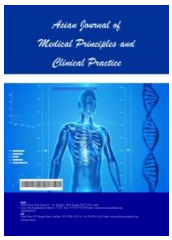

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Clinical Pharmacist's Role in Medication Error Detection and Management

K. K. Sharma [a*#], Arinjay Jain [b≡], Shubham Singh Tyagi [c], Yash Goel [d], Sebu [d] and Piyush Mittal [bφ]

[a] Department of Pharmacology, Teerthanker Mahaveer College of Pharmacy, Teerthanker Mahaveer University, Delhi Road, Nh 24, Bagadpur Moradabad, Uttar Pradesh, 244001, India.
[b] Teerthanker Mahaveer College of Pharmacy, Teerthanker Mahaveer University, Delhi Road, NH 24, Bagadpur, Uttar Pradesh, 244001, India.
[c] Drug Safety Associate I, Parexel International, United States.
[d] TMU, College of Pharmacy, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Medication errors (MEs) are a significant issue that can jeopardize treatment quality and patient safety while also instilling distrust in the system, organization, and experts' work. MEs are a complicated problem. They can arise at any point throughout the medication development process and are linked to a variety of healthcare professionals. Medication errors are a serious medical problem. However, the language connected with these beliefs may be puzzling even at the most basic level, and the influence on individuals and communities is sometimes understated.

When an error is detected, patients want immediate disclosure, in-person disclosure, an apology, and a discussion of steps to prevent future problems. Learning more about drug mistakes may help health care workers give their patients with safer therapy.

Keywords: Medication Error (M.E.); patient safety; clinical pharmacist.

[#] Associate Professor;
[≡] Assistant Professor;
[φ] Professor and Head;
**Corresponding author: E-mail: drkk108@gmail.com, krishanas.pharmacy@tmu.ac.in;*

1. INTRODUCTION

Today, the president of the United States, federal and state legislators, the insurance sector, pharmaceutical firms, health care providers, and patients all agree on the need of decreasing prescription mistakes and enhancing patient safety. Clinical pharmacologists, on the other hand, are well aware of this. Improving medication judiciousness and reducing adverse drug responses have long been important topics of research and study for individuals working in clinical pharmacology.

However, in addition to the earlier concepts of adverse drug reactions and rational treatments, the newly politically acceptable word pharmaceutical error has evolved. Because of the emphasis on the word "error," attention has shifted to "prevention" and what can be done to eliminate mistakes and enhance patient care.

Medication errors (MEs) are a serious problem which can jeopardize treatment quality and patient safety while also instilling distrust in the system, organization, and experts' work. MEs are a complicated problem. They can arise at any point throughout the medication development process and are linked to a variety of healthcare professionals. That most of MEs go unreported is a serious source of concern. [1, 2, 3] When it comes to the number of years of healthy life that have been lost, the global effect of medication-related adverse events is roughly double that of high-income nations in middle-income countries. Every day, at least one person is killed by a medication error, which affects roughly 1.3 million people in the United States of America [3].

Medication mistakes are a significant clinical problem. But, at even the most basic level, the nomenclature used to describe these mistakes may be confusing, and the impact on individuals and communities is frequently overlooked. This article gives a general overview of medication errors for general practitioners, with a focus on medication error nomenclature and definitions, (1) prevalence, (2) adverse outcomes, (3) prevention measures, and (4) disclosure and (5) legal ramifications.

2. MEDICATION ERROR (M.E.)

In health care, there is a fallacy that human error can be completely eliminated: "Errors are an unavoidable result of human performance."What are they? What causes them? How should they be reported? How can you prevent them?

“A medication error(M.E.) is defined as any preventable incident that may cause or contribute to insufficient medicine usage or patient suffering when the drug is under the supervision of a health care provider or the patient” [4].

A medication error(M.E.), according to Bates et al5, is defined as "any error that occurs throughout the medication usage process" and focuses on problems with drug administration to patients.

3. TYPES OF M. E.

Relevant characteristics, such as stage of occurrence, can be used to categorize errors. Medication errors(M.E.) can therefore be categorized in compliance with the medication usage technique.

3.1 Prescribing Errors

The improper medication dosing regimen, dose, dosage form, amount, mode of administration, concentration, rate of administration, or use instructions of a medicinal product prescribed or licensed by a physician, as well as illegible prescriptions or medicine orders that result in blunders.

3.2 Transcription Errors

Any modification from the preceding stage in transcribing medicine orders (Order on the order sheet, remark from the administration nurse, and/or order documentation in the pharmacy database).

3.3 Dispensing Errors

Any unexpected divergence from an interpretable written prescription or medication order, involving contents and labelling problems, as well as any unwanted deviation from professional or regulatory standards or norms that impact dispensing operations, is classified as a dispensing mistake.

3.4 Administration Errors

Any variation from medication regimen that has been prescribed as printed on the patient's errors chat, preparation/administration instructions, or related institutional rules.

3.5 Monitoring Errors

Not succeeding to check a prescribed regimen for suitability and identify issues, or failure to use relevant clinical or laboratory data to assess patient response to prescribed medicine.

4. WHEN CAN A MEDICATION ERROR OCCURS

In deciding/selecting the medication and dose regimen to administer (medication error(M.E.), inadequate, and inefficient prescribing, under prescribing, overprescribing).

Drafting the prescription (prescription errors) — Illegible symbols, incorrect frequencies, and incorrect dosage.

Incorrect transcription of doctor's spoken directives.

Forming the formulation (incorrect strength, pollutants or adulterants, and incorrect or deceptive packaging).

The formulation is dispensed (Wrong dose, Wrong formulation, Physically preparing Medication incorrectly, Wrong label).

Taking or administering the medication (Wrong dose, Wrong route, Wrong frequency, Wrong duration).

Therapy monitoring (failing to alter therapy when required).

5. ILLEGIBLE HANDWRITING

Illegible writing has been a problem for nurses and pharmacists for decades. Physicians are generally busy and often make notes instructions that are illegible, which frequently leads in serious drug errors. Taking shortcuts when drafting medicine orders is a recipe for disaster. When a doctor or pharmacist has been unable to read an order, they must make the best estimate possible. Because if the medicine is required in an emergency, the patient is put at a higher risk. In order to avoid such mistakes, most hospitals establish rules that clinicians and pharmacies must follow. If the drug order is unreadable, the physician must be called and instructed to correctly repeat the order. “Never leave it up to the doctor or pharmacist to figure out what drug or dose you're on. Because poor writing by practitioners has become such a severe issue, the Institute of Good Medicines Practices has advocated for the complete elimination of handwriting orders and prescriptions. This issue has been alleviated by the adoption of computerized records in which everything is written, and terrible writing is no longer a concern; however, errors can still occur if the wrong medicine, dose, or frequency is written” [6,7].

6. ADVERSE DRUG REACTION

An adverse medication reaction is defined by the World Health Organization as " any unpleasant, unexpected, or unwanted response that occurs at levels commonly used in humans for disease prevention, diagnosis, treatment, or physiological function modification." Adverse drug responses are unavoidable undesirable effects that are inherent in the pharmacologic action of the medicine and are not always preventable, although medication mistakes. [8,9]

7. ADVERSE DRUG EVENT

An adverse drug event is a harm caused by a medicine, such as a missing or incorrectly dosed prescription. A patient suffers morbidity or death as a result of an adverse medication occurrence. An adverse drug response varies from a medication adverse event in that an adverse drug event happens when a patient is exposed to a medicine that has an unanticipated undesirable side effect. In the instance of adverse drug events, the patient gets a poor outcome as a result of not getting a drug the way it was supposed to be gotten, not getting a medicine that was needed, or getting the medication in an inappropriate way, such as too high or low a dose. [10,11]

8. MEDICATION MISADVENTURE

“A medicine misadventure is an iatrogenic event that occurs as a result of pharmacological therapy. Pharmaceutical errors, negative drug reactions, and adverse drug events are all forms of medication misadventure. It is caused by an omission or commission in the administration of medicine. Medication errors are frequently undesirable and unexpected; they can be caused by human or system error, idiosyncratic or immunologic reaction, and they can be caused by underlying disease or not” [12,13].

9. SENTINEL EVENT

A sentinel event is defined by the Joint Commission as "an unexpected incidence

involving death or serious physical or psychological impairment, or the threat of such injury". The loss of a limb or a function is considered a serious injury. Any process adjustment that increases the chance of a significant negative outcome is referred to as 'or the danger thereof." Pharmaceutical mistakes, adverse drug events, and medication mishaps are examples of sentinel occurrences. Sentinel events result in high morbidity or death and may be prevented. [14, 15]

10. CAUSE OF M.E.

10.1 Expired Product

It frequently occurs as a result of poor preparation storing, which leads to spoilage or the usage of outdated ingredients.

10.2 Incorrect Duration

When medicine is given for a longer or shorter amount of time than prescribed, this is known as a duration mistake.

10.3 Incorrect Preparation

During compounding or other forms of preparation prior to final administration, this error is most typically committed. One example is using the incorrect diluent to reconstitute.

10.4 Incorrect Strength

During the medication process, incorrect strength might occur at any time. When identical bottles or syringes with the wrong strength are used, it typically occurs as a consequence of human error.

10.5 Incorrect Rate

It is most common with drugs administered by IV push or infusion. This is very harmful with many medicines and can lead to serious adverse drug responses. Tachycardia caused by fast IV epinephrine delivery or red man syndrome caused by rapid vancomycin injection are two examples.

10.6 Incorrect Timing

It is difficult to be totally precise with planned dosages in both home and institutional settings. Some drugs' absorption is dramatically affected when taken with or without meals, which is cause for worry. As a result, it is critical to stick to prescribed timings as failing to do so may result in under or overdose.

10.7 Incorrect Dose

This error involves overdosing, underdosing, and administering an excess dosage. An improper dosage happens when an unsuitable or different pharmaceutical dose than what was authorised is administered, errors of omission occur when a planned dose of medication is not administered, and a drug is administered via an incorrect route. Errors caused by wrong routes are typically caused by illegible labelling or tubing that is adaptable to numerous connectors/lines of access. Incorrect routes can cause considerable morbidity and mortality.

10.8 Incorrect Dosage Form

This happens when a patient receives a dosage form other than what was prescribed, such as immediate-release instead of extended-release.

10.9 Incorrect Patient Action

This happens when a patient takes a medicine wrongly. Patients must be informed if this type of error is to be avoided.

10.10 Known Allergen

Failure to interact with the patient, insufficient record review, insufficient paperwork, or a lack of technology interface are all typical causes for administering an allergic drug.

10.11 Known Contraindication

When drugs are not thoroughly assessed for drug-drug, drug-disease, or drug-nutrient interactions, this can happen.

10.12 Distractions

Medication errors are frequently caused by distraction. This component has been attributed for roughly 75% of medication errors. In addition to assessing patients, ordering laboratory and imaging procedures, meeting with consultants, rounding on their patients, speaking with patient family members, and conversing with insurance carriers, physicians are routinely required to write medicine orders and prescriptions.
Unscheduled events in a healthcare provider's life, such as continual pages, meeting attendance, and phone calls, are what block

patient treatment. Many doctors are unaware that these distractions are a problem, although they are frequently the source of medication errors [16].

10.13 Distortions

Medication errors are frequently caused by distortions. The majority of distortions are the result of a poor writing, misinterpreted symbols, abbreviations, or inaccurate translation. Many healthcare practitioners in the United States are from other countries, and they routinely issue prescriptions for pharmaceuticals that are not even accessible in the nation. When a practitioner has a doubt regarding a substance, he or she will commonly ask the nurse or pharmacist to replace a comparable drug for the recommended medication. Since neither the non-prescribing doctor nor the pharmacists can replace a drug, this type of distortion might pose major complications. Every hospital pharmacy has a prescription formulary on hand, and doctors should be aware of what's available and purchase exclusively from it.

10.14 Use of Abbreviations

Abbreviations are a major source of medication errors. Suffixes such as QD, OS, TID, QID, PR, and so on are widely used to shorten the administrative path. The terms QD (once a day) and QID (once in a while) are commonly used interchangeably (four times a day). Furthermore, these acronyms might have numerous meanings and be understood incorrectly. It is suggested that no abbreviations be used when drafting medicine orders [17].

10.15 Remain Alert for High-risk Medications

Only administer warfarin for four weeks at a time if a patient needs it for deep vein thrombosis or a prosthetic heart valve, for example, and follow up with the patient after each session. Warfarin should only be used for a few months at a time. The INR of the patient should be monitored, and the dose may need to be adjusted [18].

Fig. 1. Types of medication errors

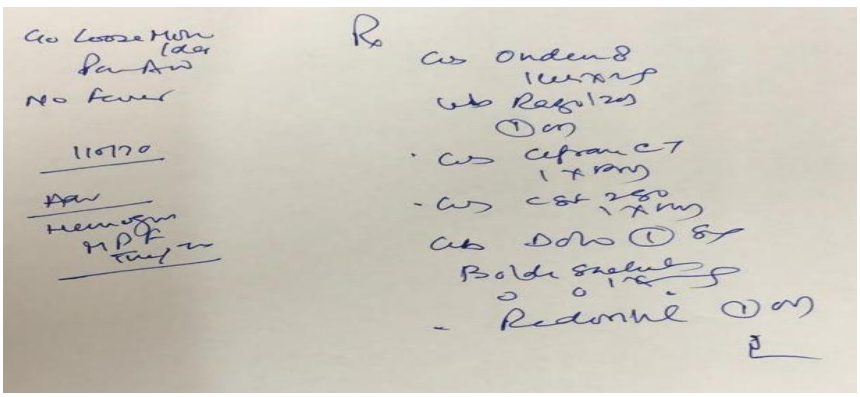

Fig. 2. Poor handwriting

Fig. 3. Polypharmacy

Fig. 4. Interpersonal factors such as stress

Table 1. Incidence and harm from medication errors

Product	Type of error	Details	Action
BCG vaccine	Route of administration and dose	Intramuscular instead of intradermal administration; 10 times the recommended dose given because BCG vaccine contains 10 doses in one bottle	Letter to physician
Methyl ergometrine	Wrong patient	Drug prescribed for the mother but given to the neonates because of the use of one prescription sheet for the mother and neonate	Letter from ministry of health to all gynecologist and all maternity hospitals in the country
Corticosteroid	Wrong indication	Drug given for weight pain	Letter to the pharmacist
Cyproheptadine	Wrong indication	Drug given as appetite stimulant	Letter to the pharmacist
Dontomycin	Erroneous publicity	Prescribed as an analgesic instead of antibiotics	Letter to the manufacturer
Rinomycin	Lack of specific warning	No warning for people with hypertension due to phenylephrine	Modification of the SPC
Indomethacin calcium pentahydrate	Erroneous publicity	Prescribed as a coxib instead of NSAID	Letter to the manufacturer
Flucloxacillin injectable	Wrong dilution	Lack of information on dilution in the SPC; sterile water for injection, not included in the drug package	Modification of the SPC

Fig. 5. Challenging patient populations

Fig. 6. Lack of follow-up

Table 2. Medication errors and risk factors

Risk Factors for Medication Errors	Avoiding Medication Errors	5 r's to Prevent Me	Additional 5 r's for Health Workers
Illegible handwriting. Staff with little or no experience. Challenging patient populations. Polypharmacy. Inadequate follow-up. Inadequate monitoring. Lack of policy enforcement Medically complex patients Medications that need calculations Environmental factors a lack of communication Verbal orders Stress and other interpersonal variables	Many adverse medication reactions are avoidable, as they are frequently caused by human error. Common causes of error related to the pharmacists include failure to: Ensure that the right dose is given. Determine whether or not medication treatment is contraindicated. Determine if you have a medication allergy. Keep an eye on medications with low therapeutic indices. Recognize the presence of a pharmacological interaction. Recognize knowledge deficits These errors are frequently avoided by chatting with the patient and double-checking their understanding of the dose, drug allergies, and any other drugs they may be taking. It's tough to analyze medication interactions since it's difficult to reach prescribers, there's confusing verbal and written instructions, and there's a lack of time. [19]	Correct medication Correct route Correct time Correct dose Correct patient	The medicine was prescribed for the right reason. Correct documentation is required. Right to refuse medication Correct monitoring and assessment

Fig. 7. In-depth patient interview and counselling

11. ROLE OF CLINICAL PHARMACIST

The clinical pharmacy has massively enhanced its professional capabilities during the last few years. In today's interdisciplinary health-care system, clinical pharmacy has become more generally recognized as a vital profession. Clinical pharmacists become valuable members of the healthcare team and assist patient care by collaborating with physicians and patients. Clinical Pharmacists are in charge of conducting an in-depth patient interview that includes questions regarding the patient's medical history, social and family history, allergy history, over-the-counter drug usage, dietary supplement use, and alternative medicine use [20].

Drug treatment evaluations are conducted by clinical pharmacists to detect and rectify Duplication of therapeutic interventions, drug–drug and drug–food interactions, incorrect dose [frequency, strength], contraindications, lack of basic lab monitoring requirements, possible adverse medication reactions (ADRs), inappropriate drug selection, and drug therapy are all drug-related concerns [20].

They actively participate in medical professional rotations in general and specialty departments. They advise patients on how to take medications, how to use gadgets, and how to make necessary lifestyle adjustments. Clinical pharmacists supplied advice on everything from drug monitoring to quitting and starting new prescriptions, as well as any difficulties that were detected. Physicians approved of approximately 90% of pharmacist interventions [21].

12. CONCLUSION

Medication errors(M.E.) is a major source of morbidity and mortality, yet it is a perplexing and underestimated notion. A medication error is defined as any mistake that happens during the medicine administration procedure. According to the IOM, mediation errors are responsible for one death for every 131 outpatients and one death for every 854 inpatients. Medication errors can be caused by a wide variety of variables, including meds factors (for example, identical words, low therapeutic index), patient - related factors (for e.g., poor renal or hepatic function, impaired cognition, polypharmacy), and medical provider factors (for example, poor renal or hepatic function, impaired cognition, polypharmacy), and healthcare practitioner factors (for example, use of abbreviations, cognitive biases).

Physicians who commit pharmaceutical errors face a variety of penalties, including loss of patient trust, civil cases, criminal accusations, and medical board discipline. Approaches for preventing pharmaceutical errors (such as the use of information systems, enhanced drug labelling, and treatment adherence) have all been explored, with varied levels of effectiveness. Most patients desire rapid communication, in-person notification, an apology, and efforts to prevent future errors when an error is detected.

High-risk medicines, such as heparin, coumarin anticoagulants, and insulin, need careful consideration when prescribed, delivered, and administered, as well as thorough follow-up following treatment. Updating these medications' procedures and utilizing preprinted prescription forms can help prevent mistakes. Writing medicine orders in the chart, dispensing prescriptions, and giving medications are not the moments to take phone calls, answer to pages, or make small conversation with coworkers;

these are the times to focus on what you are doing.

Medication errors are common on hospital wards. The actions of clinical pharmacists can successfully avoid these mistakes. The types of mistakes results indicate the importance of ongoing education and the deployment of clinical pharmacist treatments. To minimize the incidence of medication mistakes, we propose that clinical pharmacists teach other members of the health care team on drug therapy processes.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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