Indonesian Journal of Global Health Research
Volume 8 Number 2, April 2026
e-ISSN 2715-1972; p-ISSN 2714-9749
https://jurnal2.globalhealthsciencegroup.com/index.php/IJGHR

THE ROLE OF PHARMACY MANAGEMENT IN IMPROVING PATIENT SAFETY THROUGH THE PREVENTION OF MEDICATION ERRORS: A LITERATURE REVIEW

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ABSTRACT
Medication errors remain a major challenge in patient safety within healthcare facilities and may occur at any stage of the medication use process, including prescribing, preparation, dispensing, administration, and therapeutic monitoring. Such errors have the potential to cause adverse clinical outcomes, increase healthcare costs, and compromise the quality of care. Pharmacy management plays a strategic role in preventing medication errors through the development and implementation of integrated, patient safety–oriented medication management systems. This literature review aims to examine and synthesize findings from scientific journals concerning the role of pharmacy management in improving patient safety through the prevention of medication errors. The literature search was conducted using a narrative review approach of open-access scientific journal articles published within the period of 2019–2024 and retrieved from PubMed Central, Frontiers, BMC Journals, PLOS ONE, and DOAJ. The search was performed using combinations of keywords with Boolean operators as follows: ("pharmacy management" OR "pharmaceutical services" OR "medication management system") AND ("medication errors") AND ("patient safety"). A total of 285 records were identified through database searching. After the removal of duplicates and other ineligible records, 180 articles were screened, of which 80 were excluded. Subsequently, 100 full-text articles were assessed, and 30 studies were finally included in this review. The included articles comprised primary research studies relevant to pharmacy management, medication errors, and patient safety. The findings indicate that the role of pharmacy management in preventing medication errors can be categorized into several key themes, including the management of dispensing and drug distribution systems, optimization of clinical pharmacists' roles in patient care, implementation of standard operating procedures in medication management, and the utilization of pharmacy technologies and information systems. An integrated pharmacy management approach has been reported to contribute to reducing the incidence of medication errors and enhancing patient safety across various healthcare settings. This review concludes that strengthening pharmacy management constitutes a critical component in efforts to improve patient safety and to develop safer healthcare delivery systems.

Keywords: medication errors; medication management system; patient safety; pharmaceutical services; pharmacy management

How to cite (in APA style)
Amanah, N. D. A. A., Fitriasari, N. N. F., Apriansyah, M., Purwanto, W., & Purwidyaningrum, I. (2026). The Role of Pharmacy Management in Improving Patient Safety through the Prevention of Medication Errors: A Literature Review. Indonesian Journal of Global Health Research, 8(2), 1203–1212. https://doi.org/10.37287/ijghr.v8i2.1878.

INTRODUCTION

Patient safety constitutes a fundamental component of healthcare quality and has become a global priority in the development of healthcare delivery systems. Patient safety initiatives aim to prevent adverse events arising from healthcare processes, including those related to medication use. The patient safety approach emphasizes the importance of safe, standardized, and well-managed healthcare systems to minimize the risk of patient harm (World Health Organization, 2021). Medication errors represent one of the most common patient safety problems and may occur at any stage of the medication use process, from prescribing to therapeutic monitoring. Medication errors have the potential to cause serious clinical consequences, prolong hospitalization, and increase healthcare costs. The literature indicates that medication errors are frequently associated with therapeutic complexity, polypharmacy, and weaknesses in medication management systems within healthcare facilities (Keers et al., 2020; Gebre et al., 2021).

Pharmacy management plays a critical role in ensuring the safety and quality of medication use through the implementation of integrated pharmaceutical service systems. The scope of pharmacy management includes planning and controlling dispensing and medication distribution systems, implementing standard operating procedures, and strengthening the role of pharmacists in clinical services. Effective pharmacy management approaches have been reported to reduce the risk of medication errors and to support systemic improvements in patient safety (Aljadhey et al., 2020; Manias et al., 2020).

Although numerous studies have addressed medication errors and patient safety, research specifically highlighting pharmacy management as a systems-based approach remains fragmented and has not been comprehensively synthesized. Variations in research focus, design, and healthcare settings underscore the need to integrate these findings to obtain a more holistic understanding. A structured literature review is therefore necessary to identify key themes related to the role of pharmacy management and to strengthen the conceptual foundation for advancing patient safety practices (Monsey McLeod et al., 2019). This article aims to examine and synthesize scientific journal literature concerning the role of pharmacy management in improving patient safety through the prevention of medication errors. This review is expected to provide a comprehensive conceptual framework and serve as a reference for strengthening pharmaceutical care practices and developing patient safety policies in healthcare facilities.

METHOD

This study employed a narrative literature review design to examine the role of pharmacy management in improving patient safety through the prevention of medication errors. A narrative review approach was chosen to enable a descriptive and thematic synthesis of findings derived from various study designs and healthcare settings. This method allows the integration of evidence from quantitative, qualitative, and mixed-methods studies, providing a comprehensive conceptual understanding of the topic. The literature search was conducted using several electronic databases, including PubMed Central, Frontiers, BMC Journals, PLOS ONE, and the Directory of Open Access Journals (DOAJ). The search strategy utilised keywords such as *pharmacy management*, *medication errors*, *patient safety*, *pharmaceutical services*, and *medication use process*. Searches were primarily performed within the title and abstract fields where applicable. The selection of databases aimed to ensure broad coverage of relevant peer-reviewed articles in the field of pharmacy and healthcare.

The search was limited to open-access journal articles published between 2019 and 2024, yielding a total of 285 records identified through database searching. After the removal of duplicates and other ineligible records (n = 145), 180 records remained for title and abstract screening, of which 80 were excluded. Subsequently, 100 full-text articles were sought for retrieval; however, 20 reports could not be retrieved. The remaining 80 articles were assessed for eligibility, resulting in the exclusion of 50 studies that did not meet the inclusion criteria. Finally, 30 studies were included in the systematic review. Eligible studies were primary research articles written in English or Indonesian that addressed the role of pharmacy management or medication management systems in preventing medication errors and improving patient safety within healthcare facilities, including hospitals, inpatient and outpatient services, and pharmacy units.

Articles were excluded if they were editorials, commentaries, opinion papers, non-scientific reviews, or single case reports. Studies without full-text access and those published outside the specified time range were also excluded. In addition, articles that did not focus on pharmacy management, medication errors, or patient safety were not included in the review. The article selection process involved screening titles and abstracts, followed by full-text evaluation to ensure relevance to the research objectives. Selected articles were then analysed descriptively and categorised into major thematic areas, including dispensing and medication distribution systems, the

role of clinical pharmacists, standard operating procedures and medication management systems, and the utilisation of technology and pharmacy information systems. The findings were synthesised narratively to illustrate the contribution of pharmacy management in enhancing patient safety through the prevention of medication errors.

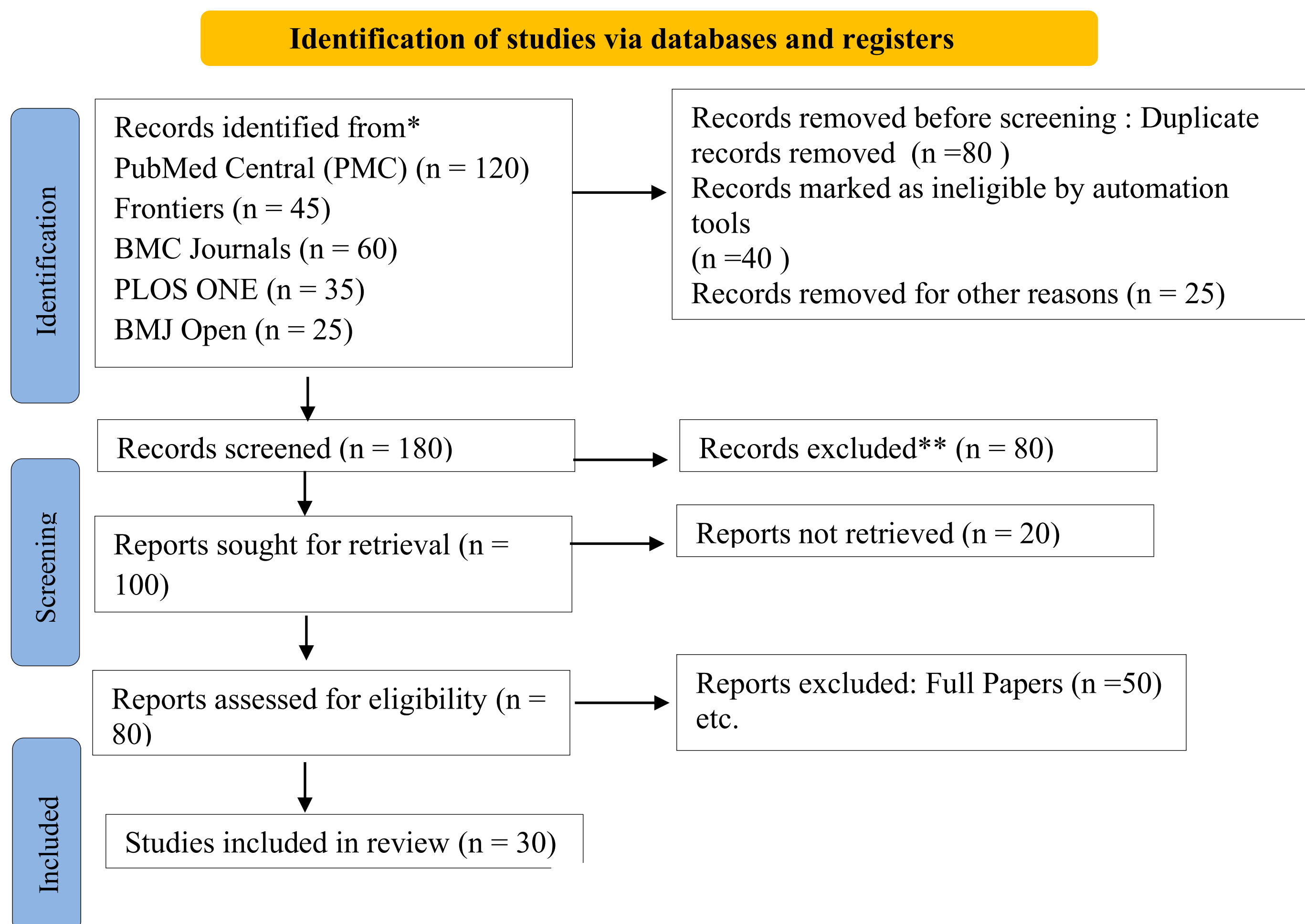

Figure 1 PRISMA

RESULT

The literature included in this study comprised open-access scientific journal articles addressing the role of pharmacy management in preventing medication errors and improving patient safety. The selected articles were primary research studies representing diverse study designs and healthcare settings. The characteristics of the literature were analyzed based on the number of articles, publication year, country and study setting, research design, and research focus to provide an overview of the scope and research trends examined.

Table 3.
Characteristics of the Reviewed Literature

Aspect	Characteristics
Number of articles	30 open-access scientific journal articles
Publication year	2019–2024, with the majority published within the last five years
Country and study setting	Conducted across various regions, including Europe, Asia, Africa, and the Americas; predominantly undertaken in hospitals, including inpatient, outpatient, and pharmacy units
Study design	Observational (prospective and retrospective), cross-sectional, and pre–post intervention studies
Research focus	Dispensing and medication distribution systems, role of clinical pharmacists, standard operating procedures in medication management, and the use of technology and pharmacy information systems in preventing medication errors

The thematic mapping of articles indicates that the role of pharmacy management in preventing medication errors encompasses multiple interrelated components, ranging from dispensing system

management to governance strengthening and patient safety culture development. Each theme contributes distinct yet complementary elements to the establishment of a safe medication use system. This mapping forms the basis for the thematic discussion presented in the following subsections.

Table 4.
Literature Analysis Table on the Role of Pharmacy Management in Preventing Medication Errors

Author (Year)	Title	Settings & Country	Research Design	Pharmaceutical Management Focus	Types of Medication Errors	Key Findings (Patient Safety Outcomes)	Journal Summary
Jošt et al. (2024)	Effectiveness of pharmacist-led medication reconciliation on medication errors at hospital discharge	RS, Slovenia	Intervention	Clinical pharmacist, medication reconciliation	Transition of care	Significant reduction in medication discrepancies	Intervention studies have shown that medication reconciliation by clinical pharmacists significantly reduces medication discrepancies at the time of patient discharge from the hospital.
Jošt et al. (2024)	Pharmacist-led hospital intervention reduces unintentional medication discrepancies	RS, Slovenia	Intervention	Pharmacist intervention	Post-treatment discrepancies	Improving patient safety after discharge	Ongoing pharmacist intervention after hospitalization effectively reduces unintentional medication errors made by patients.
Stuhec et al. (2024)	Impact of ward-based clinical pharmacist services on drug-related problems	RS, Europe	Observational	Ward clinical pharmacist	DRPs	Significant reduction in DRPs	The presence of a clinical pharmacist in the ward reduces the number of drug-related problems and improves patient safety.
Elamin et al. (2024)	Effectiveness of clinical pharmacists-led medication reconciliation	RS, Sudan	Prospective	Medication reconciliation	Prescribing errors	Early identification of medication errors	Clinical pharmacist-led medication reconciliation can identify and prevent prescribing errors early.
Bajeux et al. (2022)	Pharmacist-led medication reconciliation at patient discharge	RS, France	Observational	Medication reconciliation	Medication discrepancies	Decrease in rehospitalizations	Medication reconciliation at discharge is associated with a reduced risk of rehospitalization due to medication errors.
Gebre et al. (2021)	Medication errors among hospitalized adults in Ethiopia	RS, Ethiopia	Observational	Dispensing system	Dispensing & admin	High error rate due to system	Observational studies have found a high prevalence of medication errors due to weaknesses in medication management systems.
Hailu et al. (2021)	Medication distribution systems and medication errors in hospitals	RS, Ethiopia	Cross-sectional	Drug distribution	Dispensing errors	Distribution system affects error	A non-standardized drug distribution system increases the risk of dispensing errors in hospitals.
Westbrook et al. (2020)	Impact of electronic prescribing systems on medication errors	RS, Australia	Time series	E-prescribing	Prescribing errors	Error reduction post-digitization	The implementation of e-prescribing reduces prescribing errors and improves the readability of drug instructions.

Author (Year)	Title	Settings & Country	Research Design	Pharmaceutical Management Focus	Types of Medication Errors	Key Findings (Patient Safety Outcomes)	Journal Summary
Green et al. (2023)	Impact of transition to a digital hospital on medication errors	Digital Hospita, UK	Time series	Information Systems	Multi-stage	Errors decreased significantly	Digital hospital transformation contributes to reducing medication errors across all stages of medication use.
Monsey McLeod et al. (2019)	Impact of electronic prescribing systems on clinical pharmacy practice	RS, UK	Qualitative	Pharmaceutical technology	Systemic	Need for change management	Implementation of electronic systems changes the role of pharmacists and requires change management for optimal effectiveness.
Aljadhey et al. (2020)	Medication safety practices in hospitals	Hospital, Saudi Arabia	Survey	Pharmaceutical management	Systemic	Strong SOP → errors decrease	Strong pharmaceutical governance and SOPs are associated with better medication safety practices.
Alshakrah et al. (2021)	Medication error reporting systems	RS, UK	System review	Error reporting	All stages	Safety culture improves	A non-punitive medication error reporting system promotes a culture of patient safety and organizational learning.
Tsegaye et al. (2020)	Medication administration errors and associated factors	RS, Ethiopia	Cross-sectional	SOP for administering medication	Administrative errors	Low SOP compliance	Low compliance with SOPs and high workloads increase the risk of medication errors.
Keers et al. (2020)	Causes of medication administration errors	RS, UK	Prospective	Safety system	Administrative errors	Dominant system factors	System and organizational factors are more dominant than individual factors in the occurrence of medication errors.
Manias et al. (2020)	Interventions to reduce medication errors in hospitals	RS, Australia	Review	Management intervention	Multi-stage	The most effective systems approach	A systems approach and multidisciplinary interventions are most effective in reducing medication errors.
Mekonnen et al. (2020)	Drug-related problems and contributing factors	RS, Ethiopia	Observation	Therapy management	DRPs	Pharmacists prevent DRPs	Pharmacists play an important role in preventing drug-related problems through monitoring drug therapy.
Mekonnen et al. (2021)	Medication errors in hospital settings	RS, Multi country	Observation	Drug system	Prescribing	High error without control	The high rate of medication errors is related to weak control of the drug management system.
Assiri et al. (2018)	Epidemiology of medication errors	Hospital, Saudi	Observation	Drug safety	All stages	Dominant organizational factors	Medication errors are influenced by organizational factors, systems, and the complexity of health services.
Slight et al. (2020)	Role of pharmacists in preventing medication errors	RS, UK	Observation	The role of pharmacists	Prescribing	Pharmacists reduce errors	Pharmacist involvement in clinical services contributes to the prevention of prescribing errors.

Author (Year)	Title	Settings & Country	Research Design	Pharmaceutical Management Focus	Types of Medication Errors	Key Findings (Patient Safety Outcomes)	Journal Summary
Njeri et al. (2021)	Role of pharmacists in promoting patient safety	RS, Kenya	Qualitative	Pharmacist & safety	Systemic	Collaboration improves safety	Pharmacist collaboration with other healthcare professionals improves patient safety.
Alenezi et al. (2022)	Medication safety culture and associated factors	Hospita, Saudi	Survey	Safety culture	Systemic	Low safety culture → errors	A weak patient safety culture is correlated with high medication errors.
Ibrahim et al. (2022)	Dispensing errors and pharmacy workflow	RS, Qatar	Observational	Pharmacy workflow	Dispensing	Workflow triggers error	Inefficient pharmacy workflows increase the risk of dispensing errors.
Yusuf et al. (2023)	Medication errors and management systems in hospital practice	Hospital, Asia	Observational	Management system	Multi-stage	Need system integration	Integration of pharmacy management systems is necessary to reduce medication errors across stages.
Wondmieneh et al. (2020)	Medication errors and contributing factors among hospitalized patients	RS, Ethiopia	Cross-sectional	Medication management	Admin & dispensing	Main factor workload	Workload and limited resources are major factors in medication errors.
Hailu et al. (2021)	Medication distribution systems and errors	RS, Ethiopia	Cross-sectional	Drug distribution	Dispensing	Manual systems are risky	Manual drug distribution systems have a higher risk of error than standardized systems.
Green et al. (2023)	Digital hospital transition and medication errors	digital hospital	Longitudinal	HIS pharmacy	Multi-stage	Error down after HIS	Integration of pharmaceutical information systems supports ongoing patient safety.
Westbrook et al. (2020)	Clinical decision support and prescribing safety	Hospital	Observational	CDSS	Prescribing	Safer clinical decisions	Clinical decision support systems help prevent prescribing errors.
Aljadhey et al. (2020)	Governance of medication safety in hospitals	Hospital	Survey	Pharmaceutical governance	Systemic	Strong governance → safety	Strong pharmaceutical governance contributes to improved patient safety.
WHO (2021)	Global patient safety action plan 2021–2030	Global	Policy documents	Safety system	All stages	Medication safety is a global priority	Medication safety is established as a global priority in healthcare systems.
Zeenathunnissa et al. (2024)	Medication errors in modern healthcare systems	Multi-setting	Observational	Modern system	Multi-stage	Prevention requires a systems approach	Preventing medication errors requires a systems approach based on management and technology.

DISCUSSION

The Role of Pharmacy Management in Dispensing and Medication Distribution Systems

Dispensing and medication distribution systems represent critical stages in the medication use process, with a high risk of medication errors. The literature indicates that dispensing errors are frequently associated with incorrect drug selection, dosage inaccuracies, quantity discrepancies, and labeling errors, all of which may directly compromise patient safety. Pharmacy management plays a

central role in mitigating these risks through the design and implementation of standardized and controlled medication distribution systems (Gebre et al., 2021; Hailu et al., 2021).

Pharmacy management interventions in dispensing systems include workflow organization, multi-layer verification processes, and the effective allocation of human resources and supporting infrastructure. Strengthening procedures and internal supervision has been reported to reduce dispensing errors, particularly in high-workload service units. Systematically managed distribution systems contribute to improved accuracy and consistency in pharmaceutical services (Westbrook et al., 2020). Pharmacy management also facilitates the integration of technology within dispensing and distribution systems. The use of electronic systems and health information technologies enhances traceability and accuracy in medication preparation and delivery processes. A combined approach incorporating procedural standardization, supervision, and technological integration constitutes a critical strategy in preventing medication errors and enhancing patient safety.

The Role of Clinical Pharmacists in Preventing Medication Errors

Clinical pharmacists play a pivotal role in preventing medication errors through direct involvement in patient care processes. The literature demonstrates that clinical pharmacists contribute to identifying prescribing errors, dosing inaccuracies, drug–drug interactions, and therapeutic duplication through prescription review and medication therapy monitoring. Their participation in multidisciplinary healthcare teams enables early detection of potential medication errors before patient harm occurs (Jošt et al., 2024; Stuhec et al., 2024).

Medication reconciliation conducted by clinical pharmacists has been identified as an effective intervention in reducing medication discrepancies, particularly during transitions of care such as hospital admission and discharge. Evidence indicates that pharmacist-led reconciliation reduces unintentional discrepancies that may lead to medication errors and adverse events. These interventions demonstrate high acceptance rates among physicians and contribute significantly to patient safety improvement (Elamin et al., 2024; Bajeux et al., 2022). Strengthening the role of clinical pharmacists requires structured support from pharmacy management and clear institutional policies. The literature suggests that well-defined professional roles, integration within multidisciplinary teams, and continuous competency development enhance the effectiveness of clinical pharmacist interventions in supporting safe medication use systems.

Standard Operating Procedures and Medication Management Governance

Standard operating procedures (SOPs) and structured medication management systems are essential components in preventing medication errors, as they provide operational guidance to ensure consistency and safety in medication processes. The absence of clear SOPs or poor adherence to established procedures increases the risk of medication errors across all stages of the medication use process. Pharmacy management is responsible for the development, implementation, and evaluation of SOPs to ensure alignment with patient safety standards (Aljadhey et al., 2020). Medication management governance also includes internal supervision, auditing mechanisms, and the establishment of medication error reporting systems. Non-punitive reporting systems enable the identification of system weaknesses and promote continuous quality improvement. Healthcare facilities with strong medication management governance tend to demonstrate a more developed patient safety culture and lower rates of medication errors (Alshakrah et al., 2021). The strengthening of SOPs and medication management systems requires organizational commitment and policy support. Pharmacy management ensures resource availability, workforce training, and adherence monitoring. A systematic managerial approach to medication governance directly contributes to improved patient safety and pharmaceutical service quality (Tsegaye et al., 2020).

Utilization of Technology and Pharmacy Information Systems

The utilization of technology and pharmacy information systems plays a significant role in preventing medication errors by enhancing accuracy, traceability, and process consistency.

Evidence suggests that electronic prescribing systems and electronic health records reduce errors related to illegible handwriting and improve interprofessional communication. Technological integration within pharmacy management systems reinforces patient safety frameworks (Westbrook et al., 2020; Green et al., 2023). Technological applications in dispensing and distribution, including automated dispensing systems and barcode medication administration, have been shown to reduce drug and dosage errors. Clinical decision support systems enable early identification of potential drug interactions and therapeutic duplication. However, the effectiveness of such technologies depends on workflow design and workforce readiness (Monsey McLeod et al., 2019).

Pharmacy management holds a strategic role in ensuring safe and effective technology implementation. Policy support, workforce training, and ongoing system evaluation are necessary to mitigate emerging risks such as alert fatigue and overreliance on digital systems. An integrated pharmacy management approach enables technology to function as a key enabler of patient safety improvement.

Implications for Pharmacy Management Practice and Patient Safety

The findings of this literature review demonstrate that pharmacy management has substantial implications for improving patient safety through a systems-based approach to preventing medication errors. Strengthening dispensing systems, optimizing the role of clinical pharmacists, implementing SOPs, and leveraging technology collectively contribute to sustainable risk control in medication use processes. These findings reinforce the principle that patient safety depends not only on individual competence but also on the quality of medication governance systems (Manias et al., 2020).

Implications for pharmaceutical practice include the need to integrate pharmacy management into healthcare policy and service planning. Organizational support, role clarity, and interprofessional coordination enhance the effectiveness of pharmacy-led interventions in preventing medication errors. Pharmacy management serves as a bridge between patient safety policies and operational implementation in healthcare facilities (World Health Organization, 2021). Another implication relates to the development of patient safety culture within healthcare institutions. Non-punitive medication error reporting systems, organizational learning, and data-driven evaluation are integral components of pharmacy management practice that support continuous quality and safety improvement. These elements strengthen the strategic position of pharmacy management within safe healthcare systems.

Limitations of the Literature Review

This review has several limitations that should be considered when interpreting the findings. Variations in study design, healthcare settings, and participant characteristics may affect result consistency and limit generalizability. The predominance of hospital-based studies restricts insight into the role of pharmacy management in other healthcare contexts, such as primary care or community pharmacies. The narrative review approach did not include quantitative methodological quality assessment or meta-analysis. Consequently, the strength of the presented evidence depends on the quality of the individual studies analyzed. Potential publication bias should also be considered, as the review included only open-access articles available online, which may disproportionately report positive findings. These limitations indicate the need for future research employing more rigorous designs to strengthen empirical evidence regarding the role of pharmacy management in preventing medication errors.

Final Synthesis

The synthesis of the reviewed literature demonstrates that pharmacy management plays a central role in preventing medication errors and enhancing patient safety through an integrated systems-based approach. This role encompasses the management of dispensing and distribution systems, optimization of clinical pharmacist involvement, implementation of standardized operating

procedures, and the strategic use of technology and pharmacy information systems. These interconnected components form a comprehensive pharmacy management framework oriented toward patient safety. The integration of policy, human resources, organizational systems, and technology is essential to establishing safe and sustainable pharmaceutical services. Prevention of medication errors cannot be addressed in isolation but requires consistent and comprehensive pharmacy management across all stages of the medication use process. The findings of this review provide a conceptual foundation for strengthening pharmacy management practices and inform the development of patient safety policies within healthcare facilities.

CONCLUSION

This literature review demonstrates that pharmacy management plays a critical role in improving patient safety through the prevention of medication errors. Strengthening pharmacy management across key components, including dispensing and medication distribution systems, optimisation of clinical pharmacists' roles, implementation of standard operating procedures, and utilisation of technology and pharmacy information systems, collectively contributes to reducing the risk of medication errors at various stages of the medication use process. An integrated pharmacy management approach is therefore essential in supporting the development of a safe and effective pharmaceutical care system oriented towards patient safety. To enhance the effectiveness of pharmacy management practices, healthcare facilities should prioritise the implementation of standardised dispensing systems, optimise the involvement of clinical pharmacists, and ensure the development and continuous evaluation of standard operating procedures for medication management. In addition, the adoption of technology and pharmacy information systems should be accompanied by structured change management strategies and adequate workforce training to ensure safe and effective implementation.

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