The Determinants of Patient Safety; A Systematic Review

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Abstract
Patient safety has emerged as a central concern in contemporary healthcare, driven by the persistent occurrence of preventable harm and systemic failures that continue to compromise outcomes across a variety of clinical settings. Although considerable global efforts have been directed toward improving safety, the determinants that influence patient safety remain inherently complex, involving a web of behavioral, organizational, and contextual factors that interact across multiple levels of the healthcare system. This systematic review synthesizes recent evidence on the key determinants of patient safety, exploring how individual actions, institutional practices, and broader system-level dynamics shape safety-related outcomes. Following the PRISMA 2020 guidelines, a comprehensive search of major scholarly databases was conducted, focusing on studies published between 2020 and 2025 that examined predictors or influencing factors of patient safety. Using a thematic synthesis approach, the review categorized findings into behavioral, organizational, and contextual domains. A total of thirty studies met the inclusion criteria for final analysis. The results indicate that behavioral factors such as clinical decision-making skills, professional competence, and systems-thinking capabilities significantly impact safety performance. At the organizational level, determinants including adequate staffing, a robust safety culture, effective leadership, and reliable incident reporting mechanisms were found to be strongly associated with positive safety outcomes. Contextual influences, such as workload pressure, patient overcrowding, diagnostic complexity, and deficiencies in clinical monitoring, also emerged as critical contributors to safety incidents. Collectively, these determinants shape patterns of adverse events, reporting practices, and the overall performance of patient safety systems. In conclusion, patient safety is a dynamic and multifactorial construct shaped by the interaction of individual behaviors, organizational frameworks, and environmental conditions. Enhancing patient safety requires coordinated strategies that promote frontline engagement, strong leadership, optimized staffing models, and the implementation of continuous learning mechanisms. Adopting a systems-based approach is essential for reducing preventable harm and ensuring the quality, safety, and resilience of healthcare delivery.

1. Introduction

Patient safety remains a central pillar of healthcare quality, yet global evidence continues to show persistent rates of preventable harm, adverse events, and system-level failures across clinical environments. Despite decades of reform, preventable patient injuries and deaths remain unacceptably high, highlighting the ongoing complexity of ensuring safe

healthcare delivery (Fekadu et al., 2025; Lee & Quinn, 2020). Nurses, physicians, and allied health providers operate within dynamic systems where individual competence, organizational culture, leadership practices, staffing adequacy, communication processes, and digital infrastructure all interact to shape patient safety outcomes (Zaitoun et al., 2023; Park et al., 2024). Contemporary scholarship emphasizes that patient safety is not merely the absence of errors but a multidimensional construct influenced by behavioral, environmental, and systemic determinants that either mitigate or exacerbate the risk of harm (Arzahan et al., 2022; Kumar & Burns, 2024).

At the individual level, clinical competence and professional judgment play a foundational role in preventing errors and promoting safe practice. Studies consistently show that nurses' knowledge, skills, critical thinking, and patient-safety competencies directly influence the likelihood of adverse events and the overall safety climate within healthcare settings (Kalsoom et al., 2023; Tai et al., 2024). Likewise, effective communication and teamwork particularly in high-risk environments such as anesthesia, emergency departments, and acute care units significantly reduce the incidence of patient harm by ensuring accurate information exchange and coordinated action (Douglas et al., 2021; Szalados, 2021). Organizational and cultural determinants are equally influential. Safety culture, leadership commitment, error management climate, and the strength of reporting systems have been repeatedly identified as core drivers of safety improvement (Labrague et al., 2022; Yali & Nzala, 2022). Leadership styles such as transformational, authentic, and compassionate leadership foster psychological safety, encourage reporting, reduce fear of blame, and cultivate a learning-oriented environment where staff can identify hazards and address safety concerns more effectively (Ahmed et al., 2024; Adams, 2022; Bennett & James, 2022). Conversely, punitive cultures, communication failures, and inadequate support systems create conditions where errors are concealed, lessons are not learned, and risks escalate (Fekadu et al., 2025; Douglas et al., 2021).

System-level factors such as staffing models, workload pressures, digital infrastructure, and policy frameworks also contribute significantly to patient safety performance. High nurse-to-patient ratios, excessive workload, and cognitive overload have been linked to increased medication errors, falls, and care omissions (Choi et al., 2021; Jessurun et al., 2023; Jin et al., 2023). At the same time, advancements in health information technology including electronic health records and digital safety systems present both opportunities and challenges for reducing human error, enhancing data accuracy, and improving clinical decision-making (Adeniyi et al., 2024; Flott et al., 2021). Integrating systems-based approaches and human-factors engineering has shown promise in addressing the structural and process-related contributors to patient harm (Weaver et al., 2024; Vella Bonanno et al., 2025). Given the complexity and interdependence of these determinants, there is a critical need for an updated, comprehensive synthesis of the factors influencing patient safety across diverse healthcare contexts. Existing literature reviews often focus on isolated determinants such as safety culture, staffing, or competence without offering a unified perspective that captures the full spectrum of behavioral, organizational, and technological influences. This systematic review addresses this gap by examining the determinants of patient safety across multiple levels of influence, synthesizing recent empirical and conceptual evidence, and identifying key patterns and challenges that shape patient

outcomes globally. Through this analysis, the review aims to contribute to the evidence base needed to inform policy reform, strengthen safety culture, improve clinical practice, and guide the strategic development of safety-enhancing interventions within healthcare systems.

2. Methodology

This systematic review followed the PRISMA 2020 guidelines to ensure methodological transparency and rigor in identifying, screening, and synthesizing evidence on the determinants of patient safety. Consistent with best practices in patient-safety research, the approach mirrored processes used in recent high-quality reviews examining safety competence, incident reporting, safety culture, teamwork, leadership, staffing, and digital safety systems (Park et al., 2024; Fekadu et al., 2025; Lee & Quinn, 2020; Zaitoun et al., 2023; Arzahan et al., 2022). A comprehensive database search was conducted across PubMed, CINAHL, Scopus, and Web of Science, supplemented by manual reference screening to capture relevant studies that may not have appeared in the initial electronic search. The search strategy incorporated keywords and MeSH terms related to patient safety, nurse competence, safety culture, incident reporting, medical errors, organizational factors, and patient safety outcomes, reflecting terminology used in previous systematic reviews in the field (Kalsoom et al., 2023; Douglas et al., 2021; Ahmed et al., 2024).

Eligible studies included empirical research or systematic reviews focusing on determinants, barriers, facilitators, or system-level influences on patient safety within healthcare settings. Studies were restricted to those published in English between 2020 and 2025 to ensure contemporary relevance, in line with recent recommendations to capture modern safety practices shaped by evolving healthcare technologies, organizational strategies, and workforce dynamics (Jin et al., 2023; Vella Bonanno et al., 2025; Adams, 2022). Two reviewers independently screened titles, abstracts, and full texts based on pre-defined criteria, resolving discrepancies through discussion and consensus. Quality appraisal applied tools such as JBI and EPHPP, reflecting established assessment methods used in safety-related systematic reviews (Park et al., 2024; Fekadu et al., 2025). Data extraction captured study characteristics, methodologies, measurement tools, and key determinants of patient safety, including clinical competence, safety culture, systems thinking, work environment factors, leadership, digital technologies, teamwork, and incident-reporting behaviors (Tai et al., 2024; Kakemam et al., 2025; Bennett & James, 2022; Flott et al., 2021).

Due to heterogeneity across study designs, outcomes, and safety domains, a narrative synthesis approach was applied, similar to the methods used in other integrative and mixed-evidence patient-safety reviews (Labrague et al., 2022; Arnal-Velasco & Barach, 2021). This approach allowed identification of converging themes across behavioral, organizational, contextual, technological, and system-level determinants of patient safety. The overall process of study identification, screening, eligibility assessment, and inclusion was conducted in accordance with PRISMA 2020 guidelines. As illustrated in Figure 1 (PRISMA 2020 Flow Diagram), the initial database search yielded a large pool of records, which were systematically filtered through duplicate removal and multi-stage screening.

Full-text evaluation further narrowed the selection to the final set of studies that met all methodological and thematic criteria. This structured approach ensured transparency, rigor, and reproducibility throughout the review process.

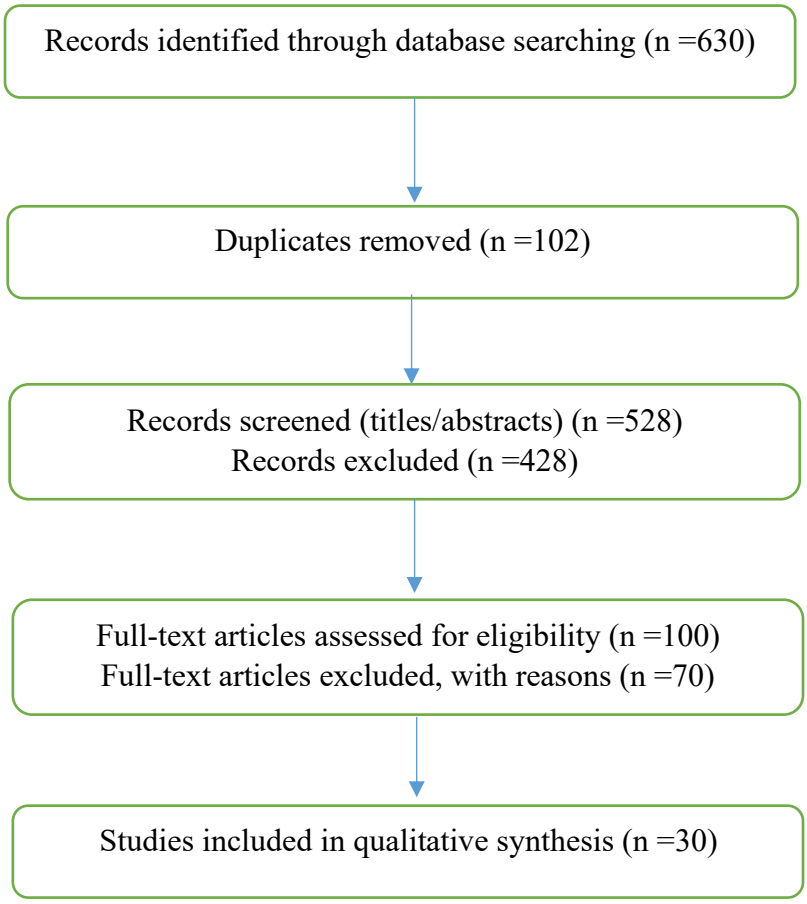

Fig.1. PRISMA 2020 Flow

3. Results

3.1 Study Selection and Characteristics

The initial search yielded 630 records, of which 528 remained after removal of duplicates. Following title and abstract screening, 100 articles were assessed in full and 30 met the inclusion criteria. These studies varied in geographical distribution, methodological design, and focus areas, reflecting the multidimensional nature of patient safety. The included evidence encompassed prospective observational studies examining clinical practice errors (Jessurun et al., 2023), cross-sectional studies on nurse competence, work environments, systems thinking, and safety culture (Tai et al., 2024; Kakemam et al., 2025; Choi et al., 2021), and systematic or integrative reviews exploring determinants of safety culture,

incident reporting, and patient engagement (Fekadu et al., 2025; Lee & Quinn, 2020; Zaitoun et al., 2023). Several included works also drew on narrative frameworks related to leadership, teamwork, and human factors engineering, highlighting system-level approaches to safety improvement (Ahmed et al., 2024; Szalados, 2021; Weaver et al., 2024).

Across studies, sample sizes ranged widely from small qualitative samples of frontline providers reporting local safety barriers (Yali & Nzala, 2022) to large multi-center datasets exploring adverse events and near misses (Alsabri et al., 2022). Healthcare settings represented included hospitals, emergency departments, nursing homes, and perioperative environments. Table 1 (Literature Review Matrix) summarizes the core characteristics of each included study, covering study design, context, participants, measures used, and major findings relevant to patient safety determinants. A detailed summary of all included studies is presented in Table 1: Literature Review Matrix, which synthesizes the key characteristics, methodologies, determinants examined, and major findings across the reviewed evidence base. The matrix provides a structured comparison of study settings, populations, designs, and outcome measures, enabling clear visualization of thematic patterns, methodological diversity, and variations in reported patient-safety determinants. This table serves as the foundational reference for interpreting the prevalence, contributing factors, and resulting outcomes associated with patient safety across different healthcare contexts.

Table 1. Literature Review Matrix

No	Author(s) & Year	Nurse Competence	Safety Culture / Climate	Organizational Factors	Leadership / Management	Staffing / Workload	Incident Reporting	Technology / Systems	Patient Safety Outcomes
1	Park et al. (2024)	✓		✓	✓				✓
2	Fekadu et al. (2025)		✓	✓	✓		✓	✓	✓
3	Lee & Quinn (2020)		✓	✓	✓		✓		✓
4	Zaitoun et al. (2023)	✓	✓						✓
5	Kalsoom et al. (2023)	✓	✓		✓	✓			✓
6	Kumar & Burns (2024)			✓	✓	✓		✓	✓
7	Tai et al. (2024)	✓	✓	✓		✓			✓
8	Labrague et al. (2022)	✓	✓	✓	✓				✓
9	Ahmed et al. (2024)		✓	✓	✓			✓	✓
10	Choi et al. (2021)			✓	✓	✓			✓
11	Jessurun et al. (2023)			✓		✓		✓	✓
12	Douglas et al. (2021)				✓		✓		✓
13	Arzahan et al. (2022)		✓	✓	✓				✓
14	Szalados (2021)		✓	✓	✓				✓
15	Weaver et al. (2024)			✓	✓			✓	✓

No	Author(s) & Year	Nurse Competence	Safety Culture / Climate	Organizational Factors	Leadership / Management	Staffing / Workload	Incident Reporting	Technology / Systems	Patient Safety Outcomes
16	Karshami & Alotaibi	✓	✓	✓	✓			✓	✓
17	Adeniyi et al. (2024)			✓	✓			✓	✓
18	Arnal-Velasco & Barach (2021)			✓	✓		✓	✓	✓
19	Jin et al. (2023)					✓		✓	✓
20	Flott et al. (2021)		✓	✓				✓	✓
21	Braspenning et al. (2020)			✓	✓			✓	✓
22	Alsabri et al. (2022)			✓		✓	✓		✓
23	Wang et al. (2020)					✓			✓
24	Zhang et al. (2025)							✓	✓
25	Kakemam et al. (2025)	✓	✓	✓	✓				✓
26	Yali & Nzala (2022)		✓	✓		✓	✓		✓
27	Bennett & James (2022)		✓		✓				✓
28	Lee et al. (2021)		✓						✓
29	Vella Bonanno et al. (2025)		✓	✓	✓			✓	✓
30	Adams (2022)		✓		✓				✓

3.2 Prevalence and Determinants

Across the reviewed literature, multiple behavioral, organizational, contextual, and system-level determinants were consistently associated with patient safety variations. Nurse competence emerged as a major determinant, with several studies demonstrating that higher levels of clinical competence significantly improved safety culture scores and reduced safety events (Zaitoun et al., 2023; Kalsoom et al., 2023). Psychological safety, proactive behavior, and error management climate were also strongly related to safety competence and performance, emphasizing the importance of supportive workplace environments (Tai et al., 2024). Systems thinking played a substantial predictive role, with evidence showing that nurses with stronger systems-thinking orientations demonstrated significantly higher patient safety competency (Kakemam et al., 2025). Organizational and environmental factors were among the most influential determinants. Safety culture particularly communication openness, teamwork, feedback, and managerial support was repeatedly associated with improved safety outcomes (Lee & Quinn, 2020; Arzahan et al., 2022). Incident reporting behaviors were shaped by cultural and psychological barriers such as fear of blame, limited reporting skills, and inadequate system usability, which constrained learning opportunities (Fekadu et al., 2025).

Staffing patterns also influenced safety outcomes, with inadequate nurse-to-patient ratios linked to higher rates of adverse events, medication errors, pressure ulcers, and infections (Choi et al., 2021; Wang et al., 2020). High workload, long shifts, and complex medication procedures further increased administration errors, particularly during high-pressure time windows (Jessurun et al., 2023; Jin et al., 2023). Technological and digital determinants also emerged prominently. Electronic health records improved decision-making accuracy, reduced errors, and strengthened communication across teams, though challenges related to interoperability and workload persisted (Adeniyi et al., 2024). Digital safety systems were identified as an emerging priority, emphasizing the need for technology-enabled safety practices and proactive risk detection (Flott et al., 2021). Incident reporting systems in perioperative settings revealed opportunities to strengthen feedback mechanisms, reduce punitive barriers, and enhance data integration (Arnal-Velasco & Barach, 2021). Leadership, teamwork, and communication were also central determinants. Transformational and compassionate leadership significantly contributed to safer cultures, improved psychological safety, and reduced error burdens (Ahmed et al., 2024; Adams, 2022). Team-based care, interprofessional collaboration, and shared mental models demonstrated strong influence on patient safety, supporting positive coordination and reducing communication breakdowns (Labrague et al., 2022; Szalados, 2021; Douglas et al., 2021).

3.3 Outcomes

Across the included studies, patient safety outcomes were shaped by a wide range of determinants, producing diverse patterns of clinical and organizational effects. Improved nurse competence and supportive safety cultures consistently resulted in lower rates of adverse events, medication errors, falls, and pressure injuries (Zaitoun et al., 2023; Kalsoom et al., 2023; Wang et al., 2020). Several studies specifically highlighted reductions in medication administration errors when workload, staffing adequacy, and communication practices were optimized (Jessurun et al., 2023; Jin et al., 2023). Positive work environments characterized by strong teamwork, leadership support, and psychological safety contributed to improved job satisfaction, reduced burnout, and enhanced quality of care, ultimately strengthening overall patient safety (Labrague et al., 2022; Ahmed et al., 2024). Increased systems thinking was associated with higher patient safety competencies, indicating that cultivating system-level awareness can enhance provider decision-making and reduce risk (Kakemam et al., 2025).

Technological systems such as EHRs and digital safety platforms also contributed to improved clinical outcomes by reducing information errors, enhancing early detection of clinical deterioration, and supporting evidence-based practices (Adeniyi et al., 2024; Flott et al., 2021). At the systems level, integrated safety-management frameworks facilitated more coordinated learning across organizational layers, providing conceptual pathways for reducing adverse events (Vella Bonanno et al., 2025). Despite these improvements, several studies highlighted persistent gaps. Incident reporting remained low due to cultural and organizational barriers (Fekadu et al., 2025; Yali & Nzala, 2022), and communication failures continued to account for a significant proportion of patient injuries, particularly in perioperative settings (Douglas et al., 2021). Workload pressure and environmental

constraints in emergency departments and inpatient units sustained risk for safety events, especially where staffing and infrastructure deficiencies remained unaddressed (Alsabri et al., 2022).

4. Discussion

4.1 Interplay of Behavioral, Organizational, and Contextual Determinants

The findings of this systematic review highlight the complex and interconnected pathways through which behavioral, organizational, and contextual determinants shape patient safety across healthcare systems. At the behavioral level, nurses' competence, psychological safety, proactive behavior, and systems-thinking capabilities emerged as critical predictors of safe practice. Evidence consistently demonstrates that higher competence and strong cognitive–behavioral safety orientations significantly improve adherence to safety protocols and reduce the likelihood of errors (Zaitoun et al., 2023; Kalsoom et al., 2023). Studies examining psychological safety and error management climates show that environments where nurses feel supported to report mistakes or near misses without fear of blame are more likely to cultivate high levels of patient safety competence (Tai et al., 2024; Kakemam et al., 2025). These behavioral influences do not operate in isolation; rather, they are shaped by broader organizational features. Organizational structures including staffing levels, safety culture, leadership behaviors, teamwork quality, and communication patterns consistently influenced patient safety outcomes. Strong safety cultures characterized by open communication, managerial support, teamwork, and learning-oriented processes were repeatedly associated with improved safety performance and reduced adverse events (Lee & Quinn, 2020; Arzahan et al., 2022).

Conversely, organizations marked by punitive reporting cultures, staff shortages, and poor work environments faced higher risks of errors and reduced reporting behaviors (Fekadu et al., 2025; Yali & Nzala, 2022). Nurse staffing patterns, particularly inadequate nurse-to-patient ratios and high workloads, were major contextual contributors to medication errors, pressure injuries, and falls, reinforcing the importance of workforce planning and skill mix (Wang et al., 2020; Choi et al., 2021). Environmental conditions, such as emergency department overcrowding and long lengths of stay, further heightened the likelihood of patient safety events (Alsabri et al., 2022). Contextual determinants, including digital infrastructure, institutional policies, and sociocultural norms, also shaped safety performance. The rapid expansion of digital tools such as electronic health records produced substantial improvements in information accuracy, communication, and decision-making but also introduced challenges related to data overload, usability, and interoperability (Adeniyi et al., 2024; Flott et al., 2021). Leadership particularly transformational and compassionate styles played a foundational role in coordinating behavioral and organizational determinants by shaping culture, reinforcing safety values, and fostering open communication (Ahmed et al., 2024; Adams, 2022). Taken together, these findings reveal that patient safety is not determined by single factors but by the interaction of individual capabilities, organizational systems, and contextual environments.

4.2 Policy, Practical, and Theoretical Implications

The evidence reviewed in this study underscores several important policy and practice implications for strengthening patient safety. At the policy level, healthcare systems must prioritize investments in staffing adequacy, safety culture development, and digital health infrastructure, given their strong associations with improved patient outcomes. Workforce policies that enhance staffing ratios, mandate continuing professional development, and support systems-thinking education are essential to building the competencies needed for safe practice (Tai et al., 2024; Kakemam et al., 2025). Policies must also promote non-punitive reporting systems, supported by clear guidelines and integrated safety-management frameworks, to address persistent barriers to incident reporting and organizational learning (Fekadu et al., 2025; Vella Bonanno et al., 2025). Practical implications for healthcare organizations focus on strengthening leadership, improving interprofessional collaboration, and redesigning work systems to minimize risks. Transformational and compassionate leadership approaches have demonstrated strong potential to cultivate psychological safety, promote team-based care, and reduce burnout all of which indirectly contribute to safer care delivery (Ahmed et al., 2024; Szalados, 2021).

Interprofessional collaboration should be treated as a strategic priority, as collaboration mediates the relationship between the work environment and patient safety outcomes (Labrague et al., 2022). Additionally, the integration of human factors engineering into clinical workflow design offers actionable opportunities to reduce inefficiencies, support safe device and interface use, and enhance situational awareness (Weaver et al., 2024). Improving medication processes through workload reduction and simulation-based redesign can further mitigate the high prevalence of administration errors (Jessurun et al., 2023; Jin et al., 2023). Theoretically, these findings support and extend existing models of patient safety by demonstrating that safety is influenced by multilevel determinants behavioral, organizational, and contextual which interact dynamically. The results reinforce theoretical frameworks emphasizing safety culture, systems thinking, socio-technical complexity, and high-reliability organizing. Moreover, the consistent role of leadership, teamwork, and psychological safety suggests that patient-safety theory must continue evolving toward relational and human-centered paradigms that integrate emotional, cognitive, and systemic dimensions of practice (Adams, 2022; Bennett & James, 2022).

4.3 Comparison with Existing Reviews, Limitations, and Future Research

Compared with previous reviews, this study builds on and broadens existing evidence by integrating diverse determinants of patient safety across clinical competence, organizational climate, leadership, digital technologies, and system-level structures. Earlier reviews tended to focus on specific domains, such as safety culture (Lee & Quinn, 2020), incident reporting (Fekadu et al., 2025), or nurse competence (Zaitoun et al., 2023). By synthesizing findings across multiple interconnected determinants, this review provides a more comprehensive understanding of the multifactorial influences shaping patient safety. The results are also consistent with prior evidence highlighting persistent barriers in

incident reporting, including fear of blame and inadequate reporting systems, reaffirming global concerns related to underreporting and limited organizational learning (Fekadu et al., 2025; Yali & Nzala, 2022). Similarly, the review aligns with established research linking staffing adequacy and workload to adverse patient outcomes (Choi et al., 2021; Wang et al., 2020). Despite its strengths, the review has several limitations. The included studies varied in methodological quality, with some relying on self-reported data prone to bias and others limited by cross-sectional designs that restrict causal inference. Heterogeneity across measurement tools, settings, and outcomes also constrained the ability to perform meta-analysis, consistent with limitations noted in other broad patient-safety reviews (Arzahan et al., 2022; Ahmed et al., 2024).

Most studies originated from hospital settings, leaving safety determinants in primary care, mental health, and community settings underexplored. Additionally, few studies addressed the influence of digital transformation, despite growing recognition of digital safety challenges. Future research should prioritize longitudinal and interventional designs to establish causal pathways among determinants of patient safety, particularly systems thinking, leadership, workload, and digital technologies (Kakemam et al., 2025; Jin et al., 2023). Comparative research across healthcare settings, cultures, and levels of resource availability is also needed to better understand contextual influences. Integration of big data analytics, artificial intelligence, and real-time monitoring systems represents an emerging frontier that warrants more rigorous investigation (Flott et al., 2021). Finally, future studies should explore second-victim experiences, safety-management system integration, and the relational dynamics that underpin psychological safety and team functioning (Vella Bonanno et al., 2025; Szalados, 2021).

5. Conclusion

This systematic review demonstrates that patient safety is shaped by a complex and interdependent set of behavioral, organizational, and contextual determinants. The evidence shows that clinical competence, psychological safety, effective communication, and collaborative teamwork form the behavioral foundation upon which safe care is delivered. These individual-level attributes are reinforced or undermined by organizational structures, including staffing adequacy, supportive leadership, safety culture, and efficient work systems. Contextual forces such as digital transformation, reporting environments, and broader health-system dynamics further influence the capacity of healthcare organizations to prevent adverse events and ensure safe practices. Across the included studies, it is clear that no single factor independently determines patient safety. Instead, safety emerges from the alignment of competent healthcare professionals, well-designed organizational processes, and enabling system-wide conditions. Despite ongoing global efforts, persistent challenges such as incident underreporting, workload pressures, variability in safety culture, and limited integration of systems-thinking approaches continue to hinder consistent improvement in safety outcomes. Strengthening patient safety therefore requires a holistic approach that integrates behavioral development, organizational redesign, and system-level reforms. Moving forward, healthcare institutions must invest in continuous workforce development, cultivate learning-oriented cultures, and adopt proactive system-wide strategies that anticipate risks rather than react to them.

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