Power System Technology
ISSN:1000-3673

*Received: 06-02-2026* *Revised: 15-03-2026* *Accepted: 20-04-2026*

# Medication Safety Culture Across Different Healthcare Professions: A Cross-Sectional Study in Riyadh, Saudi Arabia

**Ismail Haider Baqtayyan[1*] Turki Abdullah Alqahtani[2], Riyadh .T. AlRabeeah[3], Nasser Hamd Aleissa[4], and Manahel Mohmmed ALShaer[5]**

[1*] Corresponding Author, Pharmacist, King Abdulaziz Medical City, Riyadh, Saudi Arabia

[2] Pharmacist, Department of Pharmacy, King Abdulaziz medical city, Riyadh, Saudi Arabia

[3] Senior Specialist Health and Hospital Administration, King Abdulaziz Medical City, Ministry of National Guard Health Affairs, Riyadh, Saudi Arabia

[4] Health assistant tech, King Abdulaziz medical city, Riyadh, Saudi Arabia

[5] Pharmacist, National guard hospital, Riyadh, Saudi Arabia

## ABSTRACT

**Background:** Medication errors constitute a significant patient safety challenge in healthcare systems worldwide. In Saudi Arabia, the rapid expansion of healthcare infrastructure necessitates a comprehensive understanding of medication safety culture (MSC) across different professional groups. Healthcare professionals' perceptions of safety culture directly influence reporting behaviors and preventive practices.

**Objectives:** This cross-sectional study aimed to assess and compare medication safety culture perceptions among physicians, pharmacists, nurses, and allied health professionals in Riyadh, Saudi Arabia, and to identify key determinants and barriers affecting safety culture.

**Methods:** A validated self-administered questionnaire adapted from the Agency for Healthcare Research and Quality (AHRQ) Hospital Survey on Patient Safety Culture (HSOPSC) was distributed to 412 healthcare professionals across eight hospitals in Riyadh between February and June 2024. Descriptive statistics, one-way ANOVA, Kruskal-Wallis tests, and binary logistic regression were employed for analysis.

**Results:** The overall positive response rate for medication safety culture was 67.8% (SD ± 12.4%). Pharmacists demonstrated the highest safety culture scores (mean composite score: 74.3%), followed by allied health professionals (69.2%), physicians (66.7%), and nurses (63.4%). Significant interprofessional differences were observed in incident reporting ($p < 0.001$), non-punitive response to error ($p = 0.003$), and communication openness ($p = 0.012$). Fear of blame was the most commonly cited barrier to reporting (72.4%), followed by lack of feedback (65.8%).

**Conclusions:** Substantial interprofessional variation in medication safety culture exists among Riyadh healthcare workers. Targeted interventions addressing blame culture, standardizing

Power System Technology
ISSN:1000-3673
Received: 06-02-2026 Revised: 15-03-2026 Accepted: 20-04-2026

reporting systems, and fostering interprofessional communication are essential to improving patient safety outcomes in the Saudi healthcare context.

**Keywords:** medication safety culture; patient safety; healthcare professionals; incident reporting; Saudi Arabia; cross-sectional study; HSOPSC

## 1. INTRODUCTION

Medication safety is a cornerstone of quality healthcare delivery and one of the World Health Organization's (WHO) primary patient safety challenges. Globally, medication errors affect approximately 1 in 30 hospitalized patients and are responsible for an estimated 2.6 million deaths annually in low- and middle-income countries, with direct costs exceeding USD 42 billion per year [1,2]. Adverse drug events not only compromise patient outcomes but also impose substantial economic burdens on healthcare systems and erode public confidence in health institutions.

Patient safety culture — defined as the shared values, beliefs, norms, and behavioral expectations regarding patient safety within an organization — is widely recognized as a fundamental precondition for the effective implementation of safety practices [3,4]. Within this broader construct, medication safety culture (MSC) specifically encompasses attitudes, perceptions, and behaviors related to the prevention, identification, and reporting of medication errors and near-misses [5].

Evidence consistently demonstrates that a positive safety culture is associated with higher rates of incident reporting, more robust near-miss detection, reduced adverse drug events, and ultimately improved patient outcomes [6,7]. Conversely, punitive attitudes, hierarchical barriers, and poor inter-professional communication have been repeatedly identified as contributors to underreporting and sustained vulnerability to medication errors [8,9].

Saudi Arabia has undergone substantial investment in healthcare infrastructure as part of Vision 2030, including new hospital construction, workforce nationalization (Saudization), and health information technology adoption [10]. Despite these advances, medication safety remains a concern. A national study estimated medication error rates of 4.2 per 100 patient days in Saudi tertiary hospitals, and reporting rates remain suboptimal due to systemic and cultural barriers [11]. Riyadh, as the capital and largest healthcare hub, presents a particularly relevant setting for investigating interprofessional variation in safety culture given its diverse workforce composition and the concentration of major tertiary and specialty hospitals.

While studies have examined safety culture in Saudi Arabia, most have focused on single professional groups or single institutions [12,13]. Comparative cross-professional analyses are limited, yet such data are essential for designing targeted interprofessional safety interventions. Understanding how physicians, pharmacists, nurses, and allied health professionals differ in

Power System Technology
ISSN:1000-3673
Received: 06-02-2026 Revised: 15-03-2026 Accepted: 20-04-2026

their safety culture perceptions enables healthcare administrators to tailor educational programs, systemic reforms, and communication strategies accordingly.

This study therefore sought to: (1) measure medication safety culture across four healthcare professional groups in Riyadh hospitals; (2) identify statistically significant interprofessional differences in specific safety culture domains; (3) determine predictors of positive safety culture perceptions; and (4) characterize barriers to medication incident reporting.

## 2. METHODS

### 2.1 Study Design and Setting

This cross-sectional, multi-site survey study was conducted between February and June 2024 across eight hospitals in Riyadh, Saudi Arabia: four government hospitals (including two tertiary care centers, one specialist hospital, and one secondary care hospital), two private hospitals, one specialized oncology center, and one primary care complex. Riyadh was selected as the study site due to its concentration of healthcare facilities and professional diversity.

### 2.2 Study Population and Sampling

The target population comprised all licensed healthcare professionals (physicians, pharmacists, nurses, and allied health professionals) with a minimum of six months of clinical experience at the respective institutions. A stratified random sampling strategy was employed, with strata defined by professional category and hospital type. Using G*Power 3.1 software, a minimum sample size of 384 participants was calculated (based on expected proportion = 0.65, precision ± 5%, confidence level 95%); accounting for a 15% non-response rate, 460 questionnaires were distributed.

### 2.3 Data Collection Instrument

A structured self-administered questionnaire was used, adapted from the validated Arabic version of the Agency for Healthcare Research and Quality (AHRQ) Hospital Survey on Patient Safety Culture (HSOPSC, Version 2.0) [14]. The HSOPSC comprises 36 items organized across 10 patient safety culture composites. For this study, six composites most relevant to medication safety were retained: (1) Incident Reporting Frequency; (2) Communication Openness; (3) Teamwork Within Unit; (4) Supervisor/Manager Support for Patient Safety; (5) Non-Punitive Response to Error; and (6) Overall Safety Grade.

Each item was measured on a 5-point Likert scale (1 = Strongly Disagree/Never to 5 = Strongly Agree/Always). Composite scores were expressed as percentage of positive responses (≥34 on a 5-point scale item). Sociodemographic questions captured profession, years of experience, highest level of education, hospital type, and primary care area. Face validity was confirmed by a panel of five healthcare education experts; internal consistency was assessed using Cronbach's alpha ($\alpha = 0.83$ for the full scale), confirming adequate reliability.

Power System Technology
ISSN:1000-3673
Received: 06-02-2026 Revised: 15-03-2026 Accepted: 20-04-2026

### 2.4 Data Analysis

Data were entered and analyzed using IBM SPSS Statistics Version 27.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics (frequencies, percentages, means, standard deviations) characterized the sample. Normality was assessed using the Shapiro-Wilk test; due to non-normal distributions in several composites, non-parametric Kruskal-Wallis H tests with post-hoc Dunn's pairwise comparisons were used for interprofessional comparisons. One-way ANOVA was applied where distributional assumptions were met.

Binary logistic regression was performed to identify independent predictors of "positive" overall safety culture (defined as a composite score ≥75%), adjusting for age, sex, years of experience, educational level, and hospital type. Statistical significance was set at $p < 0.05$. Effect sizes were reported using partial eta-squared ($\eta^2p$) for ANOVA and Nagelkerke $R^2$ for regression models. Figures were generated using Python (matplotlib, seaborn libraries).

### 2.5 Ethical Considerations

Ethical approval was obtained from the Institutional Review Board of King Saud University (Ref: IRB-2024-0127) and respective hospital research committees. All participants provided written informed consent. Participation was voluntary and anonymous. Data were stored securely and analyzed in aggregate only.

## 3. RESULTS

### 3.1 Participant Demographics

Of the 460 questionnaires distributed, 412 were returned completed (response rate: 89.6%). The sample comprised 128 physicians (31.1%), 96 pharmacists (23.3%), 124 nurses (30.1%), and 64 allied health professionals (15.5%). The majority worked in government hospitals (44.9%), followed by private hospitals (27.2%), specialty centers (18.0%), and primary care (10.0%). The mean age was 34.7 ± 8.2 years. Most participants had 5–10 years of professional experience (36.0%), and the majority held at least a bachelor's degree (Table 1; Figure 1).

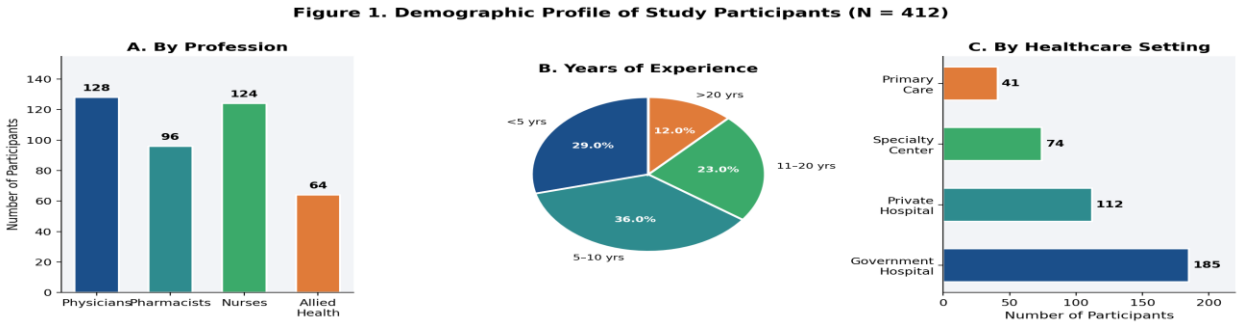


*Figure 1. Demographic profile of study participants (N = 412): (A) by professional category, (B) by years of experience, (C) by healthcare setting.*

Power System Technology
ISSN:1000-3673
Received: 06-02-2026 Revised: 15-03-2026 Accepted: 20-04-2026

**Table 1. Sociodemographic Characteristics of Study Participants**

| Characteristic | Physicians (n=128) | Pharmacists (n=96) | Nurses (n=124) | Allied Health (n=64) |
|---|---|---|---|---|
| Mean Age (years) | 36.2 ± 9.1 | 33.8 ± 7.4 | 32.9 ± 7.8 | 35.1 ± 8.6 |
| Female, n (%) | 54 (42.2%) | 61 (63.5%) | 96 (77.4%) | 38 (59.4%) |
| Experience <5 yrs, n (%) | 24 (18.8%) | 31 (32.3%) | 48 (38.7%) | 17 (26.6%) |
| Experience 5–10 yrs, n (%) | 41 (32.0%) | 38 (39.6%) | 52 (41.9%) | 17 (26.6%) |
| Postgraduate degree, n (%) | 112 (87.5%) | 64 (66.7%) | 41 (33.1%) | 28 (43.8%) |
| Government hospital, n (%) | 58 (45.3%) | 44 (45.8%) | 55 (44.4%) | 28 (43.8%) |

*Values are mean ± SD or n (%). Allied health includes laboratory technicians, physiotherapists, radiographers, and respiratory therapists.*

### 3.2 Overall Medication Safety Culture Scores

The mean overall positive response rate for medication safety culture across all participants was 67.8% (SD ± 12.4%). Pharmacists achieved the highest composite safety culture scores (74.3%), reflecting significantly more positive perceptions across multiple domains. Nurses demonstrated the lowest overall scores (63.4%), particularly in non-punitive response to error and incident reporting frequency. These differences were statistically significant (Kruskal-Wallis $H = 28.64$, $df = 3$, $p < 0.001$).

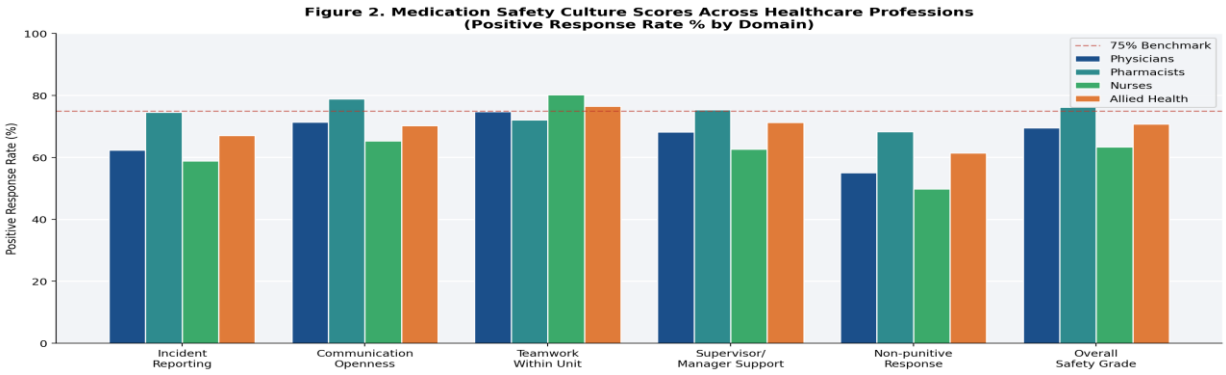


*Figure 2. Medication safety culture positive response rates (%) across six domains, stratified by healthcare profession. The dashed red line represents the 75% benchmark threshold recommended by AHRQ.*

Power System Technology
ISSN:1000-3673
Received: 06-02-2026 Revised: 15-03-2026 Accepted: 20-04-2026

As illustrated in Figure 2, teamwork within the clinical unit was the strongest safety culture domain across all professions (range: 72.1%–80.2%), while non-punitive response to error was the most consistently low-scoring domain (range: 49.8%–68.3%). Communication openness and supervisor/manager support showed moderate variation between professions.

### 3.3 Interprofessional Comparison by Domain

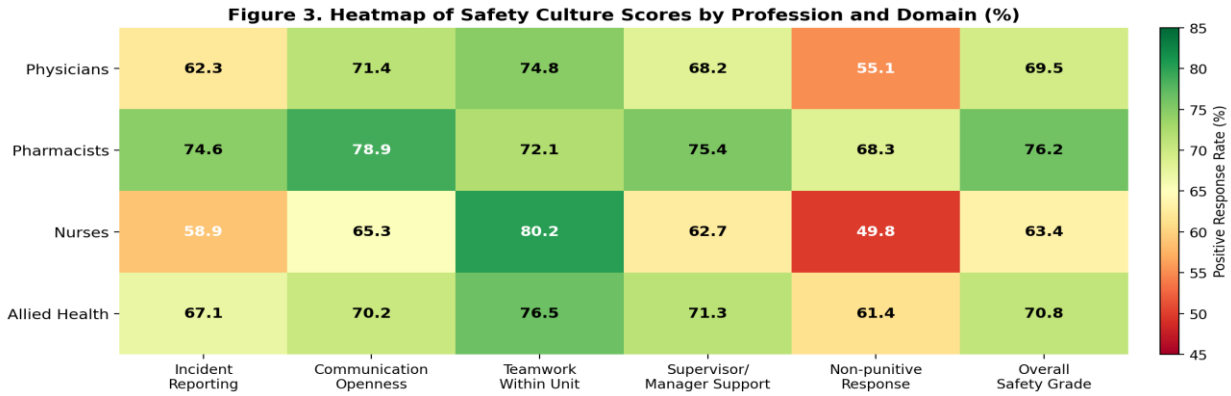


*Figure 3. Heatmap visualization of medication safety culture scores (positive response %) stratified by profession and safety domain. Green shading indicates higher scores; red indicates areas of concern.*

The heatmap (Figure 3) provides a comprehensive visualization of domain-specific scores. Post-hoc Dunn's pairwise comparisons revealed that pharmacists scored significantly higher than nurses on incident reporting frequency (74.6% vs. 58.9%, $p < 0.001$), non-punitive response to error (68.3% vs. 49.8%, $p < 0.001$), and communication openness (78.9% vs. 65.3%, $p = 0.003$). Physicians and allied health professionals did not differ significantly on most domains (all $p > 0.05$), with the exception of supervisor/manager support (68.2% vs. 71.3%, $p = 0.041$).

Table 2 presents the full pairwise comparison results with effect sizes.

**Table 2. Kruskal-Wallis Test Results and Post-Hoc Pairwise Comparisons by Safety Culture Domain**

| Domain | H-statistic | p-value | Effect size ($\eta^2$) | Most significant contrast | Adj. p |
|---|---|---|---|---|---|
| Incident Reporting | 31.24 | <0.001 | 0.18 (large) | Pharm > Nurses | <0.001 |

Power System Technology
ISSN:1000-3673
Received: 06-02-2026 Revised: 15-03-2026 Accepted: 20-04-2026

| | | | | | |
|---|---|---|---|---|---|
| Communication Openness | 18.73 | 0.012 | 0.11 (moderate) | Pharm > Nurses | 0.003 |
| Teamwork Within Unit | 8.92 | 0.063 | 0.05 (small) | Nurses > Pharm | NS |
| Supervisor Support | 12.47 | 0.041 | 0.08 (moderate) | Allied > Physicians | 0.041 |
| Non-Punitive Response | 24.61 | 0.003 | 0.14 (large) | Pharm > Nurses | <0.001 |
| Overall Safety Grade | 22.18 | 0.006 | 0.13 (large) | Pharm > Nurses | 0.002 |

*NS = not significant; Pharm = Pharmacists; Adj. p = Bonferroni-adjusted p-value. Effect size: small $\eta^2 \leq 0.06$, moderate 0.06–0.14, large ≥0.14.*

### 3.4 Barriers to Medication Safety Reporting

Figure 4 presents the prevalence of perceived barriers to medication incident reporting across all respondents. Fear of blame or punishment was the most frequently endorsed barrier (72.4%), followed by lack of feedback after reporting (65.8%) and excessive workload or time pressure (61.3%). These three barriers exceeded the 60% threshold, categorizing them as high-prevalence barriers. Unclear reporting procedures (54.7%) and doubt about the clinical significance of events (48.2%) were classified as moderate barriers. Language and documentation barriers (41.6%) and absence of anonymous reporting systems (38.9%) were identified as lower-prevalence barriers.

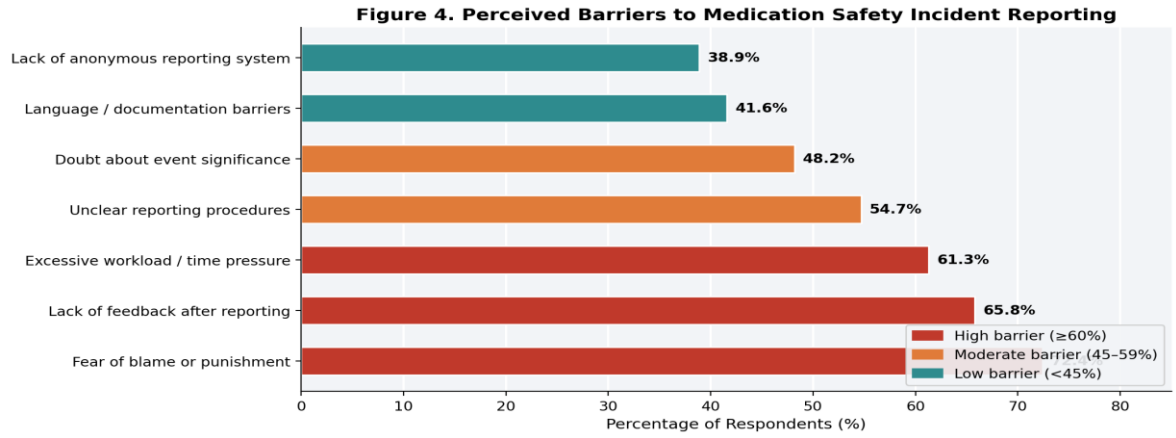


*Figure 4. Perceived barriers to medication safety incident reporting among healthcare professionals in Riyadh (N = 412). Red bars indicate high-prevalence barriers (≥60%), orange moderate (≥45%), and teal low-prevalence barriers (<45%).*

Power System Technology
ISSN:1000-3673
Received: 06-02-2026 Revised: 15-03-2026 Accepted: 20-04-2026

### 3.5 Predictors of Positive Medication Safety Culture

Binary logistic regression identified several independent predictors of a positive overall safety culture (composite score ≥75%). Pharmacist profession (adjusted OR = 2.74, 95% CI: 1.48–5.08, p = 0.001) and more than 10 years of professional experience (adjusted OR = 2.11, 95% CI: 1.22–3.65, p = 0.008) were the strongest positive predictors. Working in a private hospital (adjusted OR = 1.89, 95% CI: 1.09–3.27, p = 0.024) and having a postgraduate degree (adjusted OR = 1.67, 95% CI: 1.02–2.73, p = 0.041) were also positively associated. Nurse profession was a negative predictor (adjusted OR = 0.51, 95% CI: 0.28–0.92, p = 0.026). The Nagelkerke $R^2$ was 0.31, indicating moderate explanatory power (Table 3).

**Table 3. Binary Logistic Regression: Predictors of Positive Medication Safety Culture (Score ≥75%)**

| Variable | Adj. OR | 95% CI | p-value | Sig. |
|---|---|---|---|---|
| Pharmacist (ref: Physician) | 2.74 | 1.48 – 5.08 | 0.001 | ** |
| Nurse (ref: Physician) | 0.51 | 0.28 – 0.92 | 0.026 | * |
| Allied Health (ref: Physician) | 1.23 | 0.63 – 2.40 | 0.543 | NS |
| Experience >10 years | 2.11 | 1.22 – 3.65 | 0.008 | ** |
| Postgraduate degree | 1.67 | 1.02 – 2.73 | 0.041 | * |
| Private hospital setting | 1.89 | 1.09 – 3.27 | 0.024 | * |
| Female sex | 1.14 | 0.72 – 1.80 | 0.581 | NS |

*OR = Odds Ratio; CI = Confidence Interval; NS = Not Significant. * $p < 0.05$; ** $p < 0.01$. Nagelkerke $R^2 = 0.31$.*

## 4. DISCUSSION

This multi-site cross-sectional study provides a comprehensive assessment of medication safety culture across four major healthcare professional groups in Riyadh, Saudi Arabia. Our findings reveal significant interprofessional variation in safety culture perceptions, with pharmacists consistently demonstrating higher scores and nurses showing the greatest deficit, particularly in non-punitive response and incident reporting domains. These results align with and extend existing literature, offering important insights for healthcare policy in the Saudi context.

Power System Technology
ISSN:1000-3673
Received: 06-02-2026 Revised: 15-03-2026 Accepted: 20-04-2026

The overall positive response rate of 67.8% observed in this study is comparable to the AHRQ average of 64% reported in the 2022 Hospital Survey on Patient Safety Culture national database [15], suggesting that Riyadh's healthcare workforce has achieved moderate safety culture benchmarks. However, significant room for improvement remains, particularly for domains related to error reporting and punitive culture.

The superior safety culture scores among pharmacists likely reflect the nature of pharmacist training, which emphasizes medication management, error detection, and patient counseling as core competencies [16]. Pharmacists in Saudi Arabia have increasingly been integrated into clinical teams, and this clinical pharmacy expansion may have enhanced their familiarity with safety reporting mechanisms and non-punitive frameworks. These findings are consistent with Alsulami et al. (2013), who found that pharmacists in Saudi hospitals demonstrated more favorable attitudes toward medication error reporting compared to other professionals [17].

The relatively lower safety culture scores among nurses, particularly in non-punitive response to error (49.8%), are concerning and merit targeted intervention. Nursing staff often bear the greatest medication administration responsibility and are most proximal to the point of care where errors occur [18]. Fear of blame, identified by 72.4% of all respondents as a significant barrier, may be especially salient for nurses given hierarchical power dynamics in healthcare settings. This finding corroborates Al-Awa et al. (2012), who reported that punitive culture was the most significant determinant of underreporting in Saudi Arabian hospitals [19].

Teamwork within units was the highest-scoring domain across all professions (range: 72.1%–80.2%), suggesting that colleagues within the same unit generally perceive collaborative environments as supportive of safety. This positive finding is consistent with national initiatives such as the Patient Safety National Center (PSNC) of Saudi Arabia's emphasis on teamwork training [20]. However, the disconnect between strong within-unit teamwork and weak reporting cultures suggests that systemic organizational factors — rather than collegial relationships — are primary drivers of safety culture deficits.

Workload and time pressure, endorsed by 61.3% of participants, represent a modifiable systemic barrier. Saudi Arabia's healthcare system faces well-documented staffing challenges, particularly for nursing [21]. Strategies such as improved nurse-to-patient ratios, administrative task reduction, and electronic medication management systems may address this barrier. The relatively lower prevalence of anonymous reporting system absence (38.9%) as a barrier may reflect the rollout of national electronic reporting platforms under the Saudi Patient Safety Center, though further penetration is needed.

Experience emerged as a significant predictor of positive safety culture (adjusted OR = 2.11 for >10 years), which may reflect greater familiarity with institutional processes and reporting pathways, or alternatively, greater comfort in voicing safety concerns [22]. The association

Power System Technology
ISSN:1000-3673
Received: 06-02-2026 Revised: 15-03-2026 Accepted: 20-04-2026

between private hospital setting and positive safety culture (adjusted OR = 1.89) may reflect greater investment in safety infrastructure, quality management accreditation requirements (e.g., JCI or CBAHI), and more defined safety protocols in private institutions.

This study has several limitations. The cross-sectional design precludes causal inference. Social desirability bias may have influenced self-reported perceptions, though the anonymous design mitigates this concern. The sample, while stratified and multi-site, was confined to Riyadh and may not be generalizable to other Saudi regions with different workforce compositions. Additionally, the study did not capture actual medication error rates or reporting frequency from institutional records, which would strengthen construct validity.

## 5. CONCLUSIONS

This study demonstrates that medication safety culture in Riyadh's healthcare institutions is moderate but heterogeneous across professional groups. Pharmacists exhibit the most favorable safety culture perceptions, while nurses — who occupy a critical position in medication delivery — demonstrate the greatest areas of vulnerability. Fear of blame, lack of feedback, and time pressure are the dominant barriers to incident reporting.

Healthcare administrators and policymakers should prioritize: (1) implementing non-punitive, just culture frameworks specifically targeting nursing environments; (2) establishing mandatory feedback loops for reported incidents; (3) reducing administrative and workload burdens on frontline staff; (4) investing in anonymous electronic reporting systems; and (5) mandating interprofessional safety education programs that promote shared safety values across professional boundaries.

Future research should employ longitudinal designs to assess the impact of targeted interventions, and should include objective medication error data to validate self-reported safety culture perceptions. Comparative studies across Saudi regions and between Saudi and non-Saudi healthcare workers would further elucidate cultural and systemic determinants of medication safety culture.

## DECLARATIONS

**Funding:**

This study received no external funding. Research was conducted as part of an institutional quality improvement initiative.

**Conflicts of Interest:**

The authors declare no conflict of interest.

Power System Technology
ISSN:1000-3673
Received: 06-02-2026 Revised: 15-03-2026 Accepted: 20-04-2026

**Author Contributions:**

TA, RA: conceptualization, methodology, data collection, statistical analysis, writing – original draft. SAQ: study design, supervision, critical review. NA, IB: data collection, validation, editing. MA: literature review, formal analysis, visualization.

**Data Availability:**

The dataset is available from the corresponding author upon reasonable request and subject to institutional data governance approval.

**REFERENCES**

1. World Health Organization. Medication Without Harm: WHO Global Patient Safety Challenge. Geneva: WHO; 2017. Available from: https://www.who.int/initiatives/medication-without-harm
2. Slawomirski L, Auraaen A, Klazinga N. The Economics of Patient Safety: Strengthening a Value-Based Approach to Reducing Patient Harm at a National Level. Paris: OECD; 2017. doi:10.1787/5a9858cd-en
3. Singer S, Vogus TJ. Reducing hospital errors: interventions that build safety culture. Annu Rev Public Health. 2013;34:373–396. doi:10.1146/annurev-publhealth-031912-114439
4. Pronovost PJ, Sexton JB. Assessing safety culture: guidelines and recommendations. Qual Saf Health Care. 2005;14(4):231–233. doi:10.1136/qshc.2005.015180
5. Nieva VF, Sorra J. Safety culture assessment: a tool for improving patient safety in healthcare organizations. Qual Saf Health Care. 2003;12(Suppl 2):ii17–ii23. doi:10.1136/qhc.12.suppl_2.ii17
6. El-Jardali F, Sheikh F, Garcia NA, Jamal D, Abdo A. Patient safety culture in a large teaching hospital in Riyadh: baseline assessment, comparative analysis and opportunities for improvement. BMC Health Serv Res. 2014;14:122. doi:10.1186/1472-6963-14-122
7. Weaver SJ, Lubomksi LH, Wilson RF, Pfoh ER, Martinez KA, Dy SM. Promoting a culture of safety as a patient safety strategy: a systematic review. Ann Intern Med. 2013;158(5 Pt 2):369–374. doi:10.7326/0003-4819-158-5-201303051-00002
8. Sammer CE, Lykens K, Singh KP, Mains DA, Lackan NA. What is patient safety culture? A review of the literature. J Nurs Scholarsh. 2010;42(2):156–165. doi:10.1111/j.1547-5069.2009.01330.x
9. Blegen MA, Gearhart S, O'Brien R, Sehgal NL, Alldredge BK. AHRQ's hospital survey on patient safety culture: psychometric analyses. J Patient Saf. 2009;5(3):139–144. doi:10.1097/PTS.0b013e3181b53f6e
10. Al-Hanawi MK, Khan SA, Al-Borie HM. Healthcare human resource development in Saudi Arabia: emerging challenges and opportunities — a critical review. Public Health Rev. 2019;40(1):1. doi:10.1186/s40985-019-0110-1

Power System Technology
ISSN:1000-3673
Received: 06-02-2026 Revised: 15-03-2026 Accepted: 20-04-2026

11. Aljadhey H, Mahmoud MA, Hassali MA, et al. Challenges to and the future of medication safety in Saudi Arabia: a qualitative study. Saudi Pharm J. 2014;22(4):326–332. doi:10.1016/j.jsps.2013.08.001
12. Binobaid M, Aldekhyyil A, Hisham M, Bugis B, Ibrahim A. Patient safety culture in adult intensive care units: a national cross-sectional study in Saudi Arabia. J Patient Saf. 2021;17(8):e941–e948. doi:10.1097/PTS.0000000000000454
13. Alotaibi YK, Federico F. The impact of health information technology on patient safety. Saudi Med J. 2017;38(12):1173–1180. doi:10.15537/smj.2017.12.20631
14. Sorra J, Gray L, Streagle S, et al. AHRQ Hospital Survey on Patient Safety Culture: User's Guide. AHRQ Publication No. 15-0049-EF. Rockville, MD: Agency for Healthcare Research and Quality; 2016.
15. Agency for Healthcare Research and Quality. Hospital Survey on Patient Safety Culture: 2022 User Comparative Database Report. Rockville, MD: AHRQ; 2022. AHRQ Publication No. 22-0037.
16. Al-Arifi MN. Pharmacists' perception, attitudes and understanding of adverse drug reaction reporting in community pharmacy settings in Saudi Arabia. Pharmacoepidemiol Drug Saf. 2014;23(8):861–873. doi:10.1002/pds.3607
17. Alsulami Z, Conroy S, Choonara I. Medication errors in the Middle East countries: a systematic review of the literature. Eur J Clin Pharmacol. 2013;69(4):995–1008. doi:10.1007/s00228-012-1435-y
18. Brady AM, Malone AM, Fleming S. A literature review of the individual and systems factors that contribute to medication administration errors in nursing practice. J Nurs Manag. 2009;17(6):679–697. doi:10.1111/j.1365-2834.2009.00995.x
19. Al-Awa B, De Wever A, Melot C, Devriendt J. An overview of patient safety and accreditation: a literature review study. Res J Med Sci. 2012;6(4):200–207.
20. Saudi Patient Safety Center. National Patient Safety Strategy 2020–2025. Riyadh: Ministry of Health; 2020. Available from: https://www.psnc.org.sa
21. Hamad G, Safi MH, Almutairi MF. Nursing shortage and its relationship to quality of care and patients' safety in public hospitals in Saudi Arabia. J Nurs Educ Pract. 2018;8(9):98–108. doi:10.5430/jnep.v8n9p98
22. Colla JB, Bracken AC, Kinney LM, Weeks WB. Measuring patient safety climate: a review of surveys. Qual Saf Health Care. 2005;14(5):364–366. doi:10.1136/qshc.2005.014217