The Review Of
DIABETIC
STUDIES OPEN ACCESS

Interprofessional Collaboration And Its Association With Patient Safety Practices Among Laboratory, Nursing, And Radiology Professionals In Saudi Arabia: A Cross-Sectional Study

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Abstract

Background: Interprofessional collaboration (IPC) is recognized as a critical determinant of patient safety and quality of care in healthcare systems. While evidence suggests that collaborative practices among healthcare professionals improve outcomes, limited research exists on the relationship between IPC and patient safety among laboratory, nursing, and radiology professionals in Saudi Arabia.
This study aimed to examine the association between IPC and patient safety practices across these disciplines.
Methods: A cross-sectional study was conducted among 420 healthcare professionals (nursing 180; laboratory 140; radiology 100) working in public and private hospitals in Saudi Arabia. Data were collected using a structured, self-administered questionnaire assessing interprofessional collaboration and patient safety practices, with validated 5-point Likert scales. Descriptive statistics summarized participant characteristics and scale scores. Inferential analyses included ANOVA, t-tests, Pearson correlation, and multiple linear regression to identify predictors of patient safety practices.
Results: Participants reported moderate to high levels of IPC (Mean ± SD = 3.84 ± 0.62) and patient safety practices (4.01 ± 0.58). Nurses demonstrated significantly higher IPC and safety scores compared to laboratory and radiology professionals ($p = 0.032$). Significant associations were observed between patient safety practices and profession, age, years of experience, and work setting ($p < 0.05$). A strong positive correlation was found between IPC and patient safety practices ($r = 0.62$, $p < 0.001$). Multiple linear regression indicated that IPC was the strongest predictor of patient safety practices ($\beta = 0.51$, $p < 0.001$), explaining 46% of the variance in safety outcomes.
Conclusion: Interprofessional collaboration is strongly associated with patient safety practices among laboratory, nursing, and radiology professionals in Saudi Arabia. Nurses reported the highest collaboration and safety scores, while years of experience and work setting further influenced safety performance. These findings highlight the need for interprofessional education, structured teamwork training, and inclusive organizational policies to enhance collaborative practice and improve patient safety across healthcare disciplines.

Keywords: Interprofessional Collaboration; Patient Safety; Nursing; Laboratory; Radiology; Saudi Arabia; Cross-sectional Study.

Introduction

Interprofessional collaboration (IPC) has emerged as a cornerstone of contemporary healthcare delivery, reflecting the complex and interdependent nature of patient care that spans multiple professional domains. IPC is defined as a coordinated practice in which professionals from diverse healthcare disciplines work together with shared goals, mutual respect, and effective communication to optimize patient outcomes (Purnasiwi & Jenie, 2021). The World Health Organization (WHO) and international healthcare quality frameworks advocate for IPC as a fundamental strategy to improve health systems performance and to reduce preventable adverse events (Tomczyk et al., 2022).

IPC has been linked to a range of positive patient outcomes, including reduced medical errors, enhanced diagnostic accuracy, and improved safety climate. A systematic review of IPC in emergency and laboratory services demonstrated that collaborative teamwork leads to improved communication among team members, fewer medical errors, and more effective clinical decision-making (Alsahli et al., 2024). Moreover, evidence from primary care settings indicates that IPC interventions can significantly improve patient-centered outcomes, particularly for individuals at cardiovascular risk, elderly patients with multiple comorbidities, and those with chronic mental or physical health conditions (Bouton et al., 2023).

In addition to clinical benefits, IPC is increasingly recognized as a critical element of patient safety culture within healthcare organizations. Structured interprofessional approaches — including standardized communication protocols, shared decision-making frameworks, and joint problem-solving strategies — have been associated with reductions in adverse events and improvements in safety compliance (Alsahli et al., 2024). Studies focusing on IPC and safety outcomes consistently report that collaborative environments encourage reporting of safety concerns, reduce hierarchical barriers, and enhance accountability across professional boundaries.

In the context of Saudi Arabia's healthcare transformation, driven by Vision 2030 and the National Transformation Program, IPC is becoming increasingly relevant as healthcare systems evolve toward integrated, patient-centered models of care. Research conducted within Saudi healthcare settings highlights the importance of collaborative practice among diverse professional groups, but also underscores ongoing challenges such as communication barriers, role ambiguity, and limited interprofessional education (IPE) opportunities (Alrshedy et al., 2024; Dighriri et al., 2024). Effective communication and collaborative competencies have been identified as essential components in enhancing multidisciplinary teamwork, which ultimately contributes to improved quality and safety of care.

Several Saudi studies have examined IPC within specific professional dyads, such as between nurses and health assistants, revealing that positive attitudes toward collaboration are associated with improved perceptions of safety climate and patient care quality (Al Dhafeeri et al., 2022). Additionally, multimodal collaborations — involving laboratory, nursing, and radiology teams — are reported to enhance diagnostic workflows and clinical efficiency, particularly when supported by integrated health information systems and clear communication protocols (Dighriri et al., 2024).

Despite these insights, quantitative evidence remains limited regarding the direct association between IPC and patient safety practices among multidisciplinary professionals that include laboratory, nursing, and radiology personnel in Saudi Arabia. Most existing research either focuses on nursing teams or is qualitative in nature, leaving a gap in large-scale, cross-sectional investigations that compare collaborative behaviors and safety practices across multiple healthcare domains. Such empirical data are critical for informing both policy decisions and clinical education strategies aimed at fostering collaborative cultures within health systems undergoing rapid transformation.

This study seeks to address this gap by examining the relationship between IPC and patient safety practices among laboratory, nursing, and radiology professionals working in Saudi healthcare facilities. By exploring both collaborative patterns and safety behaviors across these core clinical disciplines, the research aims to contribute foundational evidence that supports organizational initiatives for teamwork, quality improvement, and patient safety enhancement in the Saudi healthcare context.

Methodology

Study Design

A quantitative, analytical cross-sectional study was conducted to examine the association between interprofessional collaboration and patient safety practices among laboratory, nursing, and radiology professionals working in healthcare facilities in Saudi Arabia.

Study Setting

The study was conducted in public and private healthcare facilities across different regions of Saudi Arabia. These facilities included tertiary and secondary hospitals that provide laboratory, nursing, and radiology services. Data collection was carried out over a defined period January to April 2024.

Study Population

The target population consisted of licensed healthcare professionals, including: Nurses, Medical laboratory technologists and Radiology technologists. Participants were required to be actively working in clinical settings and involved directly or indirectly in-patient care.

Inclusion criteria: Licensed laboratory, nursing, or radiology professionals; at least one year of clinical experience; currently employed in a Saudi healthcare facility, willing to participate and provide informed consent.

Exclusion criteria: Interns, students, and trainees; administrative staff with no clinical role; healthcare professionals on extended leave during data collection.

Sample Size and Sampling Technique

The sample size was calculated using G*Power software for correlation and regression analysis, assuming: medium effect size ($f^2 = 0.15$), power of 80%, alpha level of 0.05. The minimum required sample was approximately 350 participants. To compensate for non-response, 420 participants were recruited using a stratified convenience sampling technique, ensuring proportional representation from nursing, laboratory, and radiology professions.

Data Collection Instrument

Data were collected using a structured, self-administered questionnaire, composed of three sections:

- **Section I: Sociodemographic Characteristics** included age, gender, profession, years of experience, and work setting (public or private hospital).
- **Section II: Interprofessional Collaboration** was assessed using a validated scale adapted from established interprofessional collaboration frameworks. The scale consisted of multiple items measured on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Higher scores indicated better interprofessional collaboration.
- **Section III: Patient Safety Practices** were measured using a validated patient safety instrument focusing on: Error prevention; Safety communication; Incident reporting; Compliance with safety protocols. Items were rated on a 5-point Likert scale, with higher scores reflecting better patient safety practices.

Validity and Reliability

Content validity was ensured through expert review by specialists in nursing, laboratory medicine, radiology, and healthcare quality. A pilot study was conducted on 10% of the sample, and data from the pilot were excluded from the final analysis. Internal consistency reliability was assessed using Cronbach's alpha, which demonstrated acceptable reliability for: Interprofessional collaboration scale ($\alpha \geq 0.85$); Patient safety practices scale ($\alpha \geq 0.88$).

Data Collection Procedure

Data were collected electronically using an online survey platform. Eligible participants were invited through professional networks and institutional contacts. Participation was voluntary, and confidentiality was maintained by anonymizing responses and restricting data access to the research team.

Statistical Analysis

Data were analyzed using SPSS (version 28). Descriptive statistics were used to summarize participant characteristics and scale scores, including frequencies, percentages, means, and standard deviations. Inferential statistical analyses included: Independent t-test to compare patient safety scores by gender and work setting; One-way ANOVA to compare interprofessional collaboration and patient safety scores across professions, age groups, and years of experience; Pearson's correlation coefficient to assess the relationship between interprofessional collaboration and patient safety practices; Multiple linear regression analysis to identify predictors of patient safety practices. Statistical significance was set at $p < 0.05$.

Ethical Considerations

Ethical approval for this study was obtained from the Institutional Review Board (IRB) of Hospitals / University, Saudi Arabia. All participants provided informed consent before participation. Participation was voluntary, and respondents were assured of confidentiality and anonymity. Data were stored securely, accessible only to the research team, and all study procedures complied with the Declaration of Helsinki and national regulations governing human subject research in Saudi Arabia.

Results

Table 1 presents the sociodemographic profile of the study participants. The sample consisted predominantly of nursing professionals (42.9%), followed by laboratory (33.3%) and radiology professionals (23.8%), reflecting the multidisciplinary nature of the healthcare workforce in Saudi Arabia. Slightly more than half of the participants were female (54.8%), which is consistent with the gender distribution commonly reported among healthcare professionals, particularly in nursing disciplines.

The majority of respondents were within the 30–39-year age group (40.5%), representing a mature and professionally active workforce. Additionally, more than two-thirds of participants had five years or more of professional experience, indicating adequate exposure to interprofessional interactions and patient safety practices. Most participants were employed in public hospitals (66.7%), aligning with the dominance of the public sector in the Saudi healthcare system. Overall, the demographic characteristics suggest that the sample was sufficiently diverse and representative to examine interprofessional collaboration and patient safety practices.

Table 1. Sociodemographic Characteristics of the Study Participants (N = 420)

Variable	Category	n	%
Profession	Nursing	180	42.9
	Laboratory	140	33.3
	Radiology	100	23.8
Gender	Male	190	45.2
	Female	230	54.8
Age (years)	< 30	140	33.3
	30–39	170	40.5
	≥ 40	110	26.2
Years of Experience	< 5 years	130	31.0
	5–10 years	160	38.1
	> 10 years	130	31.0
Work Setting	Public hospital	280	66.7
	Private hospital	140	33.3

Table 2 summarizes the mean scores for interprofessional collaboration and patient safety practices among the study participants. The mean interprofessional collaboration score (3.84 ± 0.62) indicates a moderate to high level of collaborative practice among laboratory, nursing, and radiology professionals. This suggests that participants generally perceive effective communication, teamwork, and mutual respect within interprofessional healthcare teams.

Similarly, the mean patient safety practices score (4.01 ± 0.58) reflects a high level of adherence to patient safety principles, including error prevention, reporting practices, and compliance with safety

protocols. The slightly higher patient safety score compared to collaboration suggests that while safety practices are well established, further strengthening interprofessional collaboration may enhance safety outcomes even more.

Table 2. Descriptive Statistics of Interprofessional Collaboration and Patient Safety Scores

Variable	Possible Range	Mean ± SD
Interprofessional Collaboration Score	1–5	3.84 ± 0.62
Patient Safety Practices Score	1–5	4.01 ± 0.58

Table 3 illustrates the comparison of interprofessional collaboration and patient safety practices across professional groups. Nurses reported the highest mean scores for both interprofessional collaboration (3.92 ± 0.60) and patient safety practices (4.08 ± 0.55) compared to laboratory and radiology professionals.

The analysis of variance revealed a statistically significant difference between professions ($p = 0.032$), indicating that professional role influences perceptions and engagement in collaborative and safety-related practices. The higher scores among nurses may be attributed to their continuous patient contact, central role in care coordination, and frequent interaction with multidisciplinary teams. Conversely, laboratory and radiology professionals, despite playing critical diagnostic roles, may experience comparatively limited direct involvement in bedside interprofessional communication, which could explain the observed differences.

Table 3. Comparison of Collaboration and Patient Safety Scores by Profession

Profession	Collaboration Mean ± SD	Patient Safety Mean ± SD	p-value*
Nursing	3.92 ± 0.60	4.08 ± 0.55	
Laboratory	3.76 ± 0.63	3.95 ± 0.59	
Radiology	3.78 ± 0.64	3.97 ± 0.60	
ANOVA	—	—	0.032

Table 4 demonstrates the associations between selected sociodemographic variables and patient safety practices. Statistically significant associations were observed for profession ($p = 0.041$), age group ($p = 0.027$), years of experience ($p = 0.003$), and work setting ($p = 0.019$). These findings suggest that patient safety practices vary according to professional background, career stage, and institutional context.

Participants with greater professional experience and those working in public hospitals reported significantly higher patient safety scores, potentially reflecting greater exposure to structured safety programs, accreditation standards, and continuous professional development initiatives. In contrast, gender did not show a significant association with patient safety practices ($p = 0.118$), indicating that safety behaviors are not influenced by gender differences within this professional cohort.

Table 4. Association Between Sociodemographic Variables and Patient Safety Practices

Variable	Test Used	p-value
Profession	ANOVA	0.041
Gender	Independent t-test	0.118
Age group	ANOVA	0.027
Years of experience	ANOVA	0.003
Work setting	Independent t-test	0.019

Table 5 reveals a strong positive correlation between interprofessional collaboration and patient safety practices ($r = 0.62$, $p < 0.001$). This finding indicates that improvements in collaborative behaviors—such as effective communication, shared decision-making, and mutual professional respect—are strongly associated with enhanced patient safety practices.

The strength and significance of this correlation highlight interprofessional collaboration as a key organizational factor influencing patient safety outcomes. This result supports existing theoretical frameworks and empirical evidence suggesting that collaborative healthcare environments reduce errors, improve care coordination, and promote a culture of safety.

Table 5. Correlation Between Interprofessional Collaboration and Patient Safety Practices

Variables		p-value
Interprofessional Collaboration vs Patient Safety	2	< 0.001

Table 6 presents the results of multiple linear regression analysis identifying predictors of patient safety practices. Interprofessional collaboration emerged as the most significant predictor ($\beta = 0.51$, $p < 0.001$), indicating that higher levels of collaboration substantially increase patient safety performance.

Additionally, years of experience, profession, and work setting were statistically significant predictors, suggesting that both individual and organizational factors contribute to patient safety practices. The regression model explained 46% of the variance ($R^2 = 0.46$) in patient safety practices, demonstrating a robust explanatory power. These findings underscore the importance of fostering collaborative practice environments, particularly through experience-based training and organizational support, to enhance patient safety outcomes in Saudi healthcare settings.

Table 6. Multiple Linear Regression Analysis Predicting Patient Safety Practices

Predictor Variable		SE	t	p-value
Interprofessional Collaboration	1	0.04	12.8	< 0.001
Years of Experience	8	0.05	3.6	0.001
Profession	2	0.06	2.1	0.036
Work Setting	9	0.04	2.0	0.041
Model R^2	6			

Discussion

The results of the current study demonstrate that interprofessional collaboration (IPC) among laboratory, nursing, and radiology professionals was moderately high and significantly associated with better patient safety practices ($r = 0.62$, $p < 0.001$). This finding aligns with global evidence that emphasizes collaboration as a pivotal determinant of safety culture in healthcare settings. For example, IPC has been shown to mediate the relationship between organizational learning and safety climate, suggesting that collaborative teamwork enhances compliance with safety standards and helps integrate patient-centred practices across professions (Ishii, Fujitani, & Matsushita, 2024).

Furthermore, interdisciplinary collaboration has been linked to improved clinical outcomes in medication management, particularly when pharmacy, laboratory, and nursing teams coordinate care to prevent adverse events (Ravi et al., 2022; Dilles et al., 2021). These findings support the idea that structured interprofessional approaches reduce error rates and enhance clinical safety performance, which is consistent with the positive correlation observed in this study.

Our study found that nurses reported higher collaboration and safety scores compared to radiology and laboratory professionals. Several studies in Saudi Arabia have similarly emphasized the critical role of nursing teamwork on safety culture and quality of care. For example, Alshammari et al. (2022) found significant positive correlations between nursing teamwork and patient safety culture, highlighting the influence of cohesive nursing teams on healthcare quality. This suggests that frequent direct patient contact and central involvement in multidisciplinary care processes may contribute to stronger perceptions of collaboration and safety among nurses.

Moreover, nursing synergy and teamwork have been shown to support national healthcare objectives such as Saudi Vision 2030 by promoting clearer communication, efficient role execution, and shared decision-making, which are essential for advancing patient safety and quality outcomes (Al Harthi et al., 2024). Patient safety practices in this study were significantly associated with years of experience, age, profession, and work setting. These associations resonate with literature suggesting that both individual and organizational factors influence safety practices. For instance, hierarchical structures and role ambiguity have been identified as barriers to collaboration and safety performance, while clear communication channels and defined responsibilities enhance interprofessional teamwork (Rawlinson et al., 2021).

The finding that experienced professionals performed better in safety practices likely reflects greater exposure to structured safety protocols and training, which reinforces compliance with safety norms

over time. This is important in the Saudi context, where healthcare transformation initiatives emphasize capacity building and quality improvement efforts across diverse professional groups.

The integration between nursing and diagnostic services (e.g., radiology) is particularly important for safe clinical workflows. Regional research highlights that safe practices during imaging procedures rely on cross-disciplinary communication, patient assessment, and shared protocols, which contribute to reduced adverse events and improved diagnostic safety (Alasqah, 2023). Similarly, collaborative models involving nurses and radiology personnel have been shown to enhance risk identification and protocol adherence, reinforcing the relevance of teamwork for service quality (Farea et al., 2024). These points support the interpretation that IPC not only elevates safety perceptions but also translates into procedural practices that mitigate risk in high-stakes processes such as imaging.

Implications for Practice and Healthcare Policy

The evidence presented underscores the need for institutional policies that bolster interprofessional collaboration across all clinical domains. Healthcare systems should prioritize interprofessional education (IPE), joint simulation training, and multidisciplinary case reviews to promote shared competencies and mutual trust. For example, evidence from interprofessional education research indicates that structured collaborative learning enhances communication, shared problem solving, and teamwork efficacy — all of which are foundational to safety culture (Guraya et al., 2023). In the Saudi context, aligning these strategies with broader initiatives such as Vision 2030 and national quality frameworks would accelerate the adoption of integrated models of care, leading to safer, more efficient, and patient-centred healthcare delivery.

Conclusion

This cross-sectional study provides empirical evidence that interprofessional collaboration is a key determinant of patient safety practices among laboratory, nursing, and radiology professionals in Saudi Arabia. The findings demonstrate that higher levels of collaborative practice are strongly associated with improved patient safety behaviors, reinforcing the critical role of teamwork, effective communication, and shared responsibility within multidisciplinary healthcare environments. Notably, nurses reported higher levels of interprofessional collaboration and patient safety practices compared with laboratory and radiology professionals, highlighting the central role of nursing staff in coordinating patient care.

Additionally, professional experience and work setting were significant contributors to patient safety performance, suggesting that both individual competencies and organizational context influence safety outcomes. Interprofessional collaboration emerged as the strongest predictor of patient safety practices, accounting for a substantial proportion of variance in safety performance. These findings align with global and regional evidence emphasizing the importance of integrated care models and support ongoing healthcare transformation initiatives in Saudi Arabia. Strengthening interprofessional collaboration through structured interprofessional education, supportive leadership, and inclusive organizational policies may substantially enhance patient safety and quality of care across healthcare settings.

Limitations

Despite its strengths, this study has several limitations that should be considered when interpreting the findings. First, the cross-sectional design limits the ability to infer causal relationships between interprofessional collaboration and patient safety practices. Longitudinal or interventional studies are recommended to establish temporal and causal associations. Second, data were collected using self-reported questionnaires, which may be subject to response bias, including social desirability and recall bias. Participants may have overestimated their collaborative behaviors or adherence to patient safety practices. Future studies could incorporate objective measures such as observational assessments or institutional safety indicators to strengthen validity.

Third, the use of a convenience sampling approach may limit the generalizability of the findings to all healthcare professionals in Saudi Arabia. Although the sample included participants from both public and private hospitals and multiple professional groups, representation from certain regions or specialties may have been limited. Finally, while this study focused on laboratory, nursing, and radiology professionals, other key healthcare disciplines such as physicians, pharmacists, and allied health

professionals were not included. Future research should adopt a broader interprofessional perspective to capture the full complexity of collaborative healthcare practice and its impact on patient safety.

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