



Safety Culture Intervention Strategies to Enhance Patient Incident Reporting: Systematic Literature Review

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Abstract

Improving patient safety incident reporting is essential to strengthen safety culture and prevent adverse events in hospitals. We aimed to identify safety culture intervention strategies to improve patient safety incident reporting. This study was conducted using a systematic data search following the PRISMA method through PubMed, Scopus, and Google Scholar databases to identify interventional studies published between 2015 and 2025. The main keywords included "patient safety, interventions, training, program, incident reporting, adverse event reporting, error reporting." The findings were identified and organized through thematic categorization based on the Self-Protective Behavior Framework. The most prevalent and promising approach is multifaceted intervention. Key strategies, including education and training, feedback mechanisms, management support, and technology integration, showed consistent positive results with improved reporting rates. Improving incident reporting effectively requires a multifaceted strategy. Education and training must be reinforced by continuous feedback, strong leadership, and streamlined technology to build a sustainable and non-punitive reporting culture.

Introduction

Patient safety, defined as freedom from preventable harm, is a fundamental pillar of healthcare practice. However, according to the World Health Organization (WHO), 42.7 million adverse events occur in hospitalized patients (Jha et al., 2013). Medication errors are a frequent problem in the United States of America (USA), resulting in 1.5 million patients being affected by injuries each year. As many as 400,000 cases are actually preventable, but because of their dangerous nature, medication errors are the third leading cause of death (Makary & Daniel, 2016). In developing countries, data shows that there are approximately 134 million Patient Safety Incidents (PSIs) in hospitalized patients each year, resulting in approximately 2.6 million deaths annually (Dhamanti et al., 2019). This situation highlights the urgency of intervening to prevent, analyze, and learn from errors.

One important effort to prevent the recurrence of incidents is through patient safety incident reporting. This reporting is useful for identifying system failures and taking corrective action. However, the incident reporting system is still not optimal, with low reporting rates (Dhamanti et al., 2019; Rea & Griffiths, 2016). Studies show that only 10% of incidents are reported voluntarily, and many healthcare workers choose not to report incidents they experience or witness (Yung et al., 2016). This low participation hinders the creation of an effective patient safety culture (Soydemir et al., 2017).

Several intervention studies have been conducted to strengthen safety culture and encourage incident reporting, with varying results (Chaneliere et al., 2024). However, to date, there has been no literature review specifically reviewing the types of patient safety culture interventions in improving incident reporting in hospitals. The novelty of this study lies in its attempt to synthesize scientific evidence focusing on safety culture interventions for optimizing incident reporting systems, thereby providing a strong basis for developing strategies to improve patient safety incident reporting.

Method

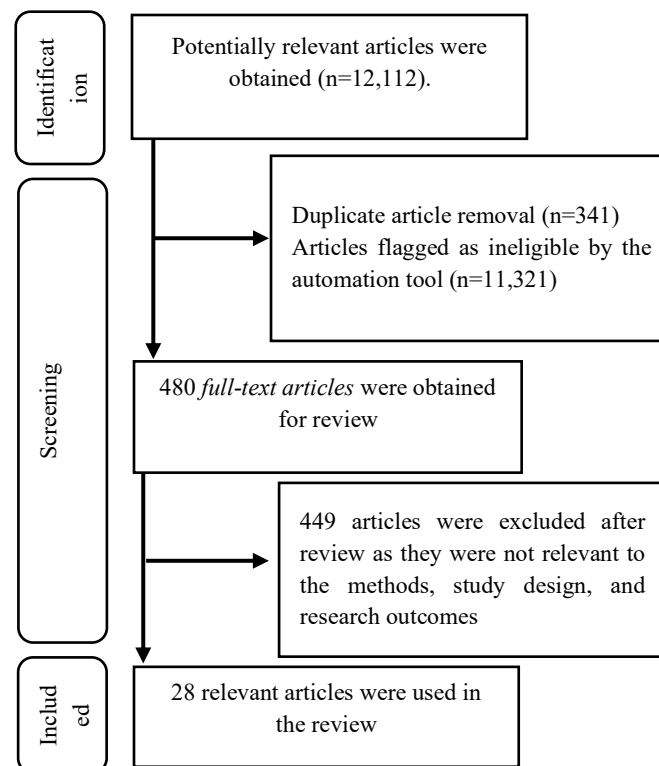


Figure 1. PRISMA diagram

This study is a systematic literature review, which is a study that systematically collects, sorts, and interprets specific topics from various literature. For the literature search process, this study accessed the PubMed®, Google Scholar, and Scopus electronic databases using keywords. The keywords used in the search were (patient safety) AND (interventions OR training OR program) AND Incident reporting OR adverse event reporting OR error reporting). Next, articles were searched for and accessed on September 20, 2025, based on title, abstract, and keywords. The next step was to screen articles using specific criteria, namely articles published between 2015 and 2025, with full text access, and in English. In compiling this systematic literature review, the researchers followed the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) guidelines.

After the search process was carried out, the articles found were then screened, analyzed, and synthesized based on inclusion and exclusion criteria. The inclusion criteria for this systematic literature review included: 1) in accordance with the researcher's questions P (population): medical personnel/hospital employees, I (Intervention): all safety culture interventions, C (Comparators): no data, O (Outcome): safety incident reporting 2) Intervention studies (experimental, quasi-experimental, observational experimental, and randomized controlled trials), 2) articles published in English, 3) full-text articles, and 3) hospital settings. The

exclusion criteria were 1) descriptive studies without intervention 2) studies in the protocol phase. After the articles were found, the researchers selected articles that met the inclusion and exclusion criteria, deleted duplicate articles, and reviewed articles that met the criteria.

After the selected articles were collected, the researchers synthesized the information, including the identity of the researchers, the location of the study, the year of publication, the title and purpose of the study, research on humans, methods, data analysis techniques, and findings related to the purpose of the writing. In synthesizing the results, this study applied a qualitative content analysis method. This content analysis approach served to consolidate and summarize all the findings data obtained.

The researchers adopted the framework by (Peters, 1991) as shown in Figure 1 as a guide in synthesizing intervention strategies. The purpose of our qualitative synthesis process was to identify the most commonly used strategies to improve incident reporting among medical personnel and to identify intervention characteristics that demonstrate sustainability over time. To help organize our findings, we report the results according to six intervention strategy themes: education and training, feedback, management and policy support, technology and electronic system integration, incentives, and disciplinary actions.

Result and Discussion

The literature search was conducted through three major electronic databases, namely Google Scholar, Scopus, and PubMed®. From these three databases, a total of 12,112 articles were obtained. After going through a selection process based on inclusion and exclusion criteria, 28 articles were found to be eligible for analysis in this review.

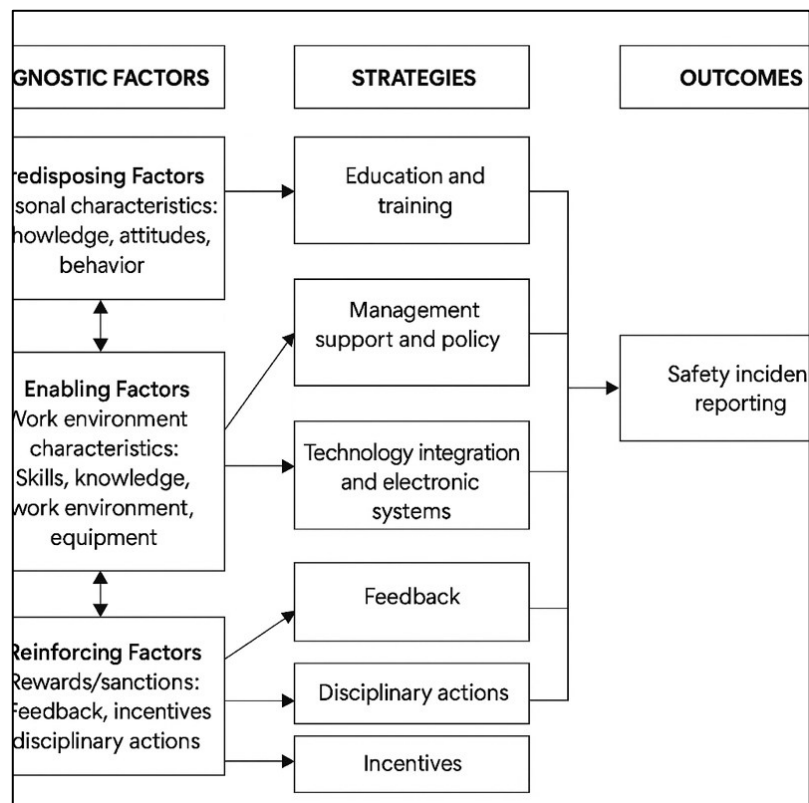


Figure 2. Adaptation of Peters' Strategies for Encouraging Self-Protective Behavior Framework

Based on the analysis of the distribution of interventions from the studies, the categories of education and training emerged as the most dominant approaches (20 studies), followed by the

integration of technology and electronic systems (16 studies), feedback provision (13 studies), management and policy support (13 studies), incentives (2 studies), and disciplinary actions (0 studies). The majority of studies adopted a multifaceted approach that combined several intervention categories simultaneously.

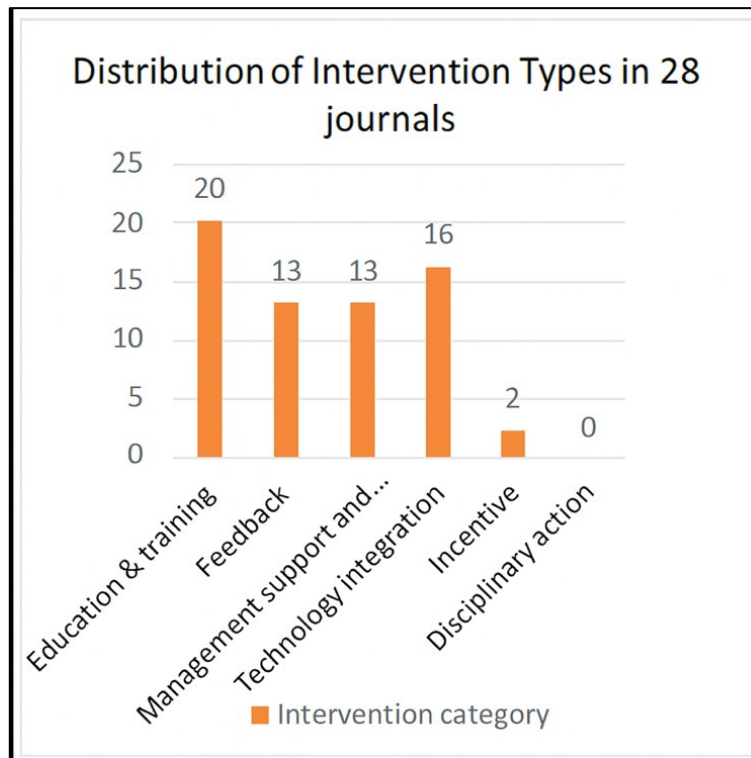


Figure 2. Distribution of Safety Culture Intervention Types to Improve Incident Reporting

Table 1. Article Review

Author	Type of Intervention
(Zhao et al., 2025)	A 12-week training program delivered via WeChat, designed based on the principles of <i>Cognitive Load Theory</i> (such as modular content , simplified interface, and immediate feedback) to reduce cognitive load and enhance learning.
(Mcsoley et al., 2024)	Multifaceted intervention: Re-education, strategic placement of reporting forms, recognition for reporting, non-punitive responses, transition to an online anesthesia incident reporting system.
(Griffeth et al., 2023)	Multifaceted intervention: <i>patient safety peer-leadership role</i> , feedback provision, interactive dashboard for patient safety data, educational resources accessible via QR (<i>Quick Response</i>) codes
(Ngo et al., 2022)	Physician involvement includes personalized email feedback from a safety committee for each report submitted by a physician, educational demonstrations on how to report, and training on disclosure conversations (with patients).
(Wilker et al., 2021)	Computer-Based Training (CBT) & Leadership Communication: A mandatory CBT module and comprehensive leadership communication strategy to educate

	staff about the new Patient and Visitor Conduct Policy and how to report bias and violations.
(McNiven et al., 2021)	Implementation of a <i>Telephone-Based Interactive Voice Response System</i> comparing standard incident reporting systems
(de Souza Joao Luiz et al., 2021)	Educational intervention related to knowledge, attitudes, and behaviors regarding patient safety incident reporting
(Kuosmanen et al., 2019)	The introduction of a structured patient safety incident reporting system as part of a broader patient safety initiative, including staff training and its integration into the institutional policy framework.
(Flott et al., 2018)	Multifaceted interventions include: creating a multidisciplinary reporting system model, revising and streamlining the incident reporting system, creating a list of the most frequent incidents, centralizing the incident report review process, anonymous reporting, learning from <i>best practices</i>
(Hamblin-Brown & Ingram, 2018)	Watching films to promote the STEP-up safety culture ('Spot, Talk, Examine, Prevent').
(Williams et al., 2017)	Interventions targeting electronic reporting systems, education, feedback, and physician involvement in improvement
(Gabriel et al., 2015)	Multifaceted interventions include: developing comprehensive reporting policies, confidential reporting, involving all clinical and non-clinical staff, developing electronic reporting systems, continuous feedback and communication, continuous monitoring, leadership commitment
(Macht et al., 2015)	Multifaceted interventions include patient safety education and training, feedback via email, involving medical personnel in problem analysis, and evaluating the positive impact of reporting
(Verbakel et al., 2015)	Two interventions: (1) a patient safety culture questionnaire with digital feedback; (2) the same intervention plus a structured workshop facilitating practice-based discussions on patient safety culture.
(Ituk & Mueller, 2023)	Creating a <i>web-based database module</i> integrated with the intranet by adopting (automatic reminders, feedback, confidentiality, and ease of access)
(Khajouei et al., 2023)	Implementing an anonymous electronic error reporting form accessible through the hospital website, accompanied by training sessions to familiarize staff with its use.
(Birkeli et al., 2022)	Implementation of the green cross method in safety incident reporting
(Unal & Intepeler, 2020)	Implementation of a web-based reporting system with the development and implementation of an anonymous web-based reporting system with standardized and coded data entry to replace the manual written system.

(Musso et al., 2017)	Watching patient safety films and involving residents in patient safety discussions during rounds over a two-week period
(Yuan et al., 2024)	Multifaceted quality improvement intervention: introduction to risk management theory, training in tools for assessing quality management, replacing paper-based reporting systems with electronic ones, providing monetary incentives for reporters, and quality improvement competitions.
(Siddiqui et al., 2021)	Introduction of a <i>smartphone-based</i> patient safety incident reporting system using a secure messaging app, followed by a post-intervention survey on staff attitudes.
(Swanson et al., 2021)	A multifaceted intervention consisting of: <i>crew resources management</i> training to change behavior, implementation of an electronic reporting system
(Deraniyagala et al., 2015)	Implementation of an electronic incident reporting system supplemented by biweekly quality and safety review meetings, as well as educational sessions to increase staff involvement in reporting.
(Herchline et al., 2022)	Multifaceted interventions include: educational tips, morbidity and mortality conferences, recognition and appreciation for reporters
(Steen et al., 2017)	Educational interventions, bi-monthly feedback, and repeated PDSA approaches
(Riga et al., 2015)	Implementation of electronic incident reporting through <i>the Medical Error Reporting Information System</i>
(Zarrabi et al., 2020)	Structured workshops addressing perceived barriers to reporting through skills-based education, simulation, and post-intervention assessment.
(Akiyama et al., 2022)	Multifaceted interventions include support & feedback from hospital leadership, standardization of reporting, electronic improvements, visualization of feedback from the safety committee

This Narrative Review presents a comprehensive analysis of the key strategies used to improve patient safety incident reporting by healthcare professionals. Findings indicate that the most influential and widely implemented interventions are education and training, feedback mechanisms, management support and policies, and integration of technology and electronic systems. When these strategies are combined, they result in the most significant and sustainable improvement in reporting behavior among healthcare professionals. Conversely, disciplinary actions and non-financial incentives rarely appear, reflecting a global shift towards fostering a non-punitive learning culture in healthcare.

Education and training consistently emerge as the foundation of successful interventions. Structured learning, simulation-based sessions, and digital training platforms produce effective outcomes in improving staff competence, awareness, and willingness to report. However, research such as that by Macht et al. (2015) and Zarrabi et al. (2020) shows that training alone is not sufficient for long-term improvement. Sustainability is achieved when education is reinforced through managerial involvement, continuous feedback, and supportive systems.

Feedback acts as a reinforcing factor in safety incident reporting. For example, routine communication via dashboards, updates from leadership, or personalized feedback increases

accountability and strengthens a shared sense of ownership of patient safety. Research by Griffeth et al. (2023), Ngo et al. (2022), and Williams et al. (2017) shows that timely feedback can encourage consistent reporting and help transform reporting into a continuous learning process.

Management support and policies also play an important role in fostering a culture conducive to sustainable reporting. Leadership involvement, organizational alignment, and clear safety policies are factors in a work environment that encourages safety incident reporting. Research such as that by Flott et al., 2018, Gabriel et al., 2015, Hamblin-Brown & Ingram, (2018) shows that when leaders actively support patient safety initiatives and integrate reporting into the policy framework, staff participation increases significantly. These findings suggest that leadership commitment and clear institutional direction can embed incident reporting awareness into the organizational culture. This makes it a normalized and valued part of daily practice.

The trend toward increased use of digital tools further strengthens interventions in improving safety incident reporting. Technology-based systems simplify access to reporting platforms, standardize documentation, and enable real-time monitoring. Electronic reporting tools, such as those implemented by Unal & Intepeler, (2020), Ituk & Mueller, (2023), Siddiqui et al., (2021) show that user-friendly platforms significantly reduce barriers to reporting by providing anonymity and ease of submission. Longitudinal results from studies such as those by Mcsoley et al. (2024) confirm that the adoption of electronic systems and technology results in lasting improvements, with some reporting rates remaining high for more than a year after implementation. These results highlight that technology not only facilitates operational efficiency but also supports behavioral change by promoting transparency, convenience, and organizational learning.

An interesting finding from this literature review is that no studies used punitive disciplinary actions, and only a few used non-financial incentives. This indicates that the current patient safety paradigm is evolving in an environment that emphasizes psychological safety, learning, and positive reinforcement, rather than punishment or coercion. Recognition-based incentives, as demonstrated by Hamblin-Brown & Ingram, (2018) and Herchline et al., (2022), can moderately increase participation but are not the main drivers of sustainable change.

Overall, the most successful interventions, such as those by Griffeth et al. (2023) and Mcsoley et al. (2024), do not rely on a single strategy but are multifaceted. These safety culture intervention programs synergistically combine education to change mindsets, technology to facilitate processes, feedback as recognition of reporters' contributions, and strong leadership to foster a good safety culture. This holistic approach simultaneously targets predisposing factors, enabling factors, and reinforcing factors that influence incident reporting behavior comprehensively.

Limitations in this review include heterogeneity in study design and varying outcomes. Nevertheless, the findings of the qualitative analysis in this literature review provide powerful and transferable insights for healthcare organizations aiming to strengthen their safety culture through improved incident reporting.

Conclusion

Based on a synthesis of all findings, it can be concluded that a multifaceted approach that integrates several strategies simultaneously shows the best effectiveness in improving incident reporting. The combination of education and training with technology integration, reinforced

by structured feedback mechanisms and strong management support, creates a comprehensive ecosystem for the development of a sustainable safety culture.

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