

# Clinical pharmacist's role in identification and management of medication errors in different wards of a hospital in Karachi

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## A B S T R A C T

**Introduction:** Medication errors are a frequent issue within healthcare facilities. The ratio of patients who suffer harm due to these errors, in contrast to those who do not, is a concerning 100:1. The research aimed to ascertain the prevalence and categories of medication errors, as well as the function of pharmacists in identifying and addressing these errors across different wards of a private tertiary care facility located in Karachi, Pakistan.

**Methodology:** A cross-sectional case study, conducted in a private hospital in Karachi and including 200 patients, was assumed to explore drug therapy errors and evaluate the pharmacist's contribution to their detection.

**Results:** Through the meticulous efforts of clinical pharmacists, an extensive assessment encompassing 200 patients was conducted with a gender distribution of 110 females (55%) and 90 males (45%). Within this cohort, a cumulative total of 250 errors (averaging 1.25 per patient) were detected and appropriately addressed. The observed frequencies of error categories were as follows: above therapeutic dose (2.8%), sub-therapeutic dose (3.2%), dose adjustment (30%), drug-drug/drug-food interaction (3.6%), duplication of drug class (4.0%), dose Rounded off (3.6%), intravenous to per oral switch (3.2%), incomplete drug order (4.8%), transcribing error (4.8%), wrong medication (22%), wrong frequency (8%), wrong route (3.6%), wrong dilution/incompatibility (3.6%), wrong infusion rate (1.6%), and miscellaneous (1.2%).

**Conclusion** This research highlighted the pervasive problem of medication errors and highlighted the critical role clinical pharmacists played in identifying and correcting errors to improve patient safety and streamline healthcare procedures.

**Keywords:** Medication error, Category of medication error, Clinical pharmacists, Intervention.

## Introduction

Globally, medication errors pose a widespread challenge. A recent study estimated a staggering 237 million incidents of Medication Errors (MEs) in the past year within the primary and secondary care settings of the UK, incurring a cost of £98 million to the National Health Service.<sup>1</sup> Research indicates a threefold higher incidence of MEs in the pediatric population (1.1%) compared to adults (0.35%), emphasizing the need for heightened.<sup>2</sup> Pediatric medication prescriptions, often based on precise

dosage calculations related to body weight or surface area, are susceptible to confusion and errors, especially when dealing with multiple dosage forms and strengths. Additionally, the incomplete development of metabolic and elimination functions in premature infants up to the age of six months increases the risk of errors or toxicity in this vulnerable patient group.<sup>3</sup> Clinical pharmacists are the most reliable source of medication-related information in hospital settings.<sup>4</sup> Pharmacists now play a variety of roles,

ranging from clinical practice to patient outcomes, patient counseling, national healthcare education, and community involvement. All prescriptions should be examined before distribution by pharmacists, according to a recommendation by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO).

The recommendation emphasizes the need for recording the consequences of the pharmacy's direct patient care. Any unnecessary event may trigger or lead to improper pharmaceutical use or patient injury when the drug is within the control of healthcare professionals, patients, or users.<sup>5-7</sup> Professional practice, healthcare goods, methods, and systems, such as prescription, order interaction, product labeling, packaging, nomenclature, compounding, dispensing, delivery, administration, education, supervising, and use, may all be influenced by such circumstances.<sup>8,9</sup> The pharmacist should intervene to identify these issues so that remedial measures may be taken, or medicine therapy may be tailored to the patient's needs. The forms of this intervention have evolved over the course of time, and range from the most basic handwritten form to digital libraries.<sup>10</sup>

Moreover, by educating medical professionals about these issues, many of them can be avoided. Medical practitioners anticipate that pharmacists and pharmacies will have a variety of duties, including managing repeat prescription services, assessing medications for chronic users, dispensation as per standards, providing management advice for common illnesses, and taking part in regional and national health promotion or disease prevention initiatives.<sup>11</sup>

For a pharmacist to be able to defend their services to patients, hospital administration, practitioners, and client caregivers, as well as to advance their profession and community as a whole, they must document their actions. These therapeutic actions are taken by pharmacists not only to affect patient outcomes but also to reduce costs. In the past few years, electronic systems and software programs have replaced physical methods as the most effective means of documenting clinical pharmacy treatments. However, the majority of outpatient pharmacies lack a centralized registry for documenting treatments at different sites.<sup>12</sup> In the past, several studies have been conducted on medical faults in the healthcare

setting. Past studies have shown a high rate of medication errors in low and middle-income countries.<sup>13</sup> Assessing the incidence of medical mistakes is challenging due to the numerous characterizations and classification procedures. The proportion of incidence differs from region to region.

Different proportions of medical faults have been reported. The rate of medication errors depends on many factors including patient treatment.<sup>14</sup> Various regions of the globe reflected distinct rates of incidence of medication errors.<sup>15</sup> UK research was conducted on prescription faults that revealed that 30% of prescription errors of those patients who took five drugs for one year. Improper monitoring of prescriptions led to 12% of adverse events in patients and 38% in those patients whose age was above seventy years. Prescription mistakes were found in 5% of all prescriptions.<sup>16</sup> Another study was conducted in Swedish that studies estimated medication errors of about forty-two percent. These medication errors encompassed 1% of inappropriate doses and two-thirds of unsuccessful goals of treatment.<sup>17</sup>

In Saudi Arabian survey revealed, that slightly below one-fifth of primary care prescriptions had been mistaken, nevertheless, only a tiny percentage were reported.<sup>18</sup> In Mexico survey was conducted that found that fifty-eight percent of prescription medication errors are related to dose schedules.<sup>19</sup> All works of literature have shown that medication error is a universal problem. A survey on medication error events revealed that in 72% of cases, the 3% error ratio at step dispensing was due to improper prescription monitoring, with 40-60% of errors attributed to differences between hospitalized and discharged medicines.<sup>20</sup>

Clinical pharmacy facilities have become firmly entrenched in several nations, which has decreased the frequency of medication errors, prescription mistakes, duration of hospital visits, overall therapeutic costs, morbidity, and death. The main goals of clinical pharmacy services are to encourage judicious prescribing and encourage the use of high-quality pharmaceutical goods. Clinical pharmacy incorporation with the health service is still in its adolescence throughout many emerging economies like Pakistan. According to a World Health Organization assessment, more than half of the medications for use by individuals are now either

recommended or given out improperly.<sup>21</sup> In a hospital, a clinical pharmacist's job is to ensure reasonable prescriptions, avoid drug mistakes, and enhance therapeutic effects. A tremendous improvement in the pharmacy profession has been seen in Pakistan during the past several years.

The increase has also been seen in the recognition of pharmacy as a separate profession, in addition to retail services. Contrary to industrialized nations, clinical pharmacists are still an underutilized part of the healthcare team in underdeveloped nations.<sup>22</sup> The research aimed to ascertain the prevalence and categories of medication errors, as well as the function of pharmacists in identifying and addressing these errors across different wards of a private tertiary care facility located in Karachi, Pakistan.

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## Methodology

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The cross-sectional study was carried out in many wards at a private tertiary medical Centre in Karachi. This study was conducted for two months from 1st November 2023 to 31 December 2023. The study involved the examination of all eligible adult and pediatric patients admitted to medical wards over a two-month data collection period, utilizing a convenient sampling method.

Every patient that was admitted to the hospital wards was included in the trial for the whole time it was conducted and excluded all OPD (outpatient department) patients. The ethical authorization to conduct this study was granted by Jinnah University for Women's IERB committee with the reference number JUW/IERB/PHARM-ARA-009/2023.

Data collection for this investigation was conducted through a systematic approach aimed at capturing comprehensive insights into medication errors and interventions within the observed wards. Firstly, observations were made on the manual ordering and delivery process of medications, documenting the transcription of doctors' orders by nurses onto distinct papers and medical charts. Additionally, daily medical rounds conducted by consultants and doctors, along with instructional visits by department heads, were observed, with attendance records of medical officers, nurse staff, and clinical pharmacists carefully documented. Clinical pharmacists actively participated in training sessions

during these rounds, contributing to discussions and interventions related to medication errors.

Furthermore, clinical pharmacists meticulously reviewed patient records and test results during morning and evening shifts in the wards, systematically recording any identified medication errors. These errors encompassed a range of issues, including the selection of incorrect medicines, doses, dosage forms, frequencies, or modes of administration. Upon identification of errors, clinical pharmacists engaged in discussions with the responsible medical officers to effect necessary modifications to prescriptions.

The types and frequencies of medication errors identified were tabulated and analyzed according to predefined criteria (Table 1). Subsequently, quantitative analysis was performed to ascertain the frequency and percentage distribution of each type of medication error, with results summarized in Table 2. Statistical analyses were performed with SPSS version 16.0.

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## Results

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Clinical pharmacists assessed 200 patients for medication errors during the trial, of whom 110 (55%) were females and 90 were male patients (45%). In 200 individuals, 250 faults (1.25 per each) were found and effectively handled. The following frequency of faults was found: Above Therapeutic Dose 7 (2.8%), Sub Therapeutic Dose 8 (3.2%), Dose Adjustment 75 (30%), Drug-Drug/Drug-Food Interaction 9 (3.6%), Duplication of Drug Class 10 (4.0%), Dose Rounded Off 9 (3.6%), Intravenous to Per Oral Switch 8 (3.2%) Incomplete Drug Order 12 (4.8%), Transcribing Error 12 (4.8%), Wrong Medication 55 (22%) Wrong Frequency 20 (8%) Wrong Route 9 (3.6%) Wrong Dilution/Incompatibility 9 (3.6%) Wrong Infusion Rate 4 (1.6%) Miscellaneous 3 (1.2%) (Table 1).

55 (22%) cases of wrong medication prescriptions were found that involved all classes of medicines. 75 (30%) Patients admitted to ICU needed dose adjustment for antibiotics, antihypertensive, and anti-diabetic drugs which was done by the pharmacist. The classes of medication errors with the lowest probability were infusion rate 4 (1.6%) and miscellaneous 3 (1.2%). The two error categories with the same prevalence included wrong route and wrong dilution which were more common in IV

antibiotics and painkillers 9 (3.6%). Other most frequent errors in post-operating drugs were Transcribing Errors 12 (4.8%), incomplete Drug Orders 12 (4.8%), and IV to PO switch 8 (3.2%). The most frequent errors with agents affecting the central nervous system were incorrect selection, sub-therapeutic dose 8 (3.2%), and above therapeutic dose 7 (2.8%).

**Table 1: Categories of medication errors and their definitions**

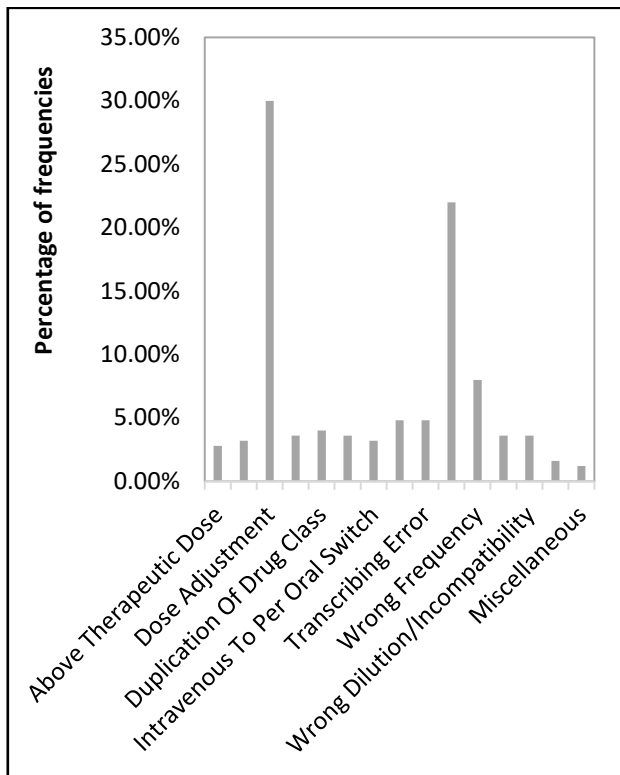
Categories of medication error: Definitions
<b>Above Therapeutic Dose:</b> The dose is given higher than therapeutic doses.
<b>Sub Therapeutic Dose:</b> The dose is given less than therapeutic doses.
<b>Dose Adjustment:</b> A statement that describes or provides a dose modification.
<b>Drug-Drug/Drug-Food Interaction:</b> The modification of a drug's effects brought about by the presence of another one, which may have an impact on the drug's distribution, metabolic processes, elimination, or absorption. / Alterations in the way that drugs behave as a result of interactions with specific meals, which may have an impact on the effectiveness of treatment or have negative side effects by altering metabolism, elimination, or absorption.
<b>Duplication Of Drug Class:</b> The act of recommending several drugs for the same condition or goal.
<b>Dose Rounded Off:</b> Medication dosage adjustments are made to the closest useful or convenient numerical value.
<b>Intravenous To Per Oral Switch:</b> Changing treatment route from intravenous (IV) to oral (PO).
<b>Incomplete Drug Order:</b> An unclear or inadequate medical prescription.
<b>Transcribing Error:</b> An error that occurs frequently in data input done by human operators and involves inaccurate information copied or transcribed.
<b>Wrong Medication:</b> refers to the unintentional use or administration of a medication that is not intended for a particular patient or medical condition, carrying the risk of ineffectiveness or negative side effects.
<b>Wrong Frequency:</b> Variation from the specified dosage schedule, including going above or under the recommended frequency of medicine administration.
<b>Wrong Route:</b> Incorrect administration route or transmit medicine to the wrong location.

<b>Wrong Dilution/Incompatibility:</b> The incorrect combination of a medicine with a fluid, vessel, or other compounds, resulting in an unsuitable and sometimes dangerous mix.
<b>Wrong Infusion Rate:</b> Describes a mismatch that may lead to the incorrect and dangerous delivery of medicine or fluids to a patient between the dose that is programmed on an intravenous (IV) device and the recommended or prescribed dose for that patient.
<b>Miscellaneous:</b> A varied assortment or combination of different drugs, chemicals, or products that might not have a similar theme or effect.

The interaction between ciprofloxacin and calcium accounted for drug-drug interaction while the second most significant interaction was between omeprazole and clopidogrel 9 (3.6%). The duplication of drug class was found to be more prevalent in proton pump inhibitors and anti-hyperlipidemic 10 (4.0%). Round-off dose errors were recorded in pediatric doses 9 (3.6%) (Table 2, Figure 1).

**Table 2: Categories of medication errors**

Categories of medication error	No of incidences frequency	Percentage of frequency
Above Therapeutic Dose	7	2.8%
Sub Therapeutic Dose	8	3.2%
Dose Adjustment	75	30%
Drug-Drug/Drug-Food Interaction	9	3.6%
Duplication Of Drug Class	10	4.0%
Dose Rounded Off	9	3.6%
Intravenous To Per Oral Switch	8	3.2%
Incomplete Drug Order	12	4.8%
Transcribing Error	12	4.8%
Wrong Medication	55	22%
Wrong Frequency	20	8%
Wrong Route	9	3.6%
Wrong Dilution/Incompatibility	9	3.6%
Wrong Infusion Rate	4	1.6%
Miscellaneous	3	1.2%



**Figure 1: Categories of medication errors and percentage of frequencies**

## Discussion

The primary objective of medicine development is to enhance patient outcomes and alleviate ailments. Despite the swift progress in pharmaceutical production, the design of therapeutic regimens, and the implementation of electronic medical programs and applications in healthcare settings, Medication Errors (MEs) remain prevalent and pose significant concerns in both developed and developing countries. MEs contribute to an escalation in drug-related complications, including adverse events and side effects, leading to potential hospitalization and the extended use of additional healthcare resources.<sup>23</sup> The research focused on improving the patient's quality of life and achieving the greatest treatment results by lowering medication errors. The safety of patients is greatly impacted by errors in medicine. The ordering, prescribing, dispensing, and administering phases are all where these errors happen. Most of the medication errors occurred during prescribing and ordering in this study. these types of errors are reduced when the clinical pharmacist is with on clinical round of physicians.<sup>24</sup>

Medication errors often stem from illegible handwriting and the use of abbreviations, leading to misinterpretation by dispensers and subsequent dispensing of incorrect medications. Additionally, prescribing errors frequently occur due to inadequate knowledge of clinical characteristics and insufficient information about patients' medical histories. These issues, consistent with findings from prior studies, highlight the recurring nature of these errors in healthcare settings.<sup>25</sup> The World Health Organization (WHO) defines health as reducing the risk of sickness or disability but also includes a person's total physical, mental, and social well-being.

According to this notion, healthcare professionals are crucial in promoting population health. Research has found that among the objectives for obtaining the highest level of public health in terms of modern healthcare delivery is utilizing interdisciplinary expertise. Although the pharmacy profession is valued for its role as a supplier of healthcare in many industrialized nations, it is still undervalued in the majority of developing nations.<sup>26</sup> The way pharmacies are operated in developing nations differs greatly from one another. In Pakistan, the growth of the pharmacy profession in terms of pharmaceutical treatment is still in its infancy. Most public hospitals do not have a suitable number of pharmacists working there. Therefore, their roles were restricted to purchasing, supply chain management, as well as the distribution of drugs.<sup>27</sup>

By enhancing pharmacological treatment, the clinical pharmacist improves overall health outcomes. This study offered proof that clinical pharmacist-initiated interventions lead to patients using medications in a more beneficial manner that was both effective and safe. According to several studies, clinical pharmacist engagement in hospitals, especially inpatient settings led to better and more efficient medication usage through the detection, avoidance, and solution of drug treatment issues.<sup>28,29</sup> Drug treatments play a significant role in medical care and are a source of prescription mistakes and other issues. Keeping up with the expanding list of prescription drugs is a tedious task for doctors. According to numerous types of research, pharmacists can enhance patient safety and results by minimizing adverse events by providing advice on the best treatments and doses.<sup>30,31</sup>

Physicians must acknowledge and make use of the specialist information held by pharmacists, and pharmacists must also make themselves more accessible to the physicians. Fortunately, pharmacy practice has altered dramatically because of the development of clinical pharmacy. The focus of the pharmacist has changed from the drug itself to the drug's interaction with the patient. True change has been difficult to achieve, and there are still many obstacles to be addressed. Many patients and doctors in Iran still do not completely grasp the role of pharmacists as an important element of the healthcare team. Unexpectedly, this is also true in wealthy nations.<sup>31</sup>

## Conclusion

The study's findings reinforce the significance of clinical pharmacists' role in raising the standard of medical treatment, improving patient care and outcomes, and lowering drug expenditures for both patients and the community.

**Limitation:** This study was limited to one tertiary care facility.

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