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Determinants of Perceived Patient Safety Impact of Incident Reporting Systems in Egypt

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ABSTRACT: Incident reporting systems (IRSs) are important tools for identifying and analysing safety incidents, promoting organisational learning, and supporting preventive action. However, their perceived contribution to patient safety may vary according to reporting practices, organisational support, feedback, and safety culture. This study examined factors associated with healthcare professionals' perceptions of the impact of IRSs on patient safety in selected Egyptian hospitals. A descriptive, correlational, cross-sectional study was conducted among eligible healthcare professionals using a structured questionnaire. The questionnaire assessed reporting practices, feedback, perceived barriers, system effectiveness, use of incident-reporting data, no-blame safety culture, familiarity with reporting policies, compliance with reporting procedures, and perceived patient-safety impact. Data were analysed using descriptive statistics, chi-square tests, Spearman's correlation, and multivariable logistic regression. Most participants reported a positive or very positive effect of IRSs on patient safety outcomes. However, there were gaps in knowledge of reporting policies and in adherence to reporting procedures. The most commonly cited barriers to incident reporting were heavy workload and lack of management support. Multivariable logistic regression indicated that system effectiveness, reporting frequency, policy familiarity, no-blame safety culture and feedback were independently associated with a positive perceived patient-safety impact. Although IRSs were generally viewed positively, limitations in reporting culture, policy awareness, feedback and safety culture may inhibit their perceived contribution to improving patient safety. Improving system function, increasing staff awareness of reporting policies, increasing compliance and frequency of reporting, providing timely and helpful input, and fostering a supportive no-blame culture may increase the effectiveness of IRSs in Egyptian hospitals.

1. INTRODUCTION

Patient safety is a core component of healthcare quality, and a priority for health systems globally. The World Health Organization [1] states that to avoid harm, healthcare organisations need to identify hazards, learn from adverse events and near misses, and put in place evidence-based interventions to prevent them happening again. Incident reporting and learning systems (IRLSs) provide the means of doing this by capturing all patient safety incidents and unsafe conditions, and using the information to identify risks, learn from the incident and implement continuous quality improvement (CQI) [2,3].

An incident reporting system (IRS) is not necessarily associated with effective reporting or better patient safety, however. Person, organisation and system factors including workload, managerial support, fear of blame or disciplinary action, confidentiality issues, procedural complexity, availability, and timely feedback can affect reporting. Previous research indicates that feedback is often not provided, discipline does not follow and there is no feeling that the feedback has any significance to the reporting [4]. Furthermore, the results from Egyptian university hospitals suggest that a "no blame" culture should be established to encourage near-miss reporting [5].

Incident reporting is more than just capturing adverse events. It plays a role in patient safety only if reports are properly analysed, shared with appropriate staff members and turned into corrective and preventive action. While IRSs can promote organizational learning and clinical-process improvements, they are only effective if they result in recommendations, feedback, or corrective action [3,6,7]. Therefore, the reporting rate, reporting ease, feedback, system effectiveness, policy awareness, compliance with procedures, data usage, and a no-blame culture play role in supporting patient-safety improvement.

International evidence indicates the underutilization of reporting. An estimated pooled reporting prevalence of 48% and substantial variation in reporting practices were noted in a comprehensive review and meta-analysis of African healthcare facilities, demonstrating continuous implementation challenges [8]. As noted by Goekcimen et al. [9] and Stavropoulou et al. [3], reports are most effective when they integrate into large patient-safety programs and used to foster organisational learning and preventive action. Although patient safety and incident reporting has increased, there is still limited evidence on the factors related to the perceived impact on patient safety of IRSs among healthcare professionals in Egyptian hospitals. Understanding the relevant organisational and system characteristics can influence healthcare organisations in enhancing reporting, learning and enhancing patient safety. Therefore, the aim of this study was to identify the factors related to patient-safety concerns for the IRSs among the health care professionals in some Egyptian hospitals.

2. MATERIALS AND METHODS

2.1 Study Design and Setting

A descriptive, correlational, cross-sectional study assessed incident-reporting practices and the relationship between incident-reporting system characteristics and perceived patient-safety impact among healthcare professionals in some Egyptian hospitals. The design enabled assessment of the study outcomes at one point in time. The study followed the STROBE statement for cross-sectional studies [10]. Data were collected through a structured, self-administered electronic questionnaire.

2.2 Participants and Sampling

The target population was health professionals who currently work in Egyptian hospitals. The study participants consisted of active healthcare workers in hospitals in Egypt during data collection. A systematic random sampling technique [11] was used to select staff from various clinical departments and professional role groups in a representative manner.

2.3 Data Collection Instrument

A structured self-administered questionnaire was administered electronically using Microsoft Forms to the healthcare professionals in Egyptian hospitals. As summarized in Figure 1, the domains on the questionnaire were chosen based on previous studies that showed these to be factors that influence the effectiveness of incident-reporting systems and patient-safety improvement [2,4,6,7].

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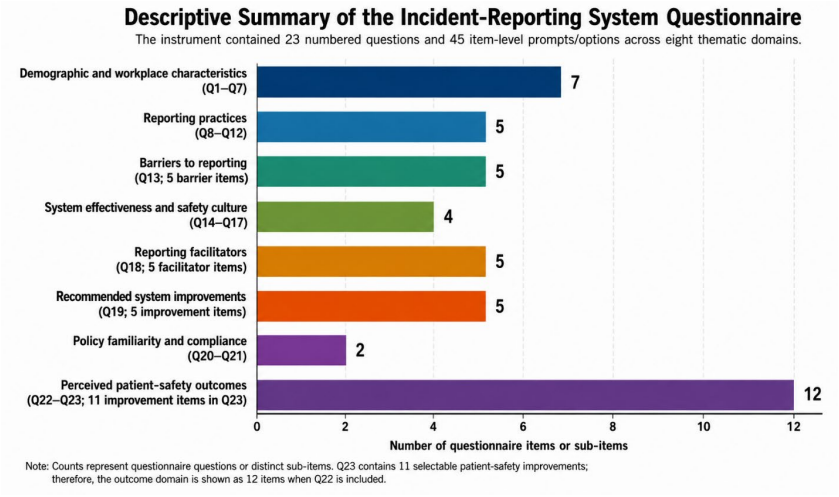


Figure 1. The questionnaire's eight thematic domains and the number of questions in each domain.

2.4 Study Variables

Patient-safety impact of the incident-reporting system, as perceived by the respondents, was the primary dependent variable, and improvements in patient safety, as reported by respondents, were treated as an additional descriptive outcome. Independent variable items included reporting practices, system performance, organizational culture, policy factors, and system perceived barriers including workload, time constraints, system complexity, lack of anonymity/lack of feedback, and limited management support. Because of differences in the professional and organizational backgrounds, potential covariates, including age, gender, professional role, healthcare experience, department, facility type, accreditation status and current employment in an Egyptian hospital, were included in adjusted analyses. Data from each of these facilitators, including anonymous reporting, a non-punitive culture, staff safety, colleague encouragement, incident-category suggestions, and uploads of photos or videos were analyzed separately, as were the safety contributions recognized in recommended improvements, including regular training, hospital system integration, mobile or offline reporting, proactive data use, and recognition of safety contributions. Associations between the variables and positive perceived impact on patient safety were examined descriptively, and analytically if appropriate, and selected determinants were examined by multivariable analysis after adjustment for relevant covariates. The conceptual framework (Figure 2) hypothesizes the following relationships.

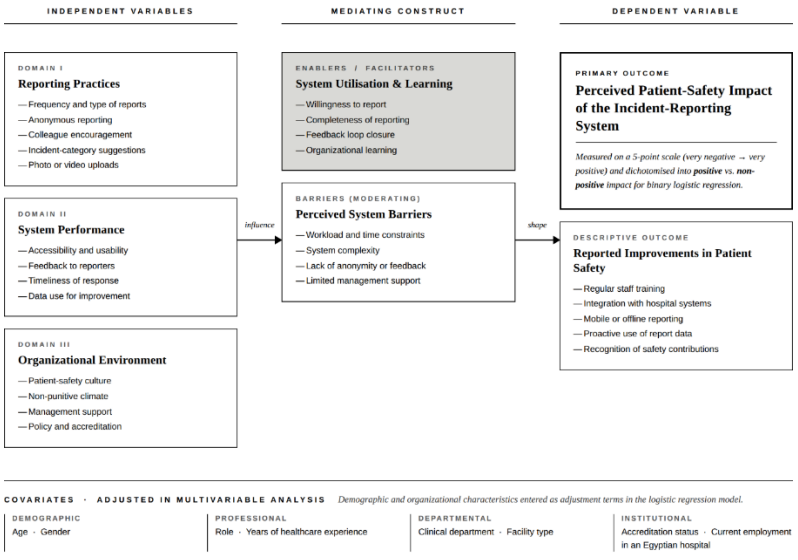


Figure 2. Conceptual framework of the factors associated with the perceived patient-safety impact of incident-reporting systems in Egyptian hospitals.

2.5 Validity and Reliability

The questionnaire's face and content validity were supported by expert review and based on known concepts and domains of incident reporting, patient-safety culture, organizational learning, incident reporting hindrances, feedback, and uses of incident data for safety improvement. The multi-item domains with the same construct were tested for internal consistency using Cronbach's alpha, but the single-item and select-all-that-apply questions or items in the different constructs were not tested. If analyzed, reliability was assessed separately for each domain (e.g., reporting facilitators and recommended system improvements) and is reported in the Results section.

2.6 Ethical Considerations

The purpose of the study, the voluntary nature, confidentiality, and the fact that the responses would only be used for research purposes were explained in the questionnaire. It reviewed incident reporting systems and patient safety in some hospitals in Egypt and the event allowed the identification of practices and areas in which they can be improved. The electronic survey was completed and returned to obtain informed consent. Microsoft Forms collected no automatically captured data that could directly identify any individual. The data were anonymous and only aggregated so that individual participants were not identified.

2.7 Data Collection Procedure

The data collected were electronic using the previously mentioned Microsoft Forms questionnaire. The link of the questionnaire was sent to eligible healthcare professionals who work in Egyptian hospitals via the available communication channels during the period of the study. The electronic version allowed for uniform administration of the questionnaire and helped to gather responses from participants at different hospital sites. Responses submitted were screened for completeness and appropriateness for analysis. Data from the responses that were not complete or invalid were eliminated from the data set based on the data-cleaning process used in the study and the final data set was ready for statistical analysis. Results include data on the number of responses received, responses that were excluded from the final analysis, and responses that were included in the final analysis.

2.8 Statistical Analysis

The data were analysed using the appropriate statistical software; means and standard deviations were used in approximately symmetric continuous variables, and medians and interquartile ranges in non-normal continuous variables, and frequencies and percentages were used for categorical variables. The primary outcome, perceived patient-safety impact, was assessed on a 5-point range scale and then dichotomized for binary logistic regression as positive impact (positive/very positive) and nonpositive impact (no, negative, or very negative patient impact). Chi-square or Fisher's exact test were used for categorical variables, and Spearman's rank correlation for ordinal or theoretically related variables. Using multivariable logistic regression analysis, factors that were found to be significantly associated with positive perceived impact, with relevant demographic and organizational characteristics as covariates, were identified. Single-item and select all that apply questions were analyzed by response category, as separate binary indicators, descriptively and when they were thought to measure a common construct, with acceptable internal consistency, they were converted into composite scores. Odds ratios (95% confidence intervals) were presented after adjustment for multiple factors, appropriate procedures were used for assessment of multicollinearity, outcome-event adequacy, model fit and missing data, and a two-sided p value of ≤ 0.05 was considered statistically significant.

3. RESULTS AND DISCUSSION

3.1 Characteristics of the Study Participants

There were a total of 438 initial responses. 18 answers were discarded due to the fact that the respondents aren't working in an Egyptian hospital at the moment. The final analytical sample was thus 420 eligible HCPs. The process of selecting participants is shown in Figure 3.

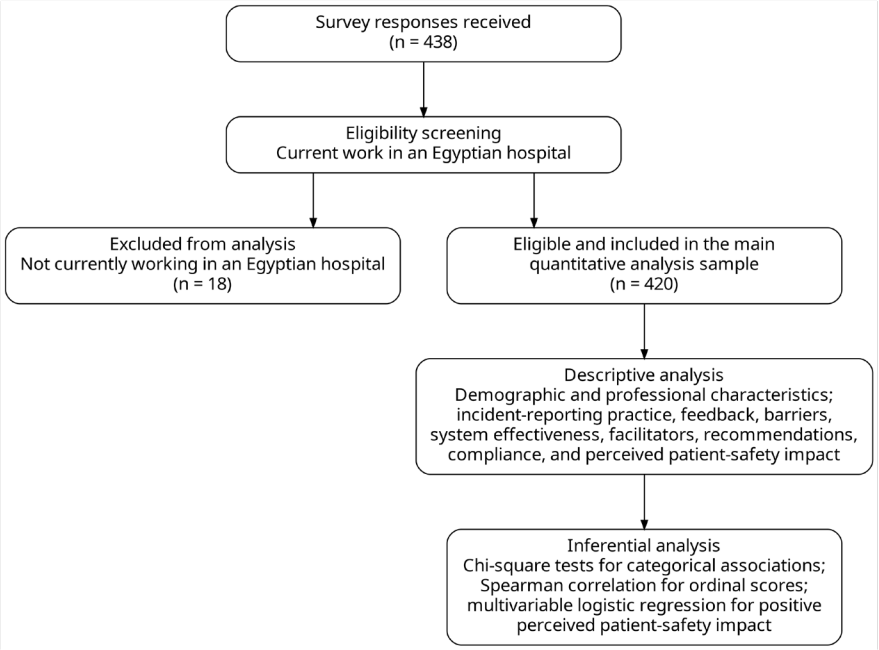


Figure 3. Flow diagram of participant recruitment and eligibility.

The mean age of participants was 31.06 ± 8.16 years. Women constituted 254 participants (60.5%), whereas men represented 166 (39.5%). Nurses constituted the largest professional group (232; 55.2%), followed by allied health professionals (86; 20.5%), physicians (74; 17.6%), and administrators/managers (28; 6.7%). Regarding healthcare experience, 168 participants (40.0%) had 1–5 years of experience, 92 (21.9%) had less than 1 year, 58 (13.8%) had 6–10 years, 60 (14.3%) had 11–20 years, and 42 (10.0%) had more than 20 years of experience. Most participants worked in university hospitals (310; 73.8%). Among the 418 participants with valid accreditation data, 142 (34.0%) worked in accredited hospitals. These demographic and professional characteristics are summarized in Figure 4.

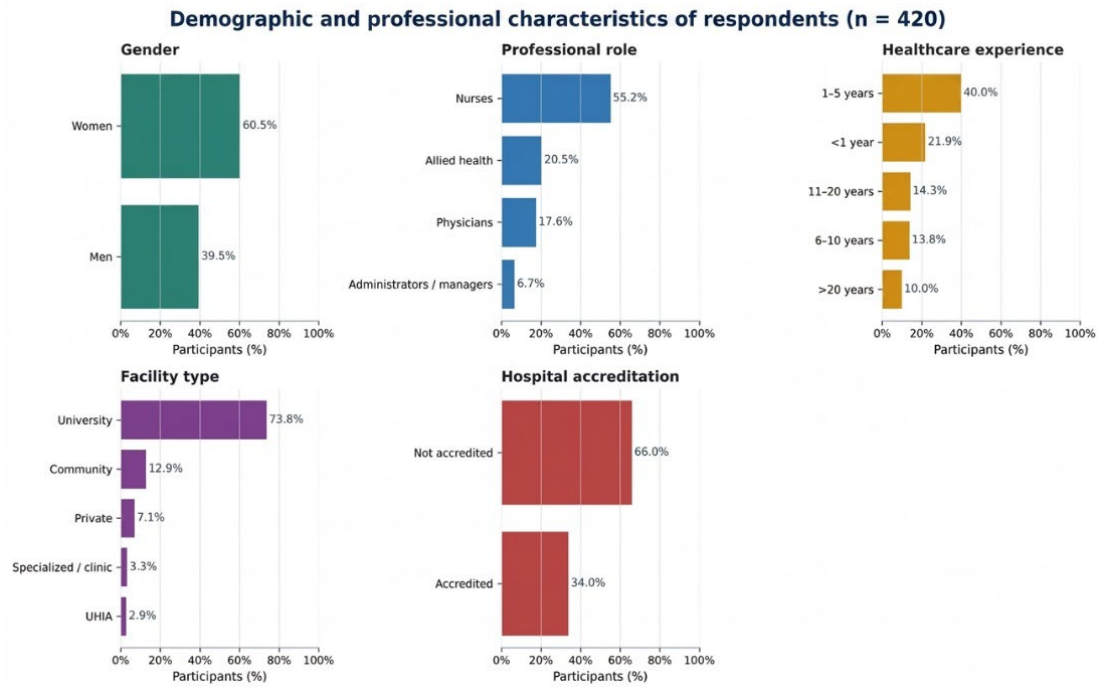


Figure 4. Demographic and professional characteristics of the study respondents (n = 420).

3.2 Incident Reporting Practices and Reporting System Characteristics

Overall, incident reporting was relatively limited. Forty-four participants (10.5%) indicated that they always reported incidents, while 42 (10.0%) reported incidents often. In contrast, 164 participants (39.0%) reported incidents rarely and 50 (11.9%) reported that they never reported incidents. In total, 206 participants (49.0%) reported incidents at least occasionally, whereas 214 (51.0%) reported incidents rarely or never, as shown in Figure 5.

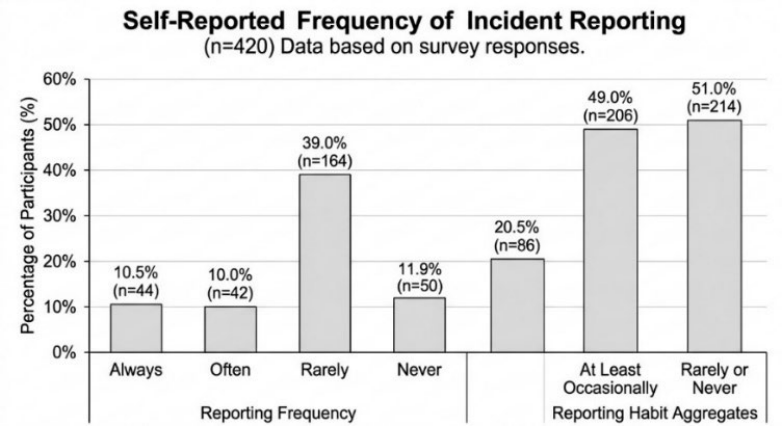


Figure 5. Frequency of incident reporting among participants (n=420).

As shown in Table 1, regarding the ease of reporting, 144 participants (34.3%) considered the reporting process easy or very easy, 196 (46.7%) were neutral, and 80 (19.0%) considered reporting difficult or very difficult. Feedback following incident reporting was also limited. Only 136 participants (32.4%) reported receiving feedback often or always, whereas 284 (67.6%) reported receiving feedback sometimes, rarely, or never. Previous studies have highlighted the need for feedback as a tool to turn incident information into learning for the organization and patient-safety improvement.

Table 1. Incident reporting practices, ease of reporting, and feedback after reporting

Domain	Category	No. (%)
Reporting frequency	Always	44 (10.5%)
	Often	42 (10.0%)
	Sometimes	120 (28.6%)
	Rarely	164 (39.0%)
	Never	50 (11.9%)
Reporting frequency summary	At least occasional reporting	206 (49.0%)
	Never/rarely reporting	214 (51.0%)
Ease of reporting	Very Easy	16 (3.8%)
	Easy	128 (30.5%)
	Neutral	196 (46.7%)
	Difficult	68 (16.2%)
	Very Difficult	12 (2.9%)
Feedback after reporting	Always	44 (10.5%)
	Often	92 (21.9%)
	Sometimes	178 (42.4%)
	Rarely	82 (19.5%)
	Never	24 (5.7%)

3.3 Barriers to Effective Incident Reporting

Heavy workload and lack of time were the most reported barriers reported by 256 participants (61.0%). This was followed by lack of management support (200; 47.6%). 102 participants (24.3%) reported a lack of anonymity or confidentiality, while 88 (21.0%) cited system complexity. Insufficient feedback was reported by 72 participants (17.1%). The most common concerns mentioned were about blame and punishment, as well as punishments by administrators (14, 3.3%), as illustrated in Figure 6.

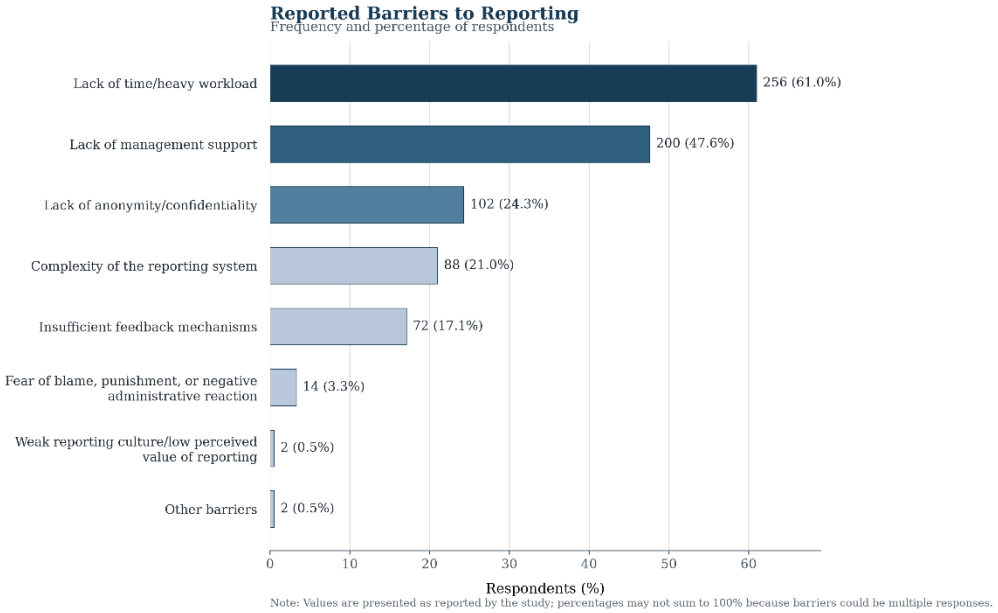


Figure 6. Perceived barriers to effective incident reporting among healthcare professionals (n = 420).

3.4 System Effectiveness, Safety Culture, Policy Familiarity, and Perceived Patient-Safety Impact

Perceived effectiveness of incident reporting systems, utilisation of incident data and no-blame safety culture are described in Table 2. Just 17.1% of participants (72) considered the incident reporting system to be very or extremely effective for hazard and risk identification. Likewise, 18.1% (76) found that the system was very or extremely effective at learning within their organization, and preventing repeat incidents. Overall, 164 participants (39.0%) frequently or always analysed and acted on incident data to improve. This discovery is significant because the process of incident reporting is not just about gathering reports, but also analyzing and then taking the information and turning it into corrective and preventative action. The safety culture was fairly low in perception of no blame. Of those who responded, 194 (46.2%) rated the 'no blame' safety culture as poor or very poor, while only 66 (15.7%) rated it as good or very good.

Table 2. Perceived system effectiveness, data utilization, and no-blame safety culture

Domain	Response category	No. (%)
Hazard and risk identification	Extremely effective	8 (1.9%)
	Very effective	64 (15.2%)
	Moderately effective	176 (41.9%)
	Slightly effective	134 (31.9%)
	Not at all effective	38 (9.0%)
Learning and prevention of recurrence	Extremely effective	8 (1.9%)
	Very effective	68 (16.2%)
	Moderately effective	172 (41.0%)
	Slightly effective	130 (31.0%)
	Not at all effective	42 (10.0%)

Data analysis and utilization	Yes, always	46 (11.0%)
	Often	118 (28.1%)
	Sometimes	162 (38.6%)
	Rarely	74 (17.6%)
	No, never	20 (4.8%)
No-blame safety culture	Very Good	4 (1.0%)
	Good	62 (14.8%)
	Neutral	160 (38.1%)
	Poor	132 (31.4%)
	Very Poor	62 (14.8%)

Only 88 participants (21.0%) were very or extremely familiar with hospital incident-reporting policies, whereas 178 (42.4%) were slightly familiar or not familiar with these policies. Similarly, only 34 participants (8.1%) reported high or very high compliance with reporting policies, while 224 (53.3%) reported low or very low compliance. Despite these limitations, 280 participants (66.7%) perceived a positive or very positive impact of incident-reporting systems on patient-safety outcomes. A total of 106 participants (25.2%) perceived no impact, while 34 (8.1%) perceived a negative or very negative impact as shown in Table 3.

Table 3. Familiarity with policies, perceived compliance, and perceived patient-safety impact

Domain	Response category	No. (%)
Familiarity with hospital incident-reporting policies	Extremely familiar	26 (6.2%)
	Very familiar	62 (14.8%)
	Moderately familiar	154 (36.7%)
	Slightly familiar	134 (31.9%)
	Not at all familiar	44 (10.5%)
Perceived compliance with reporting policies	Very High Compliance	4 (1.0%)
	High Compliance	30 (7.1%)
	Moderate Compliance	162 (38.6%)
	Low Compliance	166 (39.5%)
	Very Low Compliance	58 (13.8%)
Perceived impact on patient-safety outcomes	Very Positive Impact	52 (12.4%)
	Positive Impact	228 (54.3%)
	No Impact	106 (25.2%)
	Negative Impact	26 (6.2%)
	Very Negative Impact	8 (1.9%)

3.5 Bivariate Associations with Perceived Patient-Safety Impact

The bivariate associations between selected reporting-system characteristics and perceived patient-safety impact are visualized in Figure 7. Positive perceived patient-safety impact was significantly more common among participants who reported incidents at least occasionally than among those who rarely or never reported them (78.6% vs. 55.1%, $p \leq .001$), found reporting easy or very easy (80.6% vs. 59.4%, $p \leq .001$), and received feedback often or always (82.4% vs. 59.2%, $p \leq .001$). It was also higher among those who rated the system as very or extremely effective for hazard identification (97.2% vs. 60.3%), organizational learning and prevention (92.1% vs. 61.0%), and frequent data use (75.6% vs. 60.9%, $p = .003$; all other $p \leq .001$). Similarly, positive impact was associated with a good or very good no-blame safety culture (93.9% vs. 61.6%), greater policy familiarity (84.1% vs. 62.0%), and moderate or high policy compliance (82.7% vs. 52.7%; all $p \leq .001$). Hospital accreditation was not significantly associated with perceived impact ($p = .503$).

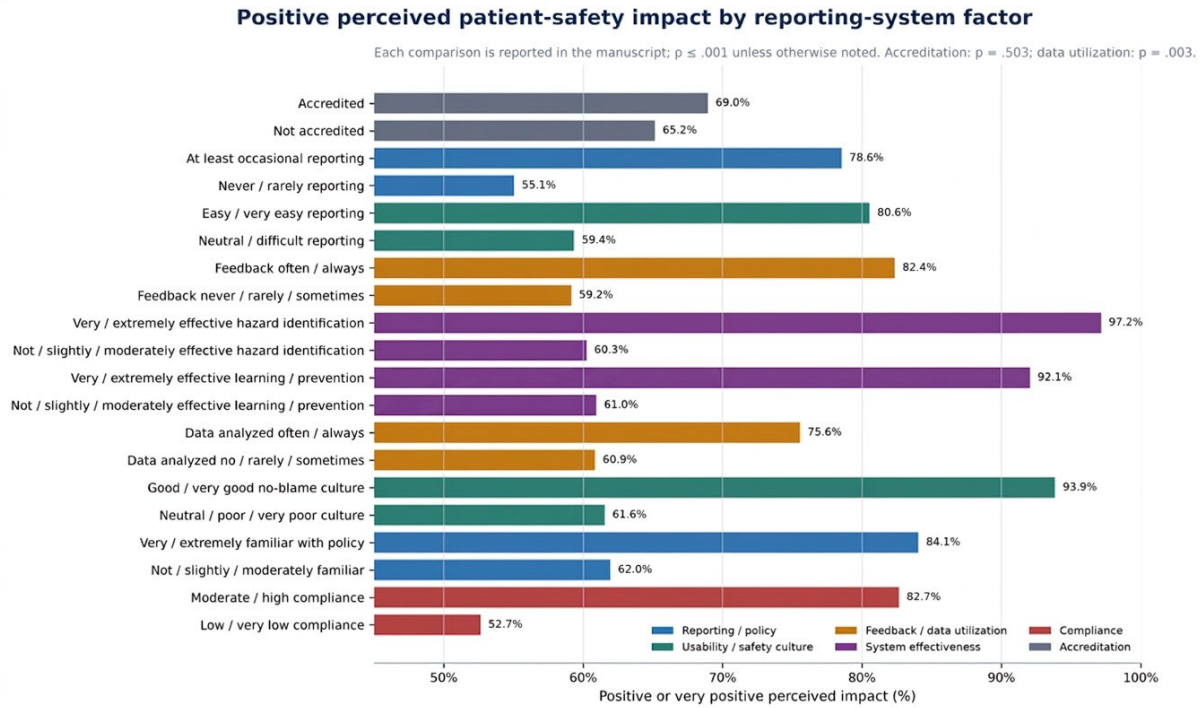


Figure 7. Positive perceived patient-safety impact by reporting-system factor: bivariate comparisons across reporting frequency, ease of reporting, feedback, system effectiveness, data utilization, no-blame culture, policy familiarity, and compliance.

3.6 Factors Associated with Reporting Behavior and Compliance

Although perceived patient-safety impact was the primary outcome, reporting behavior and perceived policy compliance were examined as important intermediate characteristics. As shown in Table 4, at least occasional reporting was significantly associated with professional role (p = .003), healthcare experience (p ≤ .001), facility type (p = .016), and familiarity with reporting policies (p = .046). Reporting was most frequent among administrators/managers (78.6%), compared with nurses (44.8%) and allied health professionals (44.2%), and increased from 30.4% among participants with less than one year of experience to 71.4% among those with more than 20 years. Gender, hospital accreditation, ease of reporting, and feedback were not significantly associated with reporting behavior.

Table 4. Relationship between reporting behavior and participant/institutional characteristics

Variable	Category	Positive/very positive impact	No/negative impact	p-value
Hospital accreditation	Yes	98 (69.0%)	44 (31.0%)	.503
	No	180 (65.2%)	96 (34.8%)	
Reporting frequency	At least occasional	162 (78.6%)	44 (21.4%)	≤.001
	Never/rarely	118 (55.1%)	96 (44.9%)	
Ease of reporting	Easy/very easy	116 (80.6%)	28 (19.4%)	≤.001
	Neutral/difficult	164 (59.4%)	112 (40.6%)	
Feedback	Often/always	112 (82.4%)	24 (17.6%)	≤.001
	Never/rarely/sometimes	168 (59.2%)	116 (40.8%)	

Hazard-identification effectiveness	Very/extremely effective	70 (97.2%)	2 (2.8%)	≤.001
	Not/slightly/moderately effective	210 (60.3%)	138 (39.7%)	
Learning/prevention effectiveness	Very/extremely effective	70 (92.1%)	6 (7.9%)	≤.001
	Not/slightly/moderately effective	210 (61.0%)	134 (39.0%)	
Data analyzed and used	Often/always	124 (75.6%)	40 (24.4%)	.003
	No/rarely/sometimes	156 (60.9%)	100 (39.1%)	
No-blame safety culture	Good/very good	62 (93.9%)	4 (6.1%)	≤.001
	Neutral/poor/very poor	218 (61.6%)	136 (38.4%)	
Familiarity with policy	Very/extremely familiar	74 (84.1%)	14 (15.9%)	≤.001
	Not/slightly/moderately familiar	206 (62.0%)	126 (38.0%)	
Perceived compliance	Moderate/high	162 (82.7%)	34 (17.3%)	≤.001
	Low/very low	118 (52.7%)	106 (47.3%)	

Table 5 presents the associations between perceived compliance and reporting-system characteristics. Moderate or high compliance was significantly associated with at least occasional reporting, ease of reporting, frequent feedback, perceived effectiveness in hazard identification, learning, and prevention, and a good or very good no-blame safety culture. Compliance was higher among participants who often or always received feedback than among those who never, rarely, or sometimes received it (66.2% vs. 37.3%, $p \leq .001$), and among those reporting a good or very good no-blame culture compared with those reporting a neutral, poor, or very poor culture (66.7% vs. 42.9%, $p \leq .001$).

Table 5. Relationship between perceived compliance and selected reporting-system factors

Variable	Category	Positive/very positive impact	No/negative impact	p-value
Hospital accreditation	**Yes**	**98 (69.0%)**	**44 (31.0%)**	**.503**
	No	**180 (65.2%)**	**96 (34.8%)**	
Reporting frequency	**At least occasional**	**162 (78.6%)**	**44 (21.4%)**	**≤.001**
	Never/rarely	**118 (55.1%)**	**96 (44.9%)**	
Ease of reporting	**Easy/very easy**	**116 (80.6%)**	**28 (19.4%)**	**≤.001**
	Neutral/difficult	**164 (59.4%)**	**112 (40.6%)**	
Feedback	**Often/always**	**112 (82.4%)**	**24 (17.6%)**	**≤.001**
	Never/rarely/sometimes	**168 (59.2%)**	**116 (40.8%)**	
Hazard-identification effectiveness	**Very/extremely effective**	**70 (97.2%)**	**2 (2.8%)**	**≤.001**
	Not/slightly/moderately effective	**210 (60.3%)**	**138 (39.7%)**	
	Very/extremely effective	**70 (92.1%)**	**6 (7.9%)**	**≤.001**

Learning/prevention effectiveness	**Not/slightly/moderately effective**	**210 (61.0%)**	**134 (39.0%)**	
Data analyzed and used	**Often/always**	**124 (75.6%)**	**40 (24.4%)**	**.003**
	No/rarely/sometimes	**156 (60.9%)**	**100 (39.1%)**	
No-blame safety culture	**Good/very good**	**62 (93.9%)**	**4 (6.1%)**	**≤.001**
	Neutral/poor/very poor	**218 (61.6%)**	**136 (38.4%)**	
Familiarity with policy	**Very/extremely familiar**	**74 (84.1%)**	**14 (15.9%)**	**≤.001**
	Not/slightly/moderately familiar	**206 (62.0%)**	**126 (38.0%)**	
Perceived compliance	**Moderate/high**	**162 (82.7%)**	**34 (17.3%)**	**≤.001**
	Low/very low	**118 (52.7%)**	**106 (47.3%)**	

3.7 Correlations between Reporting-System Characteristics and Patient-Safety Impact

A Spearman correlation analysis examined relationships among reporting-system characteristics, compliance, and perceived patient-safety impact. The relative magnitude of these correlations is visualized in Figure 8. Perceived compliance was positively correlated with reporting frequency, ease of reporting, feedback, no-blame safety culture, and familiarity with reporting policies (Spearman's rho = .180–.346; all $p \leq .001$). Perceived patient-safety impact was also positively correlated with hazard-identification effectiveness (rho = .325), learning and prevention effectiveness (rho = .281), improvement recommendations (rho = .273), perceived compliance (rho = .248), and no-blame safety culture (rho = .233; all $p \leq .001$). Data utilization showed a weaker but significant positive correlation with perceived impact (rho = .157, $p \leq .001$).

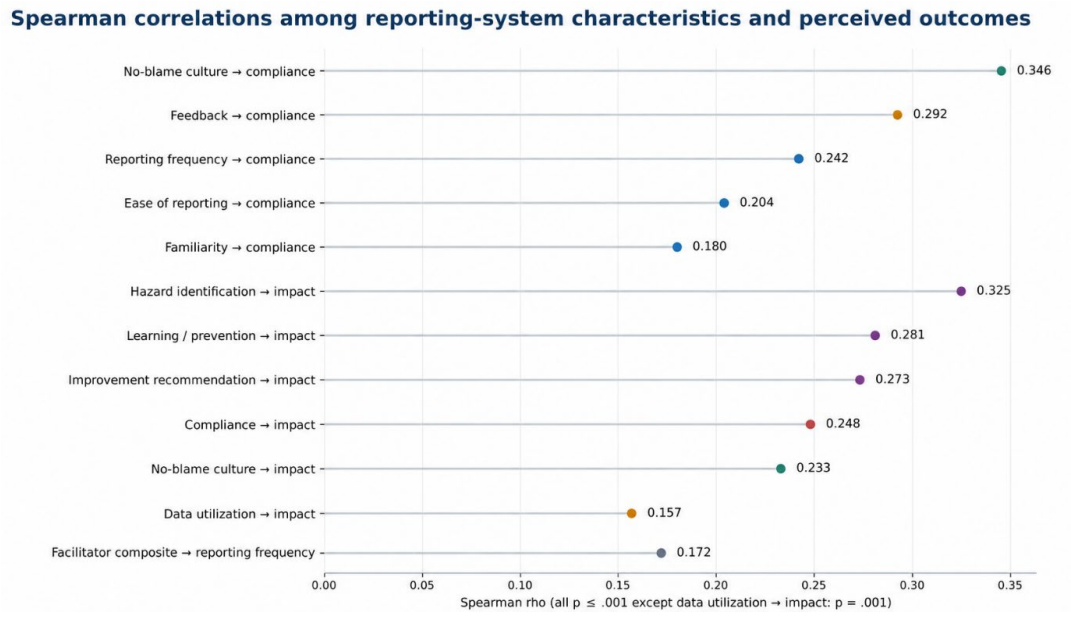


Figure 8. Spearman correlations among reporting-system characteristics, compliance, and perceived patient-safety impact.

3.8 Determinants of Perceived Patient-Safety Impact

Multivariable logistic regression analysis was performed to identify factors independently associated with positive perceived patient-safety impact. The dependent variable was dichotomized as positive or very positive perceived impact versus no, negative, or very negative perceived impact. These results are displayed graphically in Figure 9.

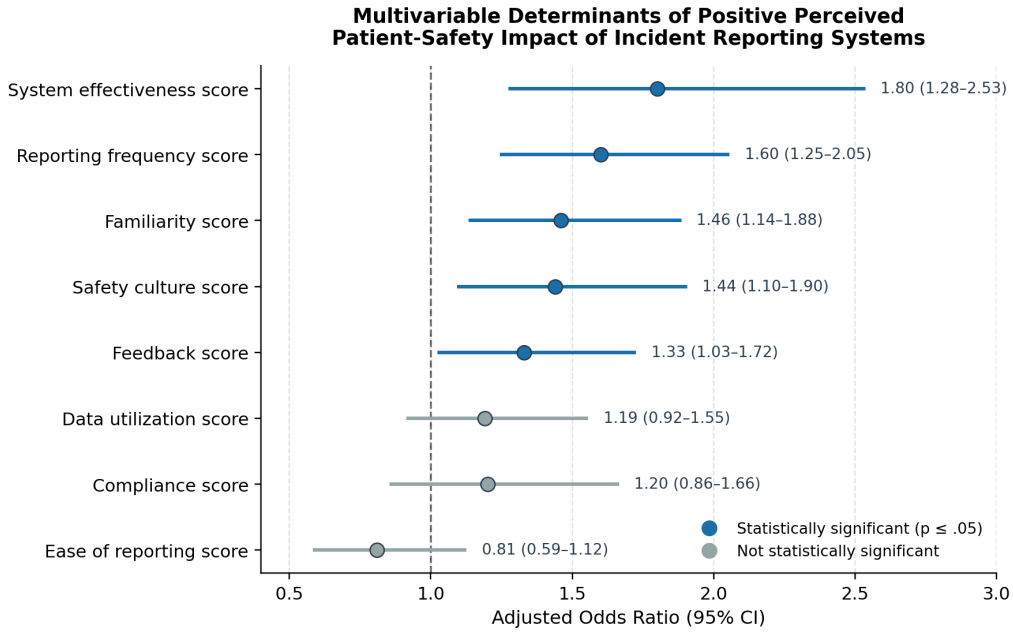


Figure 9. Forest plot of adjusted odds ratios (95% CI) for independent determinants of positive perceived patient-safety impact of incident reporting systems.

After adjustment, five variables remained independently associated with positive perceived patient-safety impact. Perceived system effectiveness was the strongest determinant (AOR = 1.80, 95% CI [1.28, 2.53], p ≤ .001), followed by reporting frequency (AOR = 1.60, 95% CI [1.25, 2.05], p ≤ .001), familiarity with reporting policies (AOR = 1.46, 95% CI [1.14, 1.88], p = .003), no-blame safety culture (AOR = 1.44, 95% CI [1.10, 1.90], p = .009), and post-reporting feedback (AOR = 1.33, 95% CI [1.03, 1.72], p = .027). Ease of reporting, data utilization, and compliance were not independently associated with perceived impact (p = .197, .183, and .285, respectively).

Overall, perceived system effectiveness, reporting frequency, familiarity with incident-reporting policies, no-blame safety culture, and feedback after reporting were the independent determinants of positive perceived patient-safety impact. System effectiveness demonstrated the strongest association, followed by reporting frequency, policy familiarity, safety culture, and feedback. The final model explained approximately 19.8% of the variance in positive perceived patient-safety impact according to McFadden's pseudo-R^2.

3.9 Principal Findings

In this study, healthcare professionals generally indicated a positive or very positive impact of incident-reporting systems (IRSs) on patient safety (66.7%). But this positive perception was accompanied by very important shortcomings in the reporting and learning process. Reported uptake was low, feedback was inconsistent, perceived system effectiveness was moderate, knowledge of reporting policies was incomplete, and perceptions of a no-blame safety culture were generally negative. The findings consequently suggest a disconnect between the perceived value of IRSs and the maturity of their implementation. An IRS value may be limited when reports are collected without adequate participation, system responsiveness, analysis, feedback and organisational learning. This interpretation is consistent with recent evidence that incident-reporting and learning systems require structured analysis and follow-up to support safety improvement [2,8,12].

3.10 Reporting Participation and Barriers

Incidents were reported at least occasionally by 49.0% of participants, whereas 51.0% rarely or never reported them. The most common barriers were workload or lack of time (61.0%), inadequate management support (47.6%) and concerns about anonymity or confidentiality (24.3%), followed by system complexity (21.0%) and insufficient feedback (17.1%). These results indicate that incomplete reporting is not merely a matter of individual behaviour. It may also demonstrate the extent to which reporting procedures are compatible with routine clinical work, usability of the reporting platform and whether staff believe

reports will receive a suitable organisational response. Recent reviews similarly identify organisational culture, time pressure, leadership support, training, and the design of reporting systems as important influences on reporting practices [8,12].

The association between reporting participation and perceived patient-safety impact was consistent with the role of staff engagement in reporting-and-learning systems. Participants who reported incidents at least occasionally were more likely to perceive a positive patient-safety impact than those who reported rarely or never. Reporting frequency also remained independently associated with positive perceived impact in the adjusted model. Nevertheless, this association should not be interpreted causally. Participants who already have more favourable experiences of their reporting systems may be more willing to report, while more active reporting may also increase exposure to feedback and organisational learning. Both explanations are compatible with the cross-sectional design.

In the bivariate analysis, ease of reporting was associated with perceived patient-safety impact, but not independently after adjustment. This finding suggests usability is necessary, but maybe not sufficient by itself. Reporting may be easy but limited if staff do not have time, management support, confidentiality, feedback or confidence that reports will lead to meaningful action. This is in line with evidence that electronic reporting systems have the potential to improve information accessibility and availability, but the implementation of such systems must also address organisational and workflow conditions [8,12]. Interventions should therefore focus on system design, staffing, integration into workflow, leadership support and the organisational response to reported concerns, rather than solely on reminders or mandatory reporting requirements.

3.11 System Effectiveness, Data Use, and Organisational Learning

Perceived system effectiveness was limited. Only 17.1% of participants rated the system as very or extremely effective for hazard identification, and 18.1% gave these ratings for organisational learning and prevention of recurrence. In addition, only 39.0% reported that incident data were analysed and used for improvement often or always. Participants who perceived the system as more effective in identifying hazards or supporting learning and prevention were more likely to report a positive patient-safety impact, and both domains were positively correlated with the outcome.

Data utilisation showed a similar pattern. Frequent use of incident data was associated with a more positive perceived impact in the bivariate analysis and was positively, although weakly, correlated with the outcome. It was not independently associated with perceived impact after adjustment. This attenuation may reflect overlap between data utilization and broader system characteristics, especially perceived system effectiveness, reporting frequency, feedback, policy familiarity and safety culture. This finding is not to suggest that the use of data is unimportant. Instead it suggests that data analysis can be most useful when it is part of a larger process of interpretation, communication, corrective action, and follow-up. Taken together, these findings describe a reporting-to-learning gap: reports might be collected but their patient-safety value is contingent on whether they are analyzed, communicated to relevant staff, linked to corrective and preventive action, and followed-up with feedback [6,7,8,12]. However, the present study did not assess whether individual reports resulted in completed corrective actions or measurable reductions in patient harm. The results should therefore be understood as evidence about perceived system functioning rather than direct evidence of objective safety improvement.

3.12 No-Blame Safety Culture and Organisational Support

Perceptions of the no-blame safety culture were generally unfavourable. Only 15.7% of participants rated the culture as good or very good, whereas 46.2% rated it as poor or very poor. A favourable safety-culture assessment was associated with more positive perceived patient-safety impact and higher perceived compliance, and it remained independently associated with the primary outcome after adjustment. These findings are consistent with recent evidence that psychological safety, fair treatment, leadership commitment, and open communication support incident reporting and organisational learning [5,13,14].

Only 3.3% of participants identified fear of blame or punishment as a specific barrier. This should not be interpreted as evidence that psychological safety is unimportant. Staff may experience an unsupportive reporting environment through limited management support, weak feedback, lack of confidentiality, or low confidence in the usefulness of reporting without explicitly describing these experiences as fear of punishment. The findings therefore support an organisational approach based on non-punitive responses, fair accountability, open communication, and visible action following reports. Because the study was cross-sectional, the direction of the association between safety culture and perceived patient-safety impact cannot be established.

3.13 Policy Familiarity and Perceived Compliance

Familiarity with hospital incident-reporting policies was limited: only 21.0% of participants reported being very or extremely familiar with the policies. Higher policy familiarity was associated with more frequent reporting and more positive perceived patient-safety impact, and it remained independently associated with the outcome after adjustment. This suggests that policy knowledge may support staff engagement and help healthcare professionals understand when and how to report incidents.

Perceived compliance was also limited. In multivariate analyses, reporting frequency, ease of reporting, feedback, system effectiveness, and safety culture were all associated with moderate or high compliance; however, after adjustment, moderate or high compliance was not independently associated with perceived patient-safety impact. The distinction between policy familiarity and compliance is important. Staff may be aware of the policy but not necessarily be able to comply with it in practice. Compliance may be influenced by the availability, integration into the workflow and feasibility of reporting procedures in the routine clinical work. Familiarity with policy should therefore be seen as one aspect of implementation, not a substitute for operable reporting procedures. Recent reviews and guidance have shown that policy awareness is most effective when combined with training, accessible reporting channels, feedback and organizational support.

3.14 Factors Independently Associated with Perceived Patient-Safety Impact

In the multivariable model, positive perceived patient-safety impact was independently associated with perceived system effectiveness, reporting frequency, policy familiarity, no-blame safety culture, and post-reporting feedback. The strongest adjusted association was between perceived system effectiveness and reporting frequency, policy familiarity, safety culture and feedback. After adjustment, ease of reporting, data use and perceived compliance were not independently associated.

These findings are consistent with an integrated interpretation of IRS performance, in accordance with the idea of incident reporting as part of a broader reporting-and-learning system rather than a standalone data-collection activity [2,8,12]. The way people see a system's usefulness may be affected by staff use of the system, understanding the purpose of the system, a culture of support, feedback and the use of incident information for learning and improvement. The absence of independent associations for ease of reporting, data utilization and compliance does not mean that these components are not relevant. Their contribution may be indirect or may overlap with more general system characteristics. The McFadden pseudo-R2 was 19.8%, a measure of fit of the model and not an interpretation of the percentage of outcome variance explained.

3.15 Professional and Institutional Differences in Reporting Behaviour

Reporting behavior differed by profession, healthcare experience, policy familiarity and facility type. Reporting was more common among administrators and managers and those with longer healthcare experience. These differences may indicate variation in role expectations, exposure to reporting procedures, access to management or familiarity with institutional systems. Reporting also varied by facility type, but gender and hospital accreditation were not significantly related to reporting behavior or perceived patient safety impact.

The results indicate that accreditation status alone may not be sufficient to ensure effective reporting and that implementation strategies may need to be adapted to professional groups and local organizational contexts. For example, new staff and groups with lower rates of reporting participation may need orientation, hands-on training, clear reporting channels and early feedback. However, these comparisons are cross-sectional and observational, and therefore do not allow for firm conclusions about why reporting differed between groups.

3.16 Strengths, Limitations, and Implications

This study is strong in its examination of multiple interrelated dimensions of incident reporting: reporting participation, system effectiveness, data use, feedback, safety culture, policy knowledge, compliance and perceived patient-safety impact. Descriptive, bivariate, correlational, and adjusted analyses offered complementary perspectives on the reporting-and-learning process. The conceptual framework also helped to organize the relationship between system characteristics, organizational factors and perceived outcome.

There are a few limitations to consider. First, because the design is cross-sectional, temporal order and causality cannot be determined. Second, all primary measurements were self-report and could be subject to recall bias, social-desirability bias, or common-method bias. Third, the primary outcome was perceived patient-safety impact and not an objective measure such as

incident rate, harm, response time, completion of corrective actions, or recurrence. Fourth, the representativeness might be influenced by the sampling and recruitment procedures if the participating hospitals or the respondents were systematically different from other Egyptian hospitals or healthcare providers. Finally, observed associations may have been influenced by unmeasured organizational and contextual factors and the model should not be interpreted as identifying a complete causal pathway.

However, the findings have practical implications despite these limitations. Hospitals should focus on strengthening the entire reporting-to-learning cycle rather than just increasing the number of reports. Important actions include reducing the burden of reporting time, improving the usability and confidentiality of systems, clarifying reporting policies, training staff, strengthening management support, establishing a just and non-punitive culture, providing timely and useful feedback and demonstrating that reports lead to action. These priorities align with international guidance and recent evidence on system-level improvement, leadership commitment, psychological safety, structured analysis and feedback [1,2,8]. Future multicentre, longitudinal and mixed-method studies should combine healthcare professionals' perceptions with objective indicators such as reporting rates, response times, corrective-action completion, recurrence and patient-safety outcomes.

4. CONCLUSION

This study found that healthcare professionals working in Egyptian hospitals that participated in the study generally perceived incident-reporting systems as beneficial for patient safety, with 66.7% reporting that they had a positive or very positive impact. However, there were notable gaps in implementation, including limited participation in reporting, inconsistent feedback, modest perceived effectiveness of the system, and limited familiarity with reporting policies, perceived compliance, and a no-blame safety culture. In multivariate analysis, perceived system effectiveness, frequency of reporting, familiarity with policy, no-blame safety culture and post-reporting feedback were independently associated with positive perceived patient-safety impact, while ease of reporting, data utilization and perceived compliance were not independently associated after adjustment. Overall the results show a mismatch between the perceived value of incident reporting and the maturity of its implementation.

Hospital leaders should provide support for incident-reporting systems that will maximize the benefits for patient safety. Such support includes providing sufficient resources, incorporating patient-safety reporting into quality-improvement plans, creating explicit managerial responsibilities, and emphasizing reporting as a learning process rather than merely a reminder or mandatory procedure. Hospitals should also establish accessible, confidential, user-friendly reporting procedures that are integrated with routine clinical work; offer regular training on what and how to report; foster a just and non-punitive culture; and ensure that reports receive timely, meaningful feedback and result in visible corrective action. Electronic, mobile or offline reporting options can improve access where possible, but such technological changes need to be accompanied by organizational support and integration into workflows. Future multicentre, longitudinal, mixed-method studies should combine the perceptions of healthcare professionals with objective indicators such as reporting rates, response times, completion of corrective actions, recurrence and patient-safety outcomes.

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AUTHOR CONTRIBUTIONS

Conceptualization, S.E.E.G.; methodology, S.E.E.G. and S.Y.M.; investigation, S.E.E.G. and S.Y.M.; writing—original draft preparation, S.E.E.G.; writing—review and editing, S.Y.M. and M.S.M.; supervision, M.S.M. All authors have read and agreed to the published version of the manuscript.

CONFLICT OF INTEREST

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

ETHICS STATEMENT

This article is a literature review that synthesizes previously published evidence. It did not involve the collection of new data from human participants or animals, and ethical approval was not required.

DATA AVAILABILITY STATEMENT

No new data were generated for this review. All data supporting the discussion are available within the cited publications listed in the References section.

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