings, where structural errors can be prevented at the point of first contact with healthcare systems. Traditionally, primary care teams have been characterized by a diverse range of healthcare professionals, each with unique expertise and responsibilities. However, the complexity of patient care needs, combined with the growing demands on primary care systems, has underscored the necessity for effective collaboration among these professionals.²²

Researchers have identified that no single profession can adequately address the multifaceted care demands of patients, underscoring the importance of collaboration to promote patient-centered care and improve patient outcomes.²³ The development of interprofessional collaboration is a crucial step in facilitating the transfer of information, coordinating services, and ensuring the provision of safe and reliable care.¹¹ Moreover, the COVID-19 pandemic has further highlighted the critical value of collaboration among healthcare providers, organizations, and institutions in addressing unprecedented challenges and delivering the highest quality of care.²⁴ To address these challenges, healthcare systems are increasingly implementing educational and training models that foster interprofessional collaboration.²⁵ These models aim to equip future healthcare providers with the necessary skills and competencies to work effectively in interprofessional teams, thereby enhancing patient safety, quality of care, and overall healthcare outcomes. By integrating interprofessional competencies into educational curricula, in-service training, and continuous education, healthcare systems can establish a culture that supports collaboration and leverages the unique strengths of each healthcare profession.²⁶

Bibliometric analysis reveals a paradigm shift in IPE from a skills-based learning approach to a systems-based safety education approach.

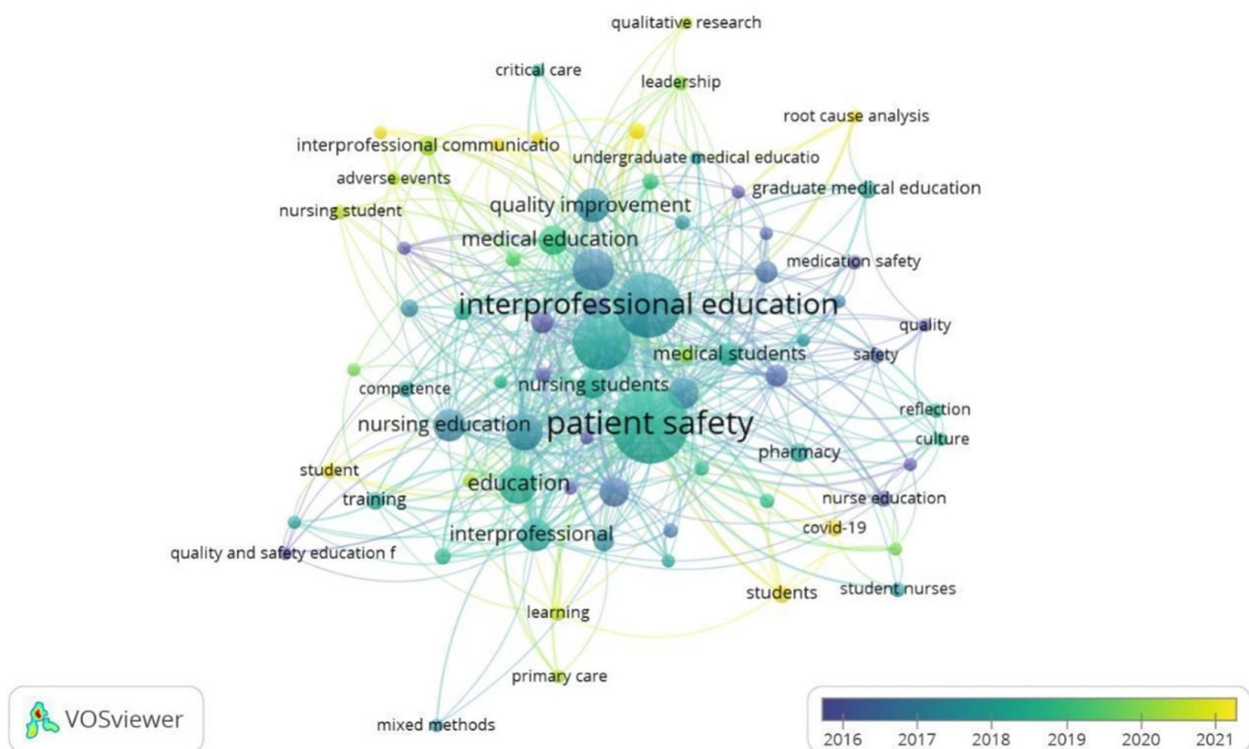


Figure 5. The trend in patient safety and IPE research

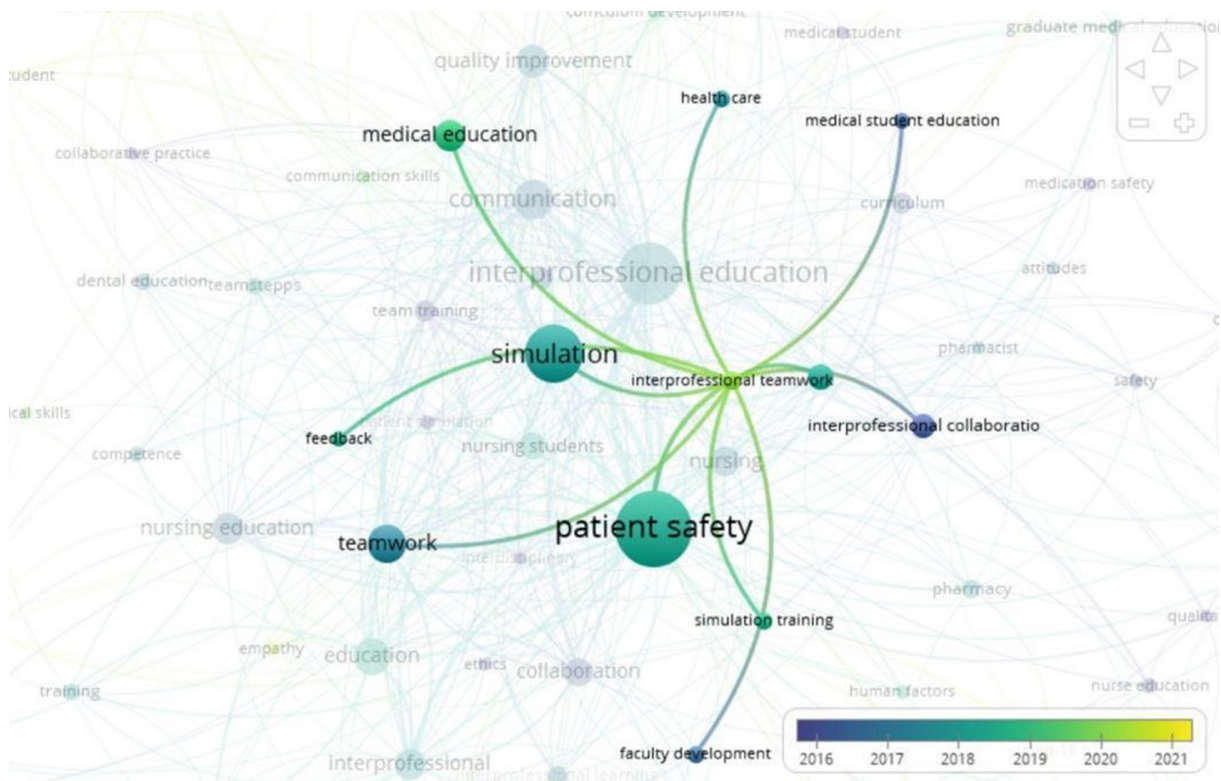


Figure 6. Interprofessional collaborative research has evolved into interprofessional teamwork focused on patient safety, simulation, teamwork, medical education, and healthcare

This finding aligns with literature showing that early-generation IPE (2000–2010) focused more on developing communication and teamwork skills, while contemporary IPE (2010–present) explicitly integrates patient safety principles into interprofessional curricula.²⁶

Barr et al. (2013) identified four outcomes of IPE: reaction, learning, behavior change, and results. Bibliometric findings indicate that most research remains at the 'learning outcomes' level, while evaluation of 'results' in patient safety systems is still limited.²⁹ Reeves et al. (2017) in a systematic review emphasized the importance of IPE based on a theoretical framework. Keyword analysis showed that the research themes 'theoretical framework' and 'curriculum development' still had low connectivity, indicating a gap in the development of theory-driven IPE.³⁵

Publications related to interprofessional teamwork

The development of research trends on interprofessional collaboration is shown in Fig. 6. A small amount of research related to interprofessional collaboration was published before 2016 (indicated in purple color), while research on patient safety has been published only in recent years (indicated in green color). Research on patient safety can also relate to other areas such as interprofessional teamwork, simulation, health care, medical student education, medical education, simulation training, and faculty development.

Incorporating patient safety principles within interprofessional competencies provides a structured incentive for clinical teams to prioritize maintaining and promoting safety. This includes fostering a culture of safety within the healthcare system, where all team members feel empowered to voice concerns and potential hazards, report errors or adverse health outcomes, and participate in root cause analysis.^{27,28} The topics addressed in this study were relevant to these issues. However, the lack of information and evidence indicates a need for further investigation.

Patient safety and interprofessional teamwork are crucial components of contemporary healthcare delivery systems, contributing to better outcomes for both patients and providers. Interprofessional education (IPE) aims to enable effective collaboration and enhance patient safety by reducing the risk of harm.²⁹ Patient safety initiatives are supported by IPE, which fosters collaboration and teamwork among healthcare professionals from diverse disciplines.³⁰ IPE emphasizes the importance of establishing boundaries, effective communication, and collaborative autonomy as essential features for providing high-quality, patient-centered care.³¹

Patient safety is linked to interprofessional teamwork. Moreover, quality improvement inevitably leads us toward education and competencies, all of which contribute to advancing healthcare delivery and improving patient outcomes. Patient safety involves preventing errors and mishaps in healthcare by emphasizing system processes and communication to ensure safer care.^{31,32}

Patient safety-focused quality improvement initiatives are systematic efforts aimed at enhancing processes, outcomes, and patient satisfaction. Healthcare teams can leverage the diverse opinions and skills brought by interprofessional education (IPE) to identify problem areas for quality improvement projects and adopt evidence-based practices effectively while monitoring outcomes.^{27,33} This study revealed limited information on how interprofessional education impacts patient safety. Further research is needed to explore how educational contexts can bridge the gap between academic processes and clinical collaboration.

The top ten countries that conduct research on patient safety and international collaboration are shown in Fig. 7.

Figure 7 highlights the top ten countries that have researched patient safety and interprofessional education and collaboration, but none of these countries are from Southeast Asia. The researchers from Southeast Asian countries might still have considerable opportunities for research in patient safety and interprofessional collaboration.

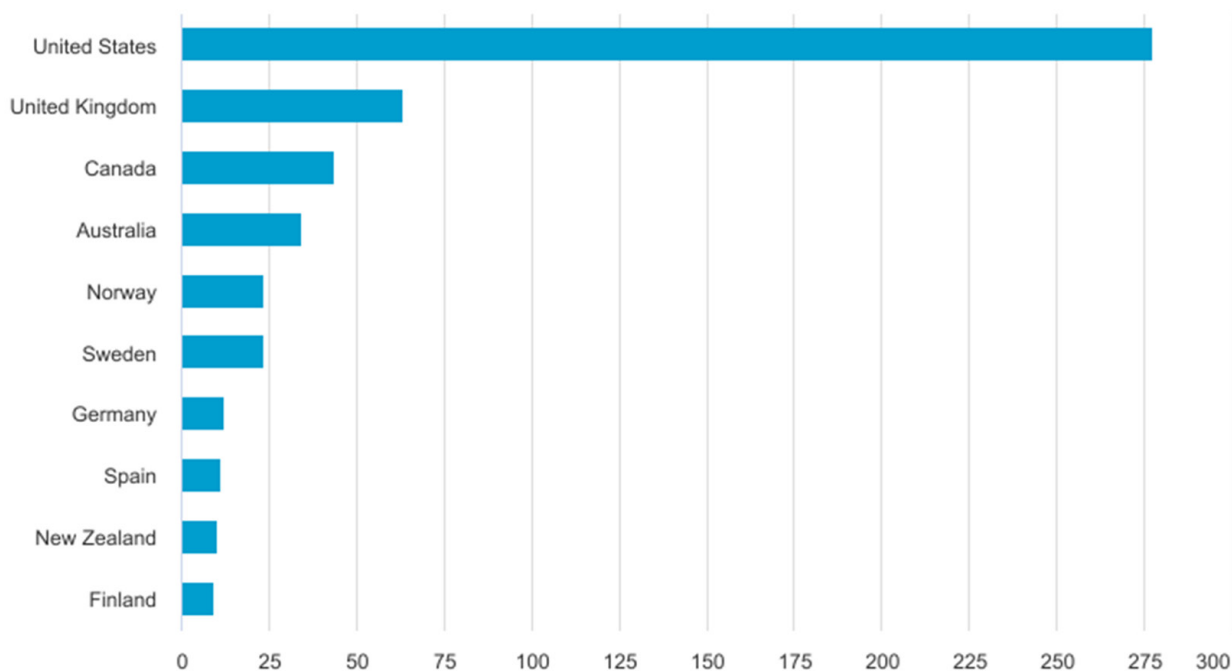


Figure 7. Top 10 countries researching patient safety and IPE/IPC

Interprofessional collaboration occurs when two or more health professionals from different fields work together and synergize to provide health services. This collaboration can be effective when supported by the implementation of interprofessional education in health education settings.⁵ Although publications on patient safety in the context of interprofessional collaboration are not extensive, there are notable examples, such as research describing the design, implementation, and evaluation of professional development programs on patient safety for clinical educators in Japan.³⁴ The use of interprofessional interventions is crucial for improving patient safety practices, and there remain many research gaps that could strengthen interventions and evaluations in this area.³⁵ In the context of health education, research in Germany on the development and implementation of interprofessional learning about patient safety found that this learning approach was well received by students and encouraged further interprofessional learning with relevant themes.³⁶ Additionally, research conducted in the United Arab Emirates discussed the integration of patient safety learning into interprofessional education through online IPE workshops³⁷

Although IPE research has shown significant growth over the past two decades, bibliometric analysis identifies several critical gaps in addressing structured system errors that require special attention from the global research community. Geographic and cultural limitations are fundamental issues revealed by the analysis of international collaborations. No Southeast Asian country is among the top 10 contributors to IPE-patient safety research, despite the region's unique health system characteristics and work culture fundamentally different from those of the Western countries that dominate the literature. Indonesia, the world's fourth-most populous country, has only one research collaboration with the United States, demonstrating a lack of exploration of how cultural factors and local context influence the effectiveness of system interventions for patient safety.

The dominance of simulation-based research over real-world system implementation is a second significant gap, as demonstrated by the subject area analysis, which reveals a concentration of research in medical education (38.3%) and nursing (28.0%), but a lack of research on real-world system

implementation in healthcare. Most research still focuses on simulation and training in controlled environments, while evaluation of the impact on health care system changes and patient outcomes in real clinical settings is very limited. Translation from the laboratory to clinical practice is a crucial step in ensuring the effectiveness of IPE interventions.

Emerging themes in primary care systems identified through trend analysis indicate that IPE research for patient safety at the primary care system level is still in its early stages of development, even though the primary care system is the primary gateway where structured system errors can be detected and prevented early. This gap is crucial given that the majority of patient interactions with the health system occur at the primary care level, and failures in interprofessional coordination at this level can have cascading impacts throughout the health care continuum, necessitating more intensive research attention to develop effective IPE models in the primary care context.

Top country doing studies of patient safety and IPE/IPC

Figure 8 demonstrates that most studies were conducted by authors from the United States, which also had the highest number of international collaborations. Research on patient safety within interprofessional education in Indonesia, the country with the 4th largest population in the world, is limited and primarily involves connections with US authors. However, Singapore and Thailand, both countries in Southeast Asia that are culturally close to Indonesia, have shown wider international collaboration.

The limited evidence regarding patient safety within interprofessional education in the Asian context, particularly in Southeast Asian countries, may be due to the lack of an interprofessional learning process tailored to the local context. Although the benefits of interprofessional education (IPE) are acknowledged, its application in Indonesia faces various obstacles influenced by local issues. Challenges include cultural factors and the roles and responsibilities

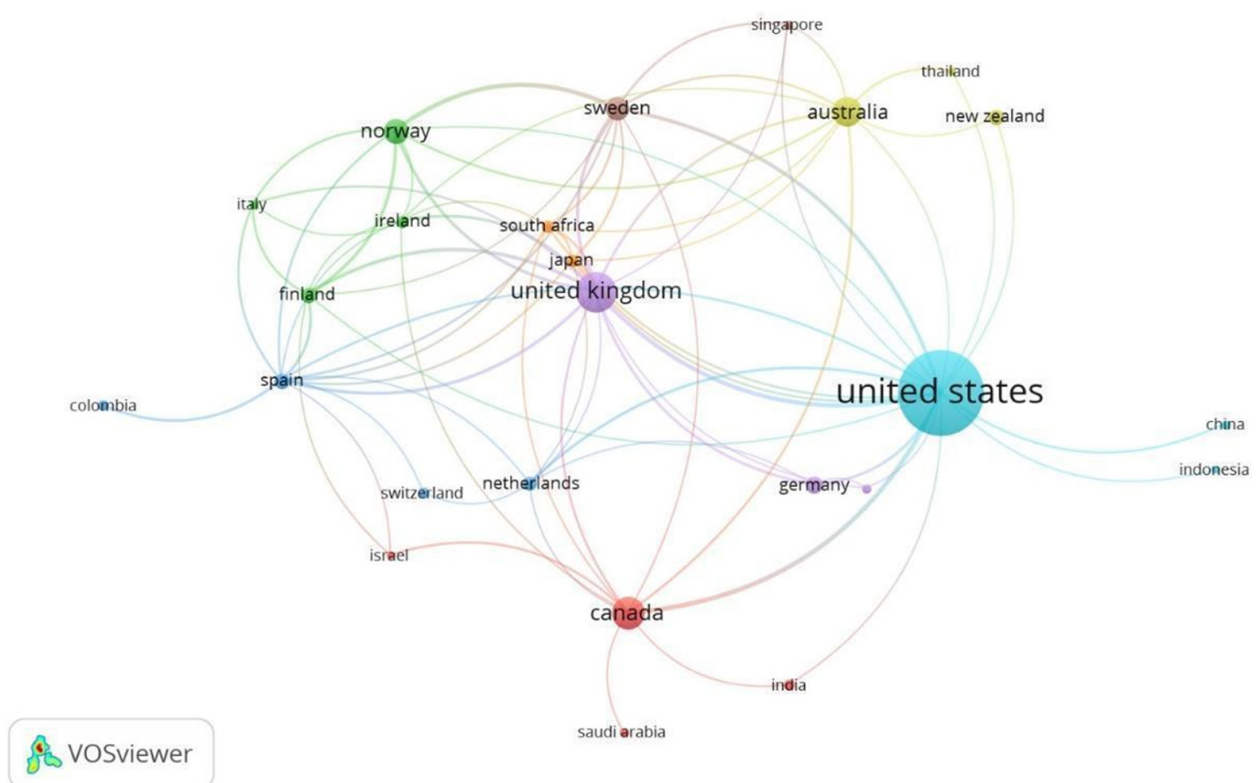


Figure 8. Co-occurrence of patient safety and IPE/IPC studies between countries

of healthcare disciplines.³⁸ Additionally, there is a lack of standardized guidelines or competencies that incorporate patient safety for students as future healthcare providers.²³ Improvement is needed in collaborating with multinational partners and implementing a diverse perspective approach to interprofessional education (IPE).

Limitation

A limitation of this analysis was the reliance on a single database, which may have led to the exclusion of some relevant articles on interprofessional education and patient safety. Scopus was selected for its extensive content and advanced search tools. Despite this limitation, the findings offer valuable insights into the research area and provide a framework for future investigations.

CONCLUSION

Interprofessional education (IPE) is crucial for advancing patient safety through systematic approaches to addressing structural system errors. This bibliometric analysis reveals a significant evolution in IPE research from individual skill-building approaches to comprehensive system-based interventions designed to prevent errors at multiple levels of healthcare delivery.

The research landscape demonstrates substantial growth in IPE-patient safety studies, with notable shifts toward simulation-based training and system-level interventions. However, significant gaps persist, particularly in Southeast Asian contexts where cultural factors and healthcare system characteristics require tailored IPE approaches. The dominance of Western research contexts and limited representation from developing countries like Indonesia highlights the need for a more inclusive and culturally responsive research framework.

Effective IPE fosters teamwork among diverse healthcare professionals, enhances communication, reduces errors, and promotes high-quality, patient-centered care. The research underscores the importance of integrating patient safety principles within IPE frameworks to ensure that healthcare teams prioritize safety and engage in

quality improvement initiatives. Key findings indicate that while IPE research has established strong foundations in simulation and teamwork development, there remains insufficient focus on real-world implementation and long-term outcomes. The emerging emphasis on primary care collaboration represents a promising direction for addressing structural system errors at the point of initial healthcare contact.

RECOMMENDATIONS

Future studies should explore the impact of IPE on patient safety in diverse settings, including increased international collaboration to strengthen and standardize practices across different regions. In addition, Future studies should prioritize the development of culturally adapted IPE models that address structural system errors specific to diverse healthcare contexts. Research should focus on longitudinal evaluation of IPE impact on patient safety outcomes, economic evaluation of interventions, and the establishment of international collaborative networks to strengthen evidence-based practices across different healthcare systems.

Specifically, there is an urgent need for research that bridges the gap between educational interventions and measurable improvements in healthcare system safety performance, particularly in resource-constrained settings where structural system errors may have the greatest impact on patient outcomes. Long-term research recommendations include developing multi-country studies comparing the effectiveness of IPE models in various health system contexts. Furthermore, technology integration by exploring the role of digital technologies (AI, VR, simulation) in enhancing IPE for patient safety education is also recommended.

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COMPETING INTEREST

The authors declare that there are no competing interests related to the study.

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LIST OF ABBREVIATIONS

IPE : Interprofessional Education

IPC : Interprofessional Collaboration

KONTRIBUSI PENULIS

Yunia Hastami – developing research proposal, collecting data, data analysis, and publication manuscript.

Eti Poncorini Pamungkasari – developing research proposal, data analysis, and publication manuscript.

Siti Munawaroh – data analysis, and publication manuscript.

Bulan Kakanita Hermasari – data analysis, and publication manuscript.

Amandha Boy Timor Randhita – data analysis, and publication manuscript.

Atik Maftuhah – data analysis, and publication manuscript.

Dian Nugroho – data analysis, and publication manuscript.

Veronika Ika Budiastuti – publication manuscript.

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