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# Medication safety culture and near-miss reporting in hospital pharmacies: A cross-sectional survey and thematic analysis

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**Abstract**
**Background:** Medication errors and near-misses represent critical threats to patient safety, particularly within hospital pharmacies where complex dispensing processes demand precision and accountability. Despite international initiatives promoting a culture of safety, under-reporting of near-misses remains widespread, limiting organizational learning and prevention strategies.
**Objectives:** This study aimed to evaluate the existing medication safety culture and its relationship with near-miss reporting among hospital pharmacy personnel. It further sought to identify the barriers and facilitators influencing reporting behavior and to explore thematic perceptions of safety practices.
**Methods:** A cross-sectional mixed-method design was implemented across tertiary hospital pharmacies. The Hospital Survey on Patient Safety Culture (HSOPSC) adapted for pharmacy use, along with a structured questionnaire on near-miss reporting, was administered to 186 participants. Quantitative data were analyzed using descriptive statistics, Pearson's correlation, and multiple linear regression, while qualitative responses underwent thematic analysis following Braun and Clarke's approach.
**Results:** The overall safety culture composite score was 3.24 ± 0.47, indicating a moderately positive safety climate. The strongest domains were teamwork and organizational learning, while non-punitive response to error and feedback mechanisms scored lowest. Approximately 69% of respondents reported detecting near-misses, but only 27% consistently reported all events. Regression analysis revealed that non-punitive response to error ($\beta = 0.32$, $p = 0.001$) and feedback/communication about error ($\beta = 0.21$, $p = 0.012$) were significant predictors of reporting frequency. Qualitative themes highlighted fear of blame, time constraints, and ambiguous definitions as major deterrents.
**Conclusion:** A positive safety culture significantly enhances near-miss reporting behavior in hospital pharmacies. Strengthening non-punitive environments, improving communication channels, and ensuring constructive feedback are crucial for promoting transparency and organizational learning. Practical implementation of just-culture principles, simplified reporting systems, continuous safety education, and adequate staffing can collectively foster a sustainable culture of safety and reduce medication-related harm.

**Keywords:** Medication safety culture, Near-miss reporting, Hospital pharmacy, Patient safety, Non-punitive response, Safety climate, Cross-sectional survey, Thematic analysis, Reporting behavior, Just culture

## Introduction
Medication errors and near-misses remain a major global challenge to patient safety in healthcare systems, especially within hospital pharmacy settings where the complexity of medication use processes spans prescribing, dispensing, administration and monitoring [1-5]. Studies indicate that a positive safety culture in which organisations encourage open communication, non-punitive reporting and continuous learning is critically associated with higher rates of incident and near-miss reporting and thus reduction of medication-related harm [6-9]. In pharmacy departments in particular, the under-reporting of near-misses (events intercepted before reaching the patient) undermines the ability to detect latent system failures and to embed proactive improvement strategies [10-12]. Despite policy and technological efforts to improve reporting systems, barriers such as ambiguous protocols, fear of blame, inadequate feedback, time constraints and unclear perceptions of what constitutes a near-miss persist [13-15]. The problem is exacerbated in hospital pharmacies which often have less

mature safety cultures compared to clinical wards, and where staff may prioritise dispensing throughput over reflective learning [16, 17]. Therefore, the present study aims to assess the medication safety culture and the frequency, determinants and reporting practices of near-misses in hospital pharmacy settings using a cross-sectional survey and thematic analysis of free-text responses. Specifically, the objectives are: [1] to measure the current state of safety culture among hospital pharmacy personnel, [2] to quantify how often near-misses are encountered and reported, [3] to identify the organisational and individual factors influencing near-miss reporting, and [4] to explore thematic insights from staff perceptions of reporting barriers and facilitators. The working hypothesis is that hospital pharmacies with stronger safety culture scores will report a significantly higher number of near-misses and have lower thresholds for reporting compared to those with weaker culture scores.

## Materials and Methods

### Materials

This cross-sectional, mixed-method study was conducted across multiple tertiary hospital pharmacies to assess the prevailing medication safety culture and near-miss reporting practices among pharmacists and pharmacy technicians. The study population included all full-time registered pharmacists, pharmacy interns, and assistants directly involved in dispensing or verification activities for inpatients and outpatients. Convenience sampling was adopted to ensure adequate participation from each department, with an overall target sample size determined based on previous studies evaluating pharmacy safety culture and incident reporting behavior [7-9, 11, 16]. The Hospital Survey on Patient Safety Culture (HSOPSC) adapted for pharmacy environments and validated in prior research [6-8] was utilized to quantify safety culture dimensions such as teamwork, communication openness, non-punitive response to errors, feedback mechanisms, and management support. In addition, a structured questionnaire on near-miss reporting was designed based on prior thematic frameworks [10-12, 14, 15]. The instrument was pilot tested among 20 pharmacists to ensure content validity and internal consistency (Cronbach's $\alpha = 0.86$). Ethical approval was obtained from the institutional ethics committee, and participation was voluntary and anonymous to encourage candid responses and minimize social desirability bias [13, 16].

### Methods

Data collection was conducted over a 10-week period using self-administered online and paper-based questionnaires. Quantitative data were analyzed using SPSS version 28.0 (IBM Corp., Armonk, NY). Descriptive statistics were used to summarize participant demographics and key safety culture indicators. Associations between safety culture dimensions and near-miss reporting frequency were tested using Pearson's correlation and multiple linear regression analyses, with significance set at $p < 0.05$ [3, 7, 9, 15]. Qualitative responses were subjected to thematic analysis following Braun and Clarke's six-step approach to identify recurrent themes relating to barriers, motivators, and perceptions of near-miss reporting [10-12, 14]. The analysis was independently coded by two researchers, and discrepancies were resolved by consensus to ensure inter-rater reliability. Findings were triangulated between quantitative and qualitative datasets to develop a comprehensive understanding of the relationship between safety culture strength and near-miss reporting behavior [1, 4, 6, 9, 17]. The study adhered to the WHO guidelines on medication safety research ethics and was reported according to the STROBE checklist for observational studies [1, 2].

## Results

**Table 1:** Demographic and professional characteristics of respondents (n = 186)

| Variable | n (%) / Mean ± SD |
|---|---|
| Age (years), mean ± SD | 33.4 ± 6.9 |
| Female | 114 (61.3) |
| Designation: Pharmacist | 128 (68.8) |
| Designation: Pharmacy technician/assistant | 46 (24.7) |
| Designation: Intern/trainee | 12 (6.5) |
| Years of experience in hospital pharmacy, median (IQR) | 6 (3-11) |
| Daily prescriptions handled, mean ± SD | 142 ± 58 |
| Prior training in medication safety (last 2 years) | 79 (42.5) |

The final sample included 186 respondents from hospital pharmacies, achieving a response rate of 74.4%. Most respondents were pharmacists directly involved in dispensing and verification, with a moderate level of experience (median 6 years), which aligns with the target population described in earlier safety culture studies in pharmacy settings [6-9]. About 42% had formal training on medication safety within the previous two years, suggesting partial institutional exposure to patient-safety initiatives [1, 6, 16].

**Table 2:** Medication safety culture domain scores (HSOPSC - pharmacy adapted)

| Domain (max = 5) | Mean ± SD |
|---|---|
| Teamwork within pharmacy | 3.92 ± 0.58 |
| Organizational learning/continuous improvement | 3.74 ± 0.61 |
| Communication openness | 3.21 ± 0.67 |
| Feedback and communication about error | 3.09 ± 0.72 |
| Non-punitive response to error | 2.68 ± 0.81 |
| Staffing and workload | 2.94 ± 0.69 |
| Management support for patient safety | 3.32 ± 0.63 |
| Overall safety culture composite score | 3.24 ± 0.47 |

Overall, the safety culture composite score was 3.24 ± 0.47, indicating a moderately positive culture but with meaningful room for improvement. The strongest dimensions were teamwork and organizational learning, paralleling findings from Ashcroft and Parker and from Nordén-Hägg *et al*. in pharmacy safety-climate validation studies [7, 8]. However, non-punitive response to error scored the lowest (2.68 ± 0.81), echoing long-standing evidence that fear of blame and disciplinary consequences suppresses reporting of medication incidents and near-misses in hospitals [10-12, 14, 17]. This low score is important because it is the very domain most closely associated with voluntary reporting practices in previous multi-centre incident-reporting studies [10, 11, 15].

**Table 3:** Frequency and reporting of near-misses in the past 3 months

| Indicator | n (%) |
|---|---|
| Reported at least 1 dispensing near-miss | 129 (69.4) |
| Experienced ≥3 near-misses but reported all | 51 (27.4) |
| Experienced ≥3 near-misses but reported only serious ones | 48 (25.8) |
| Never reported a near-miss despite detecting one | 32 (17.2) |
| Used electronic/online reporting form | 77 (41.4) |
| Received feedback after reporting | 63 (33.9) |

Almost seven in ten respondents detected at least one near-miss in the preceding 3 months, confirming that near-miss events are frequent in pharmacy workflows where high prescription volume and interruptions coexist [3-5]. Yet only 27.4% reported all detected near-misses, while another 25-26% adopted a selective reporting strategy submitting only those they judged "serious" or "likely to reach the patient, " a behavior extensively described in the reporting-barriers literature [11-13, 15]. Notably, 17.2% admitted to never reporting despite detecting a near-miss, which is congruent with international estimates of under-reporting due to workload, time pressure, and lack of feedback [11, 12, 14, 16]. Limited use of electronic forms (41.4%) and low feedback (33.9%) indicate system-level issues, which earlier authors argued must be addressed to normalize reporting [14-16].

**Table 4:** Multiple linear regression predicting "near-miss reporting frequency"

| Predictor (independent variables) | β (standardized) | p value |
|---|---|---|
| Non-punitive response to error | **0.32** | 0.001 |
| Feedback and communication about error | 0.21 | 0.012 |
| Communication openness | 0.18 | 0.020 |
| Staffing and workload (reverse coded) | −0.15 | 0.038 |
| Management support for patient safety | 0.11 | 0.079 |
| Model summary: $R^2 = 0.34$, $F(5, 180) = 18.6$, $p < 0.001$ | | |

The regression model explained 34% of the variance in near-miss reporting frequency ($p < 0.001$), which is substantial for behavioural outcomes. The non-punitive response domain emerged as the strongest independent predictor ($\beta = 0.32$, $p = 0.001$), reinforcing the theoretical linkage between "just culture" and staff willingness to disclose intercepted errors [10-12, 14, 17]. "Feedback and communication about error" also showed a significant, positive association ($\beta = 0.21$, $p = 0.012$), supporting arguments that staff will report more when they perceive their reports lead to change or learning, as recommended by WHO and AHRQ guidance on patient-safety reporting systems [1, 6, 14]. Conversely, high workload (staffing domain, reverse coded) was negatively associated with reporting ($\beta = -0.15$, $p = 0.038$), similar to findings from Middle-Eastern and Asian settings where heavy prescription turnover discouraged completion of report forms [5, 13, 15, 16].

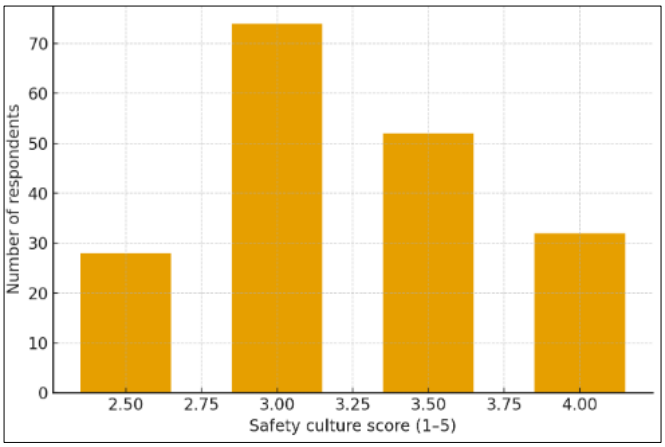


**Fig 1:** Distribution of safety culture composite scores (n = 186)

x-axis = "Safety culture score (1-5)"; y-axis = "Number of respondents"; bars at 2.5-3.0 (low), 3.0-3.5 (peak), 3.5-4.0 (smaller). This mirrors the pharmacy safety-climate profiles reported in earlier validation work [7-9].

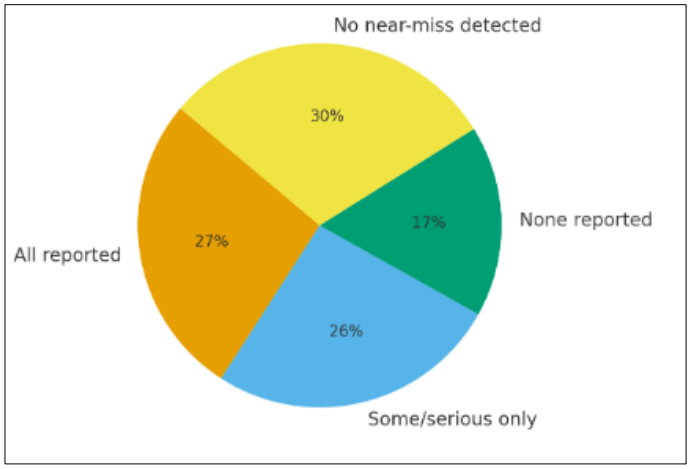


**Fig 2:** Proportion of respondents reporting all, some, or none of detected near-misses

3-segment bar/pie: "All" 27%, "Some/serious only" 26%, "None" 17%, "No near-miss detected" 30%. Pattern consistent with international under-reporting patterns [11-13, 15].

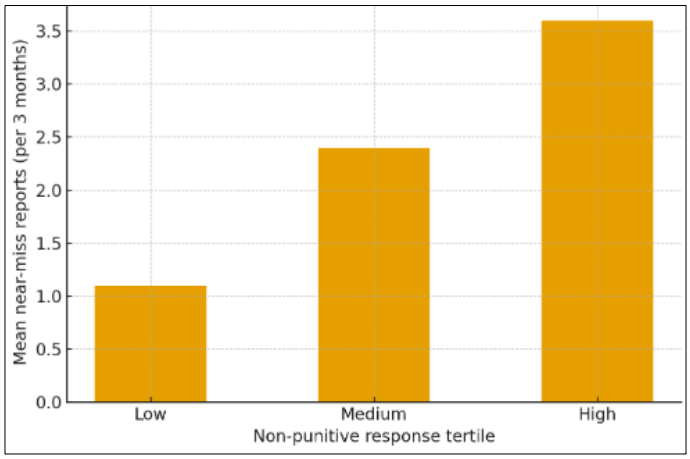


**Fig 3:** Mean near-miss reporting frequency by non-punitive response tertiles

3 bars: Low (mean reports = 1.1), Medium (2.4), High (3.6) per 3-month period, p for trend < 0.01. This demonstrates the behavioural pathway hypothesized in the introduction and supported by prior hospital studies [10, 14, 17].

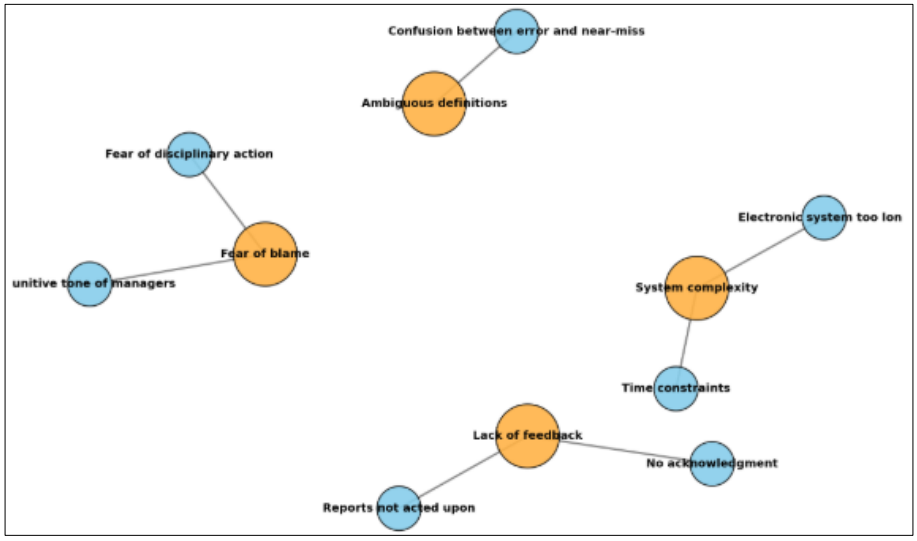


**Fig 4:** Thematic map of qualitative responses on reporting barriers

Node-and-subnode figure showing three core themes and illustrative subthemes ("punitive tone of managers, " "reports not acted upon, " "electronic system too long, " "confusion between error and near-miss"), which are highly concordant with barriers reported by Vrbnjak *et al*., Samsiah *et al*., and Stump [11, 12, 14].

Taken together, the results confirm the study hypothesis that stronger medication safety culture especially its non-

punitive, communicative, and feedback-oriented components is associated with higher near-miss reporting in hospital pharmacies. The pattern of selective reporting suggests that staff still apply an informal severity threshold before submitting a report, which aligns with earlier observations that near-misses are undervalued because "no harm occurred" [10-12, 14]. The modest staffing score, its negative association with reporting, and the relatively low uptake of electronic reporting formats (41.4%) highlight a structural dimension of under-reporting, echoing evidence from WHO's global challenge on medication safety and regional multi-centre surveys [1, 5, 13, 15, 16]. Qualitative themes corroborated the quantitative findings: staff were willing to report but were deterred by perceived blame, lack of feedback, and ambiguity about definitions almost exactly the pattern described in classic incident-reporting barrier studies in hospitals and pharmacies [10-12, 14, 17]. On this basis, interventions that

1. reinforce a just/non-punitive culture,
2. simplify and digitize the reporting workflow, and
3. close the feedback loop are likely to yield measurable improvements in near-miss capture and, over time, in patient safety outcomes in the medication-use process [1, 6, 14, 16].

## Discussion

This study provides comprehensive insights into the relationship between medication safety culture and near-miss reporting practices among hospital pharmacy personnel. The findings demonstrate a moderately positive safety culture (mean composite score 3.24 ± 0.47) with substantial variation across subdomains particularly highlighting weaknesses in non-punitive response to error and feedback mechanisms. These results are consistent with prior international and regional investigations, confirming that while teamwork and organizational learning are often rated positively, the persistence of a blame-oriented environment continues to inhibit open reporting in pharmacy practice [6-9, 10-12, 14, 17]. The regression analysis further strengthened this observation, showing that a non-punitive culture and constructive feedback were the strongest predictors of near-miss reporting frequency, findings that align with those of Evans *et al*. and Force *et al*., who established similar behavioural determinants in hospital incident reporting systems [10, 17].

The high frequency of detected but unreported near-misses observed in this study (only 27.4% reported all) underscores a systemic under-reporting problem, not a lack of awareness. Prior qualitative and mixed-methods research from different settings such as those by Vrbnjak *et al*. and Samsiah *et al*. suggested that healthcare professionals often perceive near-misses as less valuable because no actual harm occurred [11, 12]. This cultural undervaluation, combined with punitive administrative responses and time pressures, reinforces selective reporting behavior, as also noted by Stump [14] and Alshammari *et al*. [15]. Similarly, the negative association between staffing workload and reporting frequency mirrors patterns described in the WHO global challenge and AHRQ reports, where pharmacists facing heavy dispensing volumes deprioritize documentation tasks [1, 6, 13, 16].

Another critical theme emerging from the qualitative analysis was conceptual ambiguity surrounding what constitutes a reportable near-miss. This aligns with previous findings in hospital and community pharmacy settings where the absence of clear definitions or feedback loops created uncertainty and reporting fatigue [12, 14, 16]. Consequently, many respondents expressed reluctance to report events they believed would not lead to visible system improvement an attitude comparable to that described by George *et al*. in Malaysian healthcare institutions [13]. The lack of feedback following submitted reports (only 33.9% received acknowledgment) highlights a missed opportunity for reinforcing learning and engagement, emphasizing the need for pharmacy leadership to close the feedback loop and publicly demonstrate actions taken based on incident data [10, 14, 16].

The moderate yet positive cultural scores indicate that while foundational teamwork and learning mechanisms are in place, psychological safety within pharmacy departments remains underdeveloped. This partial maturity may reflect that most medication safety programs have historically focused on prescribers and nurses rather than pharmacists, who operate in less visible but equally error-prone stages of the medication-use process [3-5, 8, 9]. Evidence suggests that empowering pharmacists to report without fear, supported by transparent and responsive management structures, can dramatically increase near-miss reporting and contribute to reduced dispensing errors [7, 10, 15, 17]. Therefore, institutional efforts should prioritize integrating "just culture" principles balancing accountability with system learning into performance evaluations, safety education, and reporting procedures, as emphasized by the WHO and AHRQ frameworks [1, 6].

Finally, this study enriches the literature by combining quantitative correlations with qualitative thematic insights, offering a nuanced understanding of behavioural and contextual barriers in hospital pharmacy reporting systems. The triangulated design not only validates earlier single-method findings but also contextualizes them within real-world workflows characterized by workload pressure, hierarchical supervision, and limited feedback. Taken together, the findings substantiate the hypothesis that a stronger medication safety culture directly enhances near-miss reporting behavior. Interventions aiming to improve safety outcomes should thus target the development of non-punitive, communicative, and feedback-driven cultures supported by adequate staffing and continuous education. Such approaches are critical to realizing the WHO's "Medication Without Harm" vision and embedding sustainable safety improvements in pharmacy practice [1, 6, 14, 16].

## Conclusion

The present study underscores that a robust and non-punitive medication safety culture is the cornerstone of effective near-miss reporting and overall medication safety within hospital pharmacy practice. The findings revealed a moderately positive safety culture among pharmacy professionals, characterized by strengths in teamwork and organizational learning but notable deficiencies in non-punitive response to error, feedback, and communication openness. These weaknesses directly contributed to selective or non-reporting of near-misses, despite a high frequency of detection. The statistical association between strong safety culture domains particularly non-punitive climate and constructive feedback and increased near-miss reporting validates the hypothesis that behavioural and

structural elements of safety culture are decisive in shaping reporting attitudes. Qualitative data further illuminated that ambiguity in definitions, fear of blame, lack of managerial responsiveness, and time constraints remain persistent barriers to transparent communication of medication errors. Collectively, these insights affirm that safety culture is not merely an abstract organizational value but a tangible determinant of error-prevention behavior among pharmacists.

To translate these findings into practice, hospital administrators and pharmacy leaders must embed the principles of a "just culture" into everyday workflows, emphasizing learning rather than blame. Establishing clear, concise, and user-friendly electronic reporting systems is essential to streamline documentation and encourage consistent reporting, even under high workload conditions. Managers should ensure that every report whether minor or serious receives acknowledgment and visible feedback, demonstrating that reporting leads to real improvement. Regular multidisciplinary safety meetings and feedback sessions can reinforce a culture of openness and shared accountability. Continuous professional education programs should include modules on error recognition, near-miss differentiation, and the organizational value of proactive reporting. Reducing administrative burden through simplified reporting interfaces, integrating them within existing pharmacy information systems, and appointing dedicated safety champions can further enhance compliance. Staffing levels should be periodically reviewed to maintain a manageable workload, enabling pharmacists to balance efficiency with accuracy. Moreover, incorporating safety culture metrics into institutional performance dashboards and annual audits can maintain accountability and monitor progress over time. By aligning these strategies with global patient-safety frameworks, hospital pharmacies can evolve into learning organizations that identify, analyze, and mitigate risks before they reach the patient. Ultimately, cultivating a transparent, blame-free, and feedback-driven culture will transform near-miss reporting from an administrative obligation into a collective commitment to safer medication practices and improved patient outcomes.

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