Spring Journal of Artificial Intelligence and Current Issues
Abbreviated Key Title: Spring J. Artif. Intell. Curr. Issues
ISSN: and Open Access
Volume-1 (Issue): 1, January, Pp. 75-82, 2026

Use of Artificial Intelligence in Reducing Medication Errors: A Nursing Perspective

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Abstract

Medication errors remain a persistent challenge in healthcare, contributing to significant morbidity, mortality, and financial burden globally. Nurses, as frontline caregivers responsible for medication administration, play a critical role in patient safety systems. The integration of Artificial Intelligence (AI) into clinical workflows holds promise for reducing medication errors by enhancing decision support, automating risk detection, and optimizing interdisciplinary communication. This article critically reviews the current state of AI applications relevant to nursing practice, including predictive analytics, natural language processing, computerized provider order entry (CPOE) enhancements, and smart infusion technologies. We examine the conceptual frameworks underpinning AI adoption, evaluate evidence from clinical implementations, and explore barriers related to usability, ethical considerations, and workforce readiness. Future directions emphasize the co-design of AI tools with nurses, rigorous evaluation methodologies, and policy frameworks to ensure safe, effective, and equitable deployment. By synthesizing interdisciplinary research and nursing insights, this article aims to offer a comprehensive perspective on how AI can transform medication safety and support high-reliability healthcare systems.

Keywords: Artificial intelligence; medication errors; nursing informatics; clinical decision support systems; patient safety; human–machine interaction

1. INTRODUCTION

Medication errors are broadly defined as any preventable event that may lead to inappropriate medication use or patient harm, occurring at any stage of the medication management process, from prescribing through monitoring (Bonk et al., 2025). They are widely acknowledged as an urgent patient safety concern with serious clinical and economic consequences; persistent evidence illustrates that such errors contribute to significant morbidity and extend hospital stays, while also imposing heavy financial burdens on health systems (Bonk et al., 2025; Kerner et al., 2025). From an international perspective, research reports substantial error rates in both high- and middle-income settings, particularly in high-acuity contexts such as intensive care and emergency departments, where complex drug regimens and rapid decision-making elevate risk (Bonk et al., 2025; Kerner et al., 2025). These clinical realities underscore that medication errors are not isolated incidents but systemic phenomena with profound implications for patient outcomes and healthcare quality.

Nurses occupy a central and highly accountable role in medication safety, as they are chiefly responsible for administering medications and observing patients' responses throughout treatment courses. The nursing process inherently involves continuous assessment, accurate dose calculation, verification of medication orders, and vigilant monitoring for adverse reactions, situating nurses at multiple critical control points where errors might be intercepted—or inadvertently occur (Kerner et al., 2025). Recent research highlights nurses' acknowledgement of medication errors as a common professional challenge, with a majority reporting past involvement in errors, particularly during complex calculations and high-pressure clinical routines (Kerner et al., 2025; Orkaby et al., 2025). Such findings demonstrate that, while nursing expertise and clinical judgement are foundational to patient safety, the cognitive and workload demands inherent in medication delivery can predispose even experienced practitioners to mistakes without supportive systems and safeguards.

Epidemiologically, medication errors remain among the most frequent adverse events in healthcare. Systematic reviews and clinical studies indicate variable error rates depending on the setting and methodology used but consistently show that intravenous administration errors, prescribing inaccuracies, and documentation discrepancies are pervasive (Bonk et al., 2025). These patterns reflect broader trends observed globally and reaffirm the need to carefully examine error causation beyond isolated clinical acts to include organisational, technological, and human factors (Bonk et al., 2025). Traditional approaches to error reduction—such as Clinical Decision Support Systems (CDSS), electronic medication records, barcode medication administration, and systematic checklists—have delivered meaningful improvements in specific domains. However, limitations such as alert fatigue, high false alarm rates, and inconsistent adoption remain significant obstacles in translating these tools into uniformly safer outcomes (Bonk et al., 2025). Such challenges prompt a renewed focus on innovations that extend beyond incremental enhancements of existing systems.

The rapid evolution of Artificial Intelligence (AI) technologies offers a compelling rationale for reimagining how medication safety can be advanced within nursing practice. AI encompasses a spectrum of computational techniques—including predictive analytics, machine learning, and adaptive real-time decision support—that can augment human judgement by identifying complex risk patterns, refining alert relevance, and automating verification tasks that exceed human cognitive bandwidth (Bonk et al., 2025). Evidence from systematic studies demonstrates that AI-enhanced CDSS can markedly reduce various classes of errors, with systems reporting up to 95% reductions in certain operating room errors and smart infusion technologies achieving approximately 80% reductions in intravenous administration mistakes (Bonk et al., 2025). By integrating these capabilities, AI holds the potential not only to improve accuracy but also to mitigate well-documented issues such as excessive alerting and workload burden that undermine traditional tools' effectiveness.

Understanding the potential of AI to reduce medication errors requires a theoretical lens that accounts for the complexity of healthcare as a socio-technical system. The Swiss Cheese Model of error causation, originally articulated by Reason and widely applied in healthcare safety research, posits that adverse events result from the alignment of multiple latent vulnerabilities across layers of defence rather than from single points of failure (Reason, 1990, as adapted to healthcare contexts; Swiss cheese model descriptions widely used in safety science). Within this model, defences such as protocols, technologies, and human checks each have inherent 'holes' or weaknesses, and errors occur when these holes align momentarily to permit a hazard to reach the patient. A socio-technical perspective further emphasises that technology, people, tasks, and organisational context interact dynamically, such that the design and implementation of AI systems must be carefully aligned with clinical workflows, user needs, and organisational culture to achieve sustainable safety improvements. These frameworks together guide the critical examination of both the opportunities and challenges inherent in leveraging AI for medication safety.

In sum, medication errors remain a significant and complex barrier to achieving high-reliability healthcare systems. Nurses play a uniquely influential role in this context, operating at key junctures where risk and opportunity converge. Traditional safety strategies have yielded partial success, but persistent error rates and workload pressures signal the need for transformative solutions. AI technologies, grounded in robust socio-technical understanding, present promising avenues for advancing medication safety and supporting nurses in their critical clinical roles.

1.2 Statement of the Problem

Despite the widespread implementation of electronic health records, barcode medication administration, and traditional clinical decision support systems, medication errors continue to occur at unacceptable rates. Many existing safety technologies rely on static rule-based logic that fails to adapt to patient complexity or clinical context, often resulting in excessive alerts and alarm fatigue among nurses (Sutton et al., 2024). This phenomenon diminishes trust in safety systems and may paradoxically increase the likelihood of errors being overlooked or ignored.

Furthermore, healthcare systems are experiencing rising patient acuity and workforce shortages, which exacerbate the risk of medication errors, particularly in nursing practice. The persistence of these errors suggests a gap between technological capability and practical effectiveness, highlighting the need for more adaptive, context-aware solutions. Artificial intelligence (AI) has emerged as a promising approach to addressing these limitations; however, its application to nursing-led medication safety remains underexplored and insufficiently theorised.

1.3 Rationale for the Study

The integration of artificial intelligence into medication safety systems offers an opportunity to move beyond traditional error-prevention strategies toward predictive, personalised, and learning-based approaches. AI technologies, such as machine learning and predictive analytics, can analyse vast amounts of clinical data to identify patterns of risk that are imperceptible to human cognition alone (Topol, 2024). When embedded within nursing workflows, these systems have the potential to enhance decision-making, reduce cognitive burden, and improve patient outcomes.

From a nursing perspective, examining AI-driven medication safety is particularly important because nurses are the primary end-users of many clinical technologies. Without their active involvement in design, implementation, and evaluation, AI systems risk misalignment with real-world practice. This study is therefore justified by the need to generate nursingfocused evidence that informs the safe, ethical, and effective adoption of AI in medication administration (Al Khatib and Ndiaye, 2025).

1.4 Aim and Objectives of the Study

Aim

The aim of this study is to examine the use of artificial intelligence in reducing medication errors from a nursing perspective.

Objectives

1. To define medication errors and examine their impact on patient outcomes and nursing practice.
2. To explore the role of nurses in medication safety within technologically complex healthcare environments.
3. To analyse existing AI applications used to reduce medication errors in clinical settings.
4. To identify the benefits and challenges associated with AI adoption in nursing medication practices.
5. To examine theoretical frameworks that explain how AI can enhance medication safety systems.

1.5 Research Questions

1. What types of medication errors are most prevalent in nursing practice?
2. How do nurses currently contribute to the prevention and occurrence of medication errors?
3. What AI technologies are being used to reduce medication errors in healthcare settings?
4. How does the integration of AI influence nursing decision-making and workflow during medication administration?
5. What theoretical frameworks best explain the role of AI in reducing medication errors?

1.6 Significance of the Study

This study is significant for nursing practice, education, research, and healthcare policy. By focusing on AI-supported medication safety from a nursing perspective, it contributes to the growing body of nursing informatics literature and provides evidence to guide clinical decision-making. The findings may support nurse leaders and healthcare administrators in selecting and implementing AI tools that align with nursing workflows and patient safety goals.

Additionally, the study has implications for nursing education, as it underscores the need to prepare nurses with competencies in digital health and AI literacy. At a policy level, the findings may inform regulatory and ethical discussions regarding accountability, transparency, and equity in AI-driven clinical systems (El Arab et al., 2025).

1.7 Scope and Delimitation of the Study

This study focuses specifically on the use of artificial intelligence in reducing medication errors within nursing practice in healthcare settings. It addresses AI applications related to medication prescribing support, administration, and monitoring, with an emphasis on nurse interaction with these systems. The study does not examine AI applications unrelated to medication safety, such as diagnostic imaging or administrative automation, nor does it focus exclusively on physician-led decision-making systems.

1.8 Theoretical and Conceptual Framework

This study is grounded in the **Swiss Cheese Model of error causation** and **socio-technical systems theory**. The Swiss Cheese Model conceptualises medication errors as the result of multiple system failures aligning across layers of defence, rather than individual negligence (Reason, 2000). AI technologies can be viewed as additional defensive layers designed to detect and block errors before they reach the patient.

Socio-technical theory complements this model by emphasising that technology cannot be evaluated in isolation from human users, organisational structures, and clinical workflows (Sittig & Singh, 2015). Together, these frameworks provide a robust foundation for analysing how AI can support nurses in strengthening medication safety while acknowledging the complexity of real-world healthcare systems.

1.9 Summary

This chapter has introduced the problem of medication errors and established the critical role of nurses in ensuring medication safety. It has justified the need to explore artificial intelligence as an advanced tool for error reduction and outlined the objectives, research questions, and theoretical foundations of the study. The next chapter will review the literature on AI technologies and their application in medication safety within nursing practice.

2: OVERVIEW OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN MEDICATION SAFETY

2.1 Introduction to Artificial Intelligence in Healthcare

Artificial Intelligence (AI) refers to computational systems designed to perform tasks that typically require human intelligence, such as learning, reasoning, pattern recognition, and decision-making. In healthcare, AI has gained increasing attention due to its capacity to process large volumes of clinical data and generate actionable insights in real time, thereby supporting clinical judgement rather than replacing it (Topol, 2024). From a nursing perspective, AI technologies are particularly relevant to medication administration, where accuracy, timeliness, and situational awareness are critical to patient safety. As medication processes become more complex, AI offers opportunities to augment nurses' cognitive capacity and reduce preventable errors associated with human limitations.

For interdisciplinary audiences, it is essential to distinguish AI from traditional health information technologies. Conventional systems largely rely on rule-based logic and static thresholds, whereas AI systems continuously learn from data and adapt to evolving clinical contexts (Sutton et al., 2024). This adaptive capability positions AI as a transformative tool for medication safety, especially in environments characterised by high patient acuity, workflow interruptions, and information overload (AlDhaen, 2025).

2.2 Definitions and Taxonomy of AI Technologies

Machine learning (ML) is a foundational branch of AI that enables systems to learn patterns from data and improve performance over time without explicit programming. In medication safety, ML algorithms are commonly used to predict adverse drug events, identify high-risk patients, and detect prescribing anomalies (Rajkomar et al., 2019; Sutton et al., 2024). Deep learning, a subset of ML, employs multi-layered neural networks capable of processing complex, non-linear relationships, making it particularly effective for analysing large datasets, such as electronic health records and medication histories.

Natural language processing (NLP) allows AI systems to interpret unstructured clinical text, including nursing notes, medication orders, and discharge summaries. This capability is critical in nursing practice, where key medication-related information is often embedded in narrative documentation rather than structured fields (Topol, 2024). Reinforcement learning, another AI approach, focuses on optimising decision-making through feedback mechanisms, enabling systems such as smart pumps to adjust infusion parameters dynamically based on patient responses. Expert systems, while more traditional, use curated clinical knowledge and inference rules to support medication decisions and remain foundational components of many AI-enhanced clinical tools (Sutton et al., 2024).

2.3 AI in Clinical Decision Support for Medication Safety

AI-enhanced Clinical Decision Support Systems (CDSS) represent one of the most impactful applications of AI in medication safety. Unlike conventional CDSS, which often generate excessive and non-contextual alerts, AI-driven systems prioritise clinical relevance by incorporating patient-specific data such as renal function, comorbidities, and concurrent medications (Sittig & Singh, 2015). These systems support nurses by providing real-time alerts, individualised dosing recommendations, and predictive warnings for potential adverse drug events before harm occurs.

Drug–drug interaction prediction is a particularly valuable AI application, as polypharmacy remains a major contributor to medication errors, especially among older adults and critically ill patients. Machine learning models have demonstrated improved accuracy in identifying clinically significant interactions compared to rule-based systems, thereby reducing unnecessary alerts and mitigating alert fatigue (Sutton et al., 2024). For nurses, this refinement enhances trust in decision support tools and supports timely, informed clinical judgement during medication administration.

2.4 Smart Medication Administration Technologies

Smart medication administration technologies integrate AI capabilities directly into nursing workflows, reinforcing safety at the point of care. Barcode Medication Administration (BCMA) systems, when augmented with AI, move beyond simple verification of the “five rights” of medication administration to include predictive risk assessment and pattern recognition (Rodziewicz et al., 2024). AI-enhanced BCMA systems can identify deviations from typical administration patterns, flag high-risk situations, and prompt nurses with context-sensitive guidance.

Similarly, smart infusion pumps equipped with adaptive algorithms represent a significant advancement in preventing intravenous medication errors. These systems use real-time patient data and historical usage patterns to adjust dosing parameters and detect anomalies that may indicate programming errors (Topol, 2024). From a nursing perspective, such technologies function as an additional layer of defence, aligning with safety models that emphasise redundancy and early error interception rather than reliance on individual vigilance alone.

2.5 Evaluation Metrics for AI-Driven Medication Safety Systems

Evaluating the effectiveness of AI technologies in medication safety requires both technical and clinical metrics. Sensitivity and specificity are commonly used to assess a system's ability to correctly identify true medication risks while minimising false negatives and false positives. High sensitivity is essential to ensure that potential harms are not overlooked, whereas adequate specificity is critical to preventing alert fatigue and cognitive overload among nurses (Sutton et al., 2024).

False alarm rates serve as a particularly important metric in nursing contexts, as excessive non-actionable alerts can erode trust in AI systems and undermine their intended safety benefits (Cao et al., 2025). Beyond technical performance, clinical utility and workflow integration are equally vital evaluation criteria. AI tools must align with nursing workflows, support timely decision-making, and enhance—rather than disrupt—care delivery. Studies increasingly emphasise that the success of AI in medication safety is determined not solely by algorithmic accuracy but by how effectively these systems are embedded within the socio-technical realities of nursing practice (Sittig & Singh, 2015).

2.6 Summary

This chapter has provided an overview of artificial intelligence technologies relevant to medication safety, clarifying key concepts and applications for an interdisciplinary audience. It has examined AI taxonomies, decision support systems, and smart medication administration technologies, while emphasising evaluation metrics critical to nursing practice. Together, these insights establish a foundation for examining empirical evidence, benefits, and challenges associated with AI adoption in nursing medication safety, which will be explored in the subsequent chapter.

3: EVIDENCE OF ARTIFICIAL INTELLIGENCE IMPACT ON MEDICATION ERRORS IN NURSING PRACTICE

3.1 Introduction

The growing integration of Artificial Intelligence (AI) into healthcare has prompted an expanding body of empirical research examining its effectiveness in reducing medication errors. Given nurses' central role in medication administration and monitoring, it is essential to evaluate how AI-enhanced interventions influence nursing practice and patient outcomes. This chapter systematically reviews empirical studies and real-world implementation reports that assess AI applications in medication safety, with particular attention to nursing-relevant outcomes. By comparing AI-enabled systems with traditional approaches, the chapter elucidates both the measurable benefits and the contextual challenges associated with AI adoption in clinical settings.

3.2 Quantitative Evidence of Error Reduction

Quantitative studies consistently demonstrate that AI-enabled medication safety systems are associated with meaningful reductions in medication error rates and adverse drug events. Machine learning–based clinical decision support systems have been shown to outperform rule-based alerts by improving the detection of high-risk medication orders and reducing false positives (Sutton et al., 2024). In hospital settings, AI-enhanced prescribing and administration tools have been associated with reductions in preventable adverse drug events ranging from 30% to over 50%, particularly in high-risk populations such as older adults and critically ill patients (Rajkomar et al., 2019; Topol, 2024).

Time efficiency represents another significant quantitative benefit relevant to nursing practice. Studies examining AI-supported medication workflows report reductions in time spent verifying medication orders, responding to alerts, and documenting administration activities, thereby allowing nurses to redirect attention toward direct patient care (Rodziewicz et al., 2024). Importantly, these time savings are not achieved at the expense of safety; rather, they reflect improved prioritization of clinically significant risks. Such findings suggest that AI technologies can simultaneously enhance efficiency and safety when appropriately integrated into nursing workflows.

3.3 Qualitative Insights: Nursing Perspectives and Adoption Challenges

While quantitative outcomes highlight AI's potential, qualitative research provides critical insight into nurses' experiences, perceptions, and concerns regarding AI-based medication safety tools. Nurses frequently report that AI systems enhance confidence in medication administration by providing real-time, patient-specific guidance, particularly in complex clinical scenarios (Keers et al., 2023). Many nurses perceive AI as a supportive "second check" that reinforces professional judgement rather than replacing it, aligning with nursing values of accountability and patient advocacy.

However, qualitative studies also identify notable challenges to adoption. Nurses have expressed concerns regarding usability, lack of transparency in AI decision-making processes, and insufficient training during implementation phases (Sutton et al., 2024). Trust in AI systems is strongly influenced by the perceived relevance and accuracy of alerts; poorly calibrated systems may exacerbate alert fatigue and undermine engagement. These findings underscore that successful AI deployment depends not only on technical performance but also on human-centered design and organizational readiness.

3.4 Case Examples of AI Applications in Medication Safety

One prominent application of AI in medication safety involves predictive analytics for identifying patients at high risk of medication-related harm. Machine learning models trained on electronic health record data have demonstrated the ability to predict adverse drug events hours or days before clinical manifestation, enabling proactive nursing interventions such as closer monitoring or medication review (Rajkomar et al., 2019). These tools are particularly valuable in acute care settings, where early risk identification can significantly alter patient trajectories.

Natural Language Processing (NLP) represents another impactful AI application, particularly relevant to nursing documentation. NLP systems can extract medication-related information from unstructured clinical notes, such as undocumented adverse reactions or discrepancies between orders and administration records (Topol, 2024). By surfacing critical information that might otherwise remain hidden in narrative text, NLP supports nurses' situational awareness and strengthens continuity of care. Additionally, closed-loop medication management systems—integrating AI-enhanced prescribing, dispensing, administration, and monitoring—have demonstrated substantial reductions in errors by creating continuous feedback loops across the medication lifecycle (Rodziewicz et al., 2024).

3.5 Methodological Considerations in Evaluating AI Interventions

The evidence base on AI and medication safety encompasses a range of study designs, including randomized controlled trials (RCTs), quasi-experimental studies, and pre–post implementation evaluations. RCTs offer the strongest internal validity but are relatively scarce due to ethical, logistical, and cost constraints associated with testing safety-critical technologies (Rajkomar et al., 2019). As a result, many studies rely on observational or quasi-experimental designs, which provide valuable real-world insights but are more susceptible to confounding factors.

Bias, generalizability, and data quality remain central methodological challenges in this literature. AI systems trained on data from single institutions may perform poorly when deployed in different clinical contexts, raising concerns about external validity and equity (Topol, 2024). Additionally, incomplete or biased datasets can propagate systemic inequities and undermine the reliability of AI predictions. From a nursing perspective, these limitations reinforce the importance of rigorous evaluation, transparent reporting, and ongoing monitoring to ensure that AI-driven medication safety tools deliver consistent and equitable benefits across diverse patient populations.

3.6 Summary

This chapter has reviewed empirical evidence regarding the impact of AI on medication errors in nursing practice, highlighting both quantitative improvements in safety and efficiency and qualitative insights into nurse experiences. Case examples illustrate how predictive analytics, NLP, and closed-loop systems can strengthen medication safety across the care continuum. At the same time, methodological limitations and implementation challenges underscore the need for cautious interpretation and rigorous evaluation. These findings set the stage for the next chapter, which will examine ethical, organizational, and human-factors considerations influencing AI adoption in nursing medication safety.

5: FUTURE DIRECTIONS, POLICY IMPLICATIONS, AND PRACTICE RECOMMENDATIONS

5.1 Introduction

The integration of Artificial Intelligence (AI) into medication safety represents a pivotal shift in how healthcare systems address preventable harm. While previous chapters have demonstrated the effectiveness of AI in reducing medication errors and explored the associated ethical and human-factor challenges, it is equally important to consider how these technologies can be sustainably advanced. This chapter outlines future research directions, policy implications, and practical recommendations aimed at optimising AI adoption in nursing practice while safeguarding patient safety, professional autonomy, and ethical integrity.

5.2 Future Directions for Research and Innovation

Future research on AI in medication safety must move beyond proof-of-concept studies toward large-scale, multi-site evaluations that assess long-term outcomes and generalisability. There is a particular need for randomised controlled trials and robust quasi-experimental designs that measure nursing-specific outcomes, such as workload, cognitive burden, and clinical confidence, alongside patient safety metrics (Topol, 2024). Additionally, research should explore how AI systems perform across diverse populations and care settings to mitigate risks associated with algorithmic bias and inequitable care.

Innovation efforts should prioritise the development of explainable and transparent AI systems that allow nurses to understand the rationale behind recommendations. Advances in explainable AI may enhance trust, support clinical reasoning, and improve accountability in medication decision-making (Sutton et al., 2024). Furthermore, interdisciplinary collaboration among nurses, informaticians, engineers, and policymakers will be essential to ensure that AI technologies evolve in ways that are responsive to real-world clinical needs.

5.3 Implications for Nursing Practice

From a practice perspective, AI has the potential to redefine medication administration by functioning as an intelligent safety partner rather than a passive tool. To realise this potential, healthcare organisations must ensure that AI systems are seamlessly integrated into nursing workflows and designed to complement professional judgement. Nurses should be actively involved in system selection, implementation, and evaluation processes, as their experiential knowledge is critical to identifying usability issues and unintended consequences (Sittig & Singh, 2015).

Moreover, the adoption of AI necessitates a shift in nursing competencies. Digital literacy, data interpretation, and critical appraisal of AI recommendations should become core components of professional nursing practice. Embedding these competencies within clinical training and continuing education programmes will empower nurses to engage confidently with AI technologies and uphold patient safety standards (El-Banna et al., 2025)..

5.4 Educational and Workforce Development Considerations

Nursing education must evolve to prepare current and future practitioners for AI-enabled clinical environments. Undergraduate and graduate curricula should incorporate foundational concepts in health informatics, AI ethics, and decision-support systems, with a focus on practical application in medication safety (Topol, 2024). Simulation-based learning and case studies involving AI-supported medication scenarios can help bridge the gap between theory and practice.

At the workforce level, healthcare organisations should invest in continuous professional development initiatives that address varying levels of AI literacy. Mentorship programmes, interdisciplinary training sessions, and accessible technical support can facilitate smoother transitions and reduce resistance to adoption. Such investments are critical to fostering a workforce that is both competent and confident in leveraging AI for medication safety (Chatzichristos et al., 2025)

5.5 Policy, Regulation, and Governance

The expanding role of AI in medication safety raises important policy and regulatory considerations. Clear guidelines are needed to define accountability and responsibility when AI systems contribute to clinical decision-making. Policymakers must establish regulatory frameworks that ensure transparency, data privacy, and rigorous validation of AI tools prior to widespread deployment (Sutton et al., 2024). These frameworks should align with existing patient safety standards and professional nursing regulations.

Governance structures within healthcare organisations should also be strengthened to oversee AI implementation and ongoing performance monitoring (Kim et al., 2025). Ethics committees, nursing leadership, and informatics specialists should collaborate to evaluate risks, address bias, and ensure equitable outcomes. By embedding AI governance within existing quality and safety infrastructures, organisations can promote responsible innovation while protecting patients and clinicians alike.

5.6 Concluding Synthesis

Artificial intelligence holds substantial promise for reducing medication errors and enhancing patient safety, particularly when leveraged to support nursing practice (Rony et al., 2024). However, its success depends on more than technological sophistication; it requires thoughtful integration within socio-technical systems, ethical governance, and sustained investment in nursing education and workforce development. By aligning innovation with nursing values and evidence-based practice, AI can serve as a powerful adjunct to professional judgement and contribute meaningfully to high-reliability healthcare systems.

Overall Manuscript Conclusion

This manuscript has examined the use of artificial intelligence in reducing medication errors from a nursing perspective, integrating theoretical frameworks, empirical evidence, and practical considerations. Through a systematic exploration of AI technologies, their impact on medication safety, and the challenges associated with their adoption, the paper underscores the importance of nurse-centred, ethically grounded approaches to innovation. As healthcare systems continue to evolve, the collaboration between nursing expertise and intelligent technologies will be essential to advancing patient safety and quality of care.

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