



Medication Errors in Hospital Settings: Prevention and Management – A Review

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Abstract:

Medication mistakes are one of the most common preventable causes of injury to patients in healthcare systems globally and pose a serious challenge to patient safety in hospitals. Errors can occur at any stage of the medication-use process: prescribing, transcribing, dispensing, administering, and monitoring drugs. Medication errors happen because of the following factors such as severe work load, poor communication, under staffing, absence of standardized procedures, complex medication regimens etc. The implications include modest side effects or serious morbidity, prolonged hospitalization, higher health care costs, and even death. Effective prevention and control of pharmaceutical errors necessitate a multidisciplinary approach with the participation of healthcare professionals, hospital administrators and patients. Strategies that have shown significant potential in reducing medication-related incidents include computerized physician order entry systems, barcode medication administration, medication reconciliation, clinical decision support systems, staff education, and active involvement of clinical pharmacists. Timely detection, reporting, root cause investigation and implementation of corrective steps are critical for medication safety and prevention of recurrence. The purpose of this review is to describe the types, causes, consequences, prevention, and management of medication mistakes in the hospital setting, emphasizing the role of clinical pharmacists to promote the safe and effective administration of medications. Improving medication safety systems and promoting a culture of error reporting can significantly improve the quality of care and health outcomes.

Keywords: Medication Errors; Patient Safety; Hospital; Adverse Drug Events; Clinical Pharmacist; Medication Management; Error Prevention; Medication Reconciliation; Healthcare Quality; Drug Safety

1. Introduction

Medication mistakes are a significant public health problem and one of the most common preventable causes of patient damage in health care systems around the world . A medication error is defined by the National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) as "a preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient or consumer. Errors can happen at any stage of the medication-use process, including prescription, transcribing, dispensing, administration, and monitoring of drugs. Medication errors can come from human factors, communication breakdowns, system faults, inadequate training, or organizational problems [1,2].

Medication safety is a crucial component of patient safety and the provision of quality healthcare. Giving the right patient the right medication at the proper dose, route and time is crucial to attaining optimal therapeutic outcomes. Good medicine safety measures serve to prevent adverse drug events, improve treatment effectiveness, increase patient satisfaction and save healthcare costs. Globally, healthcare organizations have progressively sought to prevent pharmaceutical related damage by adopting safety procedures, introducing computerized prescribing systems, and promoting interdisciplinary teamwork[3,4].

Although there has been progress in healthcare technology and patient safety programs, the worldwide impact of drug errors is still enormous. The World Health Organization (WHO) estimates that medication-related damage is one of the leading causes of morbidity and mortality worldwide and that it costs USD 42 billion a year globally. WHO launched “Medication Without Harm” to reduce severe preventable medication-related harm by 50% globally. Medication errors are common in both developed and developing nations, studies have shown, particularly in high-risk environments such as intensive care units, emergency departments, pediatric wards and oncology units[5,6].

Medication mistakes can have major effects for patients and health care systems. Clinical consequences might range from transient discomfort and treatment failure to severe adverse medication reactions, protracted hospitalizations, permanent disabilities, and death. In addition, drug errors are a major contributor to higher healthcare expenses due to additional diagnostic procedures, length of hospital stay, increased resource consumption, and legal liability. Medication mistakes carry a heavy economic and clinical burden, underscoring the significance of robust prevention, detection, reporting and management techniques within hospitals. Therefore, knowing the causes and effects of medication errors is important to create strategies to improve medication safety and patient outcomes[7,8].

2. Use of Medications in the Hospital

The hospital medication-use procedure is a complicated multidisciplinary system to guarantee that pharmaceuticals are used safely and effectively. It comprises of five interrelated stages: prescription, transcribing, dispensing, administration and monitoring. Errors can occur at any level in this process and can lead to adverse medication events, treatment failure, increased health care expenses, and injury to the patient. It is important to understand each and every stage in order to identify potential sources of medication errors and to take suitable preventive measures[9,10].

2.1 Prescribing

Prescribing is the first phase of the drug-use process that entails selecting an appropriate pharmaceutical regimen for the patient’s clinical state, age, comorbidities, allergies, and current medications. The physician must determine the appropriate medicine, dose, method, frequency and duration of therapy. Prescribing errors are one of the most common types of medication errors, which can include wrong drug selection, dose errors, illegible handwriting, failure to consider drug interactions, and failure to include vital information. The introduction of computerized physician order entry (CPOE) systems and clinical decision support tools has greatly decreased prescribing errors and increased patient safety[11,12,13].

2.2 Transcribing

Transcribing refers to the process of moving pharmaceutical orders from the doctor to drug administration records or pharmacy information systems. Historically, transcription was done by hand copying of physician prescriptions, which led to misinterpretation, omission, duplication, and communication issues. Despite the implementation of electronic prescription systems that have minimized transcription errors, errors can still occur with improper data entry, software faults, or missing documentation. Accurate transcribing is crucial for continuation of care and for correct communication of prescription orders between health care practitioners[10,13].

2.3 Dispensing

Dispensing is the process of reviewing, preparing, packaging, labeling and distribution of the pharmaceuticals as per the recommended order by the pharmacist. Pharmacists are essential during this step to ensure the appropriateness of the medication, detect any drug interactions, confirm dosage accuracy, and comply with institutional protocols. problems in dispensing can include selecting the wrong medication, incorrect dosage strength, labeling problems and preparation issues. Automated dispensing cabinets, barcode verification systems and pharmacist-directed medication review programs have been demonstrated to reduce drug dispensing errors in the hospital context[14,15].

2.4 Administration

Drug administration is the act of providing the prescribed drug to the patient by the planned route and at the proper time. This stage is mostly the responsibility of nurses who need to observe the “rights” of drug administration, which include the right patient, right medication, right dose, right route, right time, right documentation, right cause, and right response. One of the most commonly reported kinds of pharmaceutical errors is administration errors which may include missed doses, poor administration method, timing issues and administration of the wrong prescription. Strategies to reduce administration errors include barcode drug administration systems, double-check protocols, and continual staff education[16,19].

2.5 Monitoring

Monitoring is the final stage in the medication-use process and includes the assessment of the patient’s response to therapy, adverse drug responses, therapeutic outcomes and necessary treatment modifications. Effective monitoring needs teamwork between physicians, nurses, pharmacists and patients. Not monitoring laboratory indicators, drug concentrations or clinical responses might lead to delayed discovery of adverse events and therapeutic failure. Continuous monitoring allows healthcare professionals to optimize pharmaceutical administration, improve treatment effectiveness and promote patient safety[17,18].

3. Classification of Medication Mistakes

Medication errors can happen at any moment of the medication-use process and are often categorized based on the point in the process at which the error took place. Understanding these categories is vital to detect system vulnerabilities and to apply particular preventive measures. The classification of medication errors is useful for reporting, analysing and developing measures to improve patient safety in health care settings[2].

3.1 Prescribing Errors

Errors in prescribing occur during the process of making the decision to select and order the therapy. These errors can be wrong drug selection, wrong amount, wrong route, wrong time, not taking into account contraindications, allergies, drug interactions and patient-specific characteristics (age, renal function). Prescribing errors are one of the most often reported drug errors and can have a major impact on patient outcomes if not detected early[11,13].

3.2 Dispensing mistakes

Dispensing errors happen in the making and giving out of drugs by pharmacists or pharmacy staff. Common instances are inappropriate drug, wrong dosage strength, labelling errors, preparation faults . Major contributing causes include look-alike packaging, similar drug names and workload pressures and disruptions within the pharmacy setting. Pharmacist verification and automated dispensing technologies are important to reduce these errors[4,15].

3.3 Administration Errors

Administration errors arise when medications are provided to patients inappropriately. These can be inappropriate dose, wrong patient, wrong route, wrong timing, omission of doses or incorrect delivery practices. Errors are commonly tied to communication breakdowns, limited staffing, diversions, and poor adherence to prescription administration standards. Administration errors are one of the more frequent types of pharmaceutical errors in hospitals[16,19].

3.4 Documentation Errors

Documentation errors include incomplete, inaccurate, illegible or missing medication records. Examples include failing to document administered prescriptions, transcribing errors, duplicate documentation, and incorrect medication histories . Such errors can interfere with communication between health care providers and raise the chances of future medication-related events. Therefore, accurate and timely documentation is important for ensuring continuity of treatment and patient safety[18].

3.5 Monitoring Errors

A monitoring error is defined as a failure of health care personnel to properly monitor treatment results, test data, adverse drug reactions or patient responses after medication administration. Poor monitoring may cause delay in the recognition of treatment failure or harm due to medications and may lead to major problems. Medication therapy should be regularly reviewed and the patient should be continually assessed to avoid monitoring errors[17].

4. Epidemiology and Incidence of Medication Error

Medication mistakes are a major concern in health care systems globally. Their occurrence varies depending on the health care settings, patient populations, reporting systems and techniques of mistake detection . Medication mistakes are a major cause of unnecessary morbidity and healthcare costs, despite efforts to improve patient safety[5,6].

4.1 World Statistics

Globally, drug errors and medicine-related injury cost the world economy some US\$42 billion a year, according to the World Health Organization. Medication errors are experienced by millions of patients each year in a variety of health care systems, and the majority of reported cases include prescribing and administration errors. Many errors do little harm yet a significant number contribute to adverse medication events, extended hospitalization and higher death[5,6].

4.2 Indian Scenario

Medication mistakes are coming to the fore as a patient safety concern in India. Factors contributing to medication related mishaps include high patient load, insufficient healthcare resources, inadequate reporting mechanisms, communication difficulties and personnel shortages. Medication errors have been recorded at all phases of the medication-use process. Studies conducted at tertiary care institutions in India have revealed prescribing and administration errors as the most commonly seen. Over recent years, enhanced awareness, the engagement of clinical pharmacists and the implementation of pharmaceutical safety programs have helped to increase detection and prevention efforts [20].

4.3 High Risk Hospital Departments

Some hospital departments are particularly vulnerable to medication errors due to the complexity of patient care and the usage of high-risk drugs. Critically sick patients, frequent drug changes and polypharmacy contribute to greater mistake rates in Intensive Care Units (ICUs). Errors happen in emergency departments due of the time-sensitive nature of decision making, overcrowding and insufficient patient information. Pediatric units have specific issues with weight-based dose calculations, while cancer departments entail the delivery of sophisticated chemotherapy regimens with restricted therapeutic indices. So these departments need more monitoring, dedicated protocols and teamwork to reduce pharmaceutical hazards[9,17].

5. Causes and Risk Factors

The likelihood of errors occurring during the medication-use process is increased by the interaction of human, system, and patient related factors that cause pharmaceutical errors.

5.1 Human factor

Fatigue, heavy workloads, lack of understanding and poor communication between health care providers contribute considerably to prescription errors. Decision-making is affected by stress and long hours, and errors are more likely[24].

5.2 System Related Factor

Common system-related causes of medication errors include poor handwriting, look-alike sound-alike (LASA) drug names, insufficient staffing, and lack of defined practices. Implementation of electronic technologies can help to mitigate these hazards [11,13].

5.3 Patient Related Factors

Polypharmacy, various comorbidities and age extremes (pediatric and geriatric populations) make drug management hard and increase the risk of medication errors [17].

6. Medication Mistakes Are Common in Hospital Environments.

Common pharmaceutical errors include administration of the wrong drug, wrong dose, wrong patient, improper route, wrong time, and omission of authorized doses. These errors can occur at any stage of the pharmaceutical usage process and can place patient safety at risk [4,19].

7. Clinical and Budgetary Impact

Medication errors can lead to adverse drug events (ADEs), increased morbidity and death, increased length of hospital stay and large cost burden on healthcare systems. Medication-related damage that is preventable causes more healthcare use and treatment expenses [7,18].

8. Reporting and Identification of Medication Errors

Early detection and reporting are critical to improve medication safety. Voluntary reporting systems, incident reporting programs, trigger tools and pharmacovigilance activities assist in the identification of medication-related occurrences, analysis of fundamental causes, and prevention of recurrence[5,18].

9. Prevention Strategies

To reduce pharmaceutical errors, a multidisciplinary strategy including technology, healthcare professional interventions, and organizational support is needed.

9.1 Technological Interventions

Technologies like Computerized Physician Order Entry (CPOE), Electronic Health Records (EHR), Barcode Medication Administration (BCMA), and Clinical Decision Support Systems (CDSS) assist in reducing errors in prescribing, dispensing and administration by enhancing accuracy and communication [12].

9.2 Health Care Professional Interventions

Pharmaceutical reconciliation, active involvement of clinical pharmacists, constant education of personnel and independent double-checking protocols are important factors in avoidance of pharmaceutical errors and patient safety improvement [21,23].

9.3 Strategies of Organization

Healthcare institutions promote safer drug practices through standard treatment standards, a strong safety culture, robust error-reporting systems and continual quality improvement programs [22].

10. Managing Medication Errors

Good management is to respond promptly to the error, analyze and monitor patient, document properly, conduct root cause analysis (RCA), and apply corrective and preventative actions (CAPA) to prevent recurrence [18,22].

11. Role of Clinical Pharmacists in Preventing Medication Errors

Clinical pharmacists play a vital role in medication evaluation, ward rounds, counseling, monitoring of adverse drug reactions and reconciliation. It has been established that their involvement reduces medication-related difficulties and improves therapeutic outcomes [21,23].

12. Recent Advances and Future Perspectives

New technologies such as artificial intelligence, smart infusion pumps, predictive analytics and telepharmacy are changing the landscape of medication safety by enhancing error detection, clinical decision making and access to pharmaceutical treatment [12,17].

13. Challenges and Barriers

Although significant progress has been made in drug safety, the effective prevention and management of pharmaceutical mistakes in healthcare settings continue to be challenged by underreporting, resource limitations, resistance to technology adoption and lack of knowledge [10,22].

14. Conclusion

Medication mistakes continue to plague hospitals and cause preventable human suffering worldwide. Medication errors can occur during prescription, transcribing, dispensing, administration, and monitoring. Their causes include human errors, system flaws, and patient complexity. Medication errors cause higher morbidity, death, hospital stays, and healthcare system costs.

A multidisciplinary strategy involving healthcare professionals, patients, and organizations is needed to prevent and manage pharmaceutical errors. Computerized physician prescription entry, electronic health records, barcode medicine administration, and clinical decision support systems have greatly enhanced pharmaceutical safety. Minimizing drug risks requires clinical pharmacist participation, medication reconciliation systems, staff education, and a strong safety culture.

Reducing pharmaceutical errors requires timely discovery, accurate reporting, detailed root cause analysis, and corrective and preventive interventions. Artificial intelligence, predictive analytics, smart infusion systems, and telepharmacy may improve pharmaceutical safety in the future. Drug safety and a non-punitive error-reporting culture can improve patient outcomes, healthcare quality, and hospital drug use.

References

1. National Coordinating Council for Medication Error Reporting and Prevention. About medication errors [Internet]. Rockville (MD): NCC MERP; 2024.

2. Aronson JK. Medication errors: definitions and classification. *Br J Clin Pharmacol*. 2009;67(6):599-604.
3. Kohn LT, Corrigan JM, Donaldson MS, editors. *To Err is Human: Building a Safer Health System*. Washington (DC): National Academy Press; 2000.
4. Cohen MR. *Medication Errors*. 2nd ed. Washington (DC): American Pharmacists Association; 2007.
5. World Health Organization. *Medication Without Harm: Global Patient Safety Challenge on Medication Safety*. Geneva: WHO; 2017.
6. Assiri GA, Shebl NA, Mahmoud MA, Aloudah N, Grant E, Aljadhey H, et al. What is the epidemiology of medication errors, error-related adverse events and risk factors for errors in adults managed in community care contexts? *BMC Health Serv Res*. 2018;18(1):645.
7. Bates DW, Boyle DL, Vander Vliet MB, Schneider J, Leape LL. Relationship between medication errors and adverse drug events. *J Gen Intern Med*. 1995;10(4):199-205.
8. Keers RN, Williams SD, Cooke J, Ashcroft DM. Causes of medication administration errors in hospitals: a systematic review. *Drug Saf*. 2013;36(11):1045-67.
9. Aspden P, Wolcott JA, Bootman JL, Cronenwett LR. *Preventing Medication Errors*. Washington (DC): National Academies Press; 2007.
10. Hughes RG, editor. *Patient Safety and Quality: An Evidence-Based Handbook for Nurses*. Rockville (MD): Agency for Healthcare Research and Quality; 2008.
11. Aronson JK. Medication errors: what they are, how they happen, and how to avoid them. *QJM*. 2009;102(8):513-21.
12. Bates DW, Gawande AA. Improving safety with information technology. *N Engl J Med*. 2003;348(25):2526-34.
13. Velo GP, Minuz P. Medication errors: prescribing faults and prescription errors. *Br J Clin Pharmacol*. 2009;67(6):624-8.
14. Shane R. Current status of administration of medicines. *Am J Health Syst Pharm*. 2009;66(5 Suppl 3):S42-S48.
15. Flynn EA, Barker KN, Gibson JT, Pearson RE, Smith LA, Berger BA. Impact of interruptions and distractions on dispensing errors. *Am J Health Syst Pharm*. 1999;56(13):1319-25.
16. Elliott M, Liu Y. The nine rights of medication administration. *Nursing Management*. 2010;17(10):300-5.
17. Dipiro JT, Yee GC, Posey LM, Haines ST, Nolin TD, Ellingrod VL. *Pharmacotherapy: A Pathophysiologic Approach*. 12th ed. New York: McGraw-Hill Education; 2023.
18. Nebeker JR, Barach P, Samore MH. Clarifying adverse drug events: a clinician's guide to terminology, documentation and reporting. *Ann Intern Med*. 2004;140(10):795-801.

19. Keers RN, Williams SD, Cooke J, Ashcroft DM. Prevalence and nature of medication administration errors in healthcare settings: a systematic review. *Drug Saf.* 2013;36(11):1045-67.
20. Agrawal P, Sachan A, Singla RK. Medication errors in India: a systematic review of prevalence and contributing factors. *Int J Clin Pharm.* 2021;43(5):1167-1178.
21. Bond CA, Raehl CL. Clinical pharmacy services, pharmacy staffing, and hospital mortality rates. *Pharmacotherapy.* 2007;27(4):481-93.
22. Institute for Healthcare Improvement. Patient Safety Essentials Toolkit. Boston: IHI; 2020.
23. Kaboli PJ, Hoth AB, McClimon BJ, Schnipper JL. Clinical pharmacists and inpatient medical care: a systematic review. *Arch Intern Med.* 2006;166(9):955-64.
24. Westbrook JI, Woods A, Rob MI, Dunsmuir WT, Day RO. Association of interruptions with increased risk of medication administration errors. *Arch Intern Med.* 2010;170(8):683-90.