

# Interventional Study Based on Prescription Errors in the Inpatient Units of a Tertiary Care Hospital in Calicut

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## ABSTRACT

**Background:** Medication errors are the main contributors to adverse events in hospitalised patients. Optimization of drug therapy can be done by minimizing the prescription error thus enhancing patient's quality of life and reducing health expense. Hence this project was proposed to identify prescription errors and thereafter reducing adverse events. **Methods:** A prospective clinical interventional study was conducted in a tertiary care hospital in Calicut. A total of 200 prescriptions were collected and audited during the study period. The collected prescriptions were assessed to identify prescription errors and other drug-related problems using prescription audit form. **Results:** Out of 200 prescriptions audited 166 (83%) prescriptions had errors. Prescription errors were classified into different types of which major error identified was Unit not mentioned (64.45%). More than half of the prescriptions had 1 to 3 errors per prescription (58.45%) and the errors increased with an increase in the number of medications. In department wise categorisation of errors, the majority were identified in the Department of General medicine. Most of the errors were accepted by the physician (90.36%) and the major intervention made was to modify the drug dose (24.69%). Drug-Drug interactions were found in 49 prescriptions of which (34.69%) was found to be major, (53.06%) moderate and (12.24%) minor interactions. **Conclusion:** The study concluded that clinical pharmacist involvement in patient care may identify, resolve and prevent prescription errors and drug-related problems in the hospital.

**Key words:** Prescription error, Drug-drug interactions, Medication error, Clinical Pharmacist Intervention, Adverse events.

## INTRODUCTION

Medication errors are a well-known problem in the hospital. Studies have shown that medication errors and adverse drug reactions are one of the main causes of adverse events in hospitals leading to disability and death in up to 65% of hospital admissions.<sup>1</sup> National Coordinating Counsel for Medication Error Reporting and Prevention (NCCMERP) defines medication error as "Any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of health care professional, patient or consumer".<sup>2</sup>

### Prescribing errors

Prescribing errors may be defined as incorrect drug selection for a patient or

errors involving wrong drug, dose, quantity and indication for use or a contraindication. Prescription errors also include illegible handwriting, misspelling of a drug with a similar name and use of abbreviation.<sup>1</sup>

Types of prescription errors

- 1. Illegible prescription:** Writing a legible prescription is the legal responsibility of the prescriber. Illegible handwriting is one of the causes of prescription errors leading to all types of errors.<sup>3</sup>
- 2. Abbreviation prone to error:** The use of medication abbreviations accounts for a subset of errors. Staff responsible for the reading, interpretation and

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processing medication orders may not recognize an abbreviation, resulting in the alteration of the intended meaning.

3. **Incorrect drug:** When a medicine is prescribed to a person who has a known allergy to that medicine; when a medicine which is contra-indicated to a patient is prescribed; when a medicine name which is not intended is written by a prescriber in the medication order.
4. **Drugs not prescribed:** Situations were a patient is diagnosed with a particular indication but left untreated.
5. **Incorrect dose:** When the quantity of medicine recommended being taken at a particular time is incorrect, applicable when the dose needs to be calculated by the weight of the patient.
6. **Dose not mentioned:** Mentioning the dose of medicine become inescapable especially with a narrow margin of safety, which if taken in overdose may cause more harm.
7. **Incorrect frequency:** Frequency is the time at which the drug is administered when the prescribed frequency of a drug is different from the current evidence-based treatment guidelines.
8. **Frequency not mentioned:** Prescriber does not mention the frequency of the drug.
9. **Incorrect dosage form:** Prescriber does not mention the correct dosage form of the drug.
10. **Formulation dosage is not mentioned:** Dosage form of the drug is not mentioned by the prescriber
11. **Incorrect quantity/ strength:** This error happens when the prescriber does not mention the concentration of IV infusion to be mixed and prepared.
12. **Incorrect route of administration:** When a route not intended by the prescriber is written in medication order.
13. **Route of administration not mentioned:** Whether it is IM, IV, subcutaneous, intrathecal, inhalation orally or rectally.
14. **Incorrect instruction for use:** Incorrect instruction is given to the patient by the prescriber.
15. **Instruction for use of the drug not mentioned:** When no instruction for use of the drug is mentioned by the prescriber.
16. **An incorrect rate of administration:** The wrong rate of administration of the IV infusion may lead to serious harm in patients.
17. **The rate of administration not mentioned:** The error mainly occurs in the case of IV infusion.
18. **Wrong duration:** When the duration of medication is different from current evidence-based treatment guidelines.
19. **Duration not mentioned:** Duration of the drug should be taken into consideration, not mentioning the duration can lead to drug resistance, especially in case of antibiotics.
20. Repetition of same drug/duplication and incomplete writing of prescriptions are also included in prescribing errors.

Other prescribing errors observed include drug interactions and contraindication of drugs. Causes of prescription errors may be associated with healthcare professionals, patients, work environment and medicines.

### Clinical pharmacist intervention

Interventions are steps taken by healthcare professionals to optimize therapeutic management in order to enhance the quality of patient care. The various interventions recommended by the clinical pharmacist for minimizing the prescription errors include drug change, frequency change, drug dose modification and a new drug to be added. It is necessary to critically address and evaluate the completeness and legibility of the prescription in a continuous and frequent manner.

Hence the study was proposed to identify the prescription error and other drug-related problem and thereafter reducing adverse events.

### MATERIALS AND METHODS

**Study design:** A prospective clinical interventional study was conducted over a period of six months from November 2017 to April 2018.

**Study population:** All patients admitted as inpatients in the study site during the study period.

**Study materials:** Case sheets of inpatients from the Indian Journal of Pharmacy Practice, Vol 12, Issue 4, Oct-Dec, 2019

different site of the study and prescription audit form.

**Study procedure:** The medication orders of the patient admitted as inpatients in various medical wards of the study site were randomly collected by considering the study criteria. The data collected was assessed to identify prescription errors and drug-related problems such as drug interactions and prescribing contraindicated drugs. The data were entered into a pre-prepared validated prescription audit form and assessed for different types of prescription errors, the number of errors per prescription and identify the department which had the most number of errors. Drug interactions were identified using Medscape drug interaction checker and the severity of the interaction was assessed and categorised as major, moderate and minor. Clinical pharmacist intervention was carried out for the observed error and it was reported to the concerned physician-in-charge

**Statistical methods:** The data found were merely explained in terms of tabular and graphical manner and the statistical analysis was performed by using Karl person correlation method, SPSS software 4, windows version 20.

**RESULTS**

Out of 200 prescriptions audited 166 (83%) prescriptions had errors and 34 (17%) prescriptions were without errors.

In our study Prescription errors are classified into different types of which the major error identified was Omission of Unit (64.45%) followed by formulation Dosage not mentioned (37.95%), Dose not mentioned (28.31%), Frequency not mentioned (10.24%) and (10.24%) other types of error (Table 1).

In order to identify the number of errors per prescription, the prescriptions were grouped into 3 groups based on the number of errors is less than or equal to 1, greater than 1 or less than 3 and greater than 3 errors per prescription and were analysed accordingly. Majority of the prescriptions belongs to the group 1 to 3 (58.45%) followed by (39.15%) less than or equal to 1 and (2.40%) greater than 3 error per prescription (Figure 1).

The number and percentage of errors in each department were analysed in which Majority of errors (36.64%) were found in General Medicine department followed by Gastroenterology (12.04%), Neurology (11.44%), Cardiology (10.84%), Nephrology (7.83%), Obstetrics and Gynaecology (7.83%), Urology (3.61%), Orthopaedics (3.01%), Surgery (3.01%),

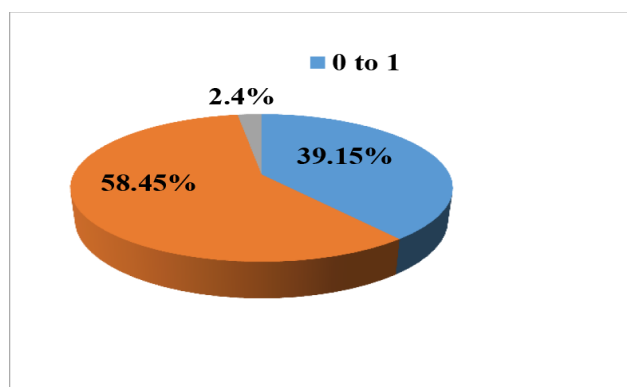
Paediatrics(2.40%), ENT(1.20%) and the least number of error (0.60%) was found in Pulmonology (Figure 2).

Out of the total prescriptions audited Drug-Drug interactions were found in 49 prescriptions of which, 17 (34.69%) were major, 26 (53.06%) were moderate and 6 (12.24%) were found to be minor (Figure 3).

Clinical Pharmacist intervention was carried out for the identified errors and recommendation was given to the respective physicians. Most of the recommendations made were drug dose modifications (24.69%) followed by frequency change (9.03%) and drug change (3.1%).

**Table 1: Types of Prescription Error.**

SL.NO	Types of Prescription Errors	Number of Errors	Percentage of Errors
1	Incorrect drug	1	0.60%
2	Incorrect dose	1	0.60%
3	Incorrect quantity/ strength	1	0.60%
4	Incorrect route of administration	1	0.60%
5	Incorrect frequency	2	1.20%
6	Illegible prescription	4	2.40%
7	Instruction for use of a drug not mentioned	6	3.61%
8	Rate of administration not mentioned	7	4.21%
9	Incorrect dosage form	9	5.42%
10	Route of administration not mentioned	15	9.03%
11	Frequency not mentioned	17	10.24%
12	Incomplete writing of prescription/others	17	10.24%
13	Dose not mentioned	47	28.31%
14	Formulation dosage not mentioned	63	37.95%
15	Unit not mentioned	107	64.45%



**Figure 1: Number of Errors per prescription.**

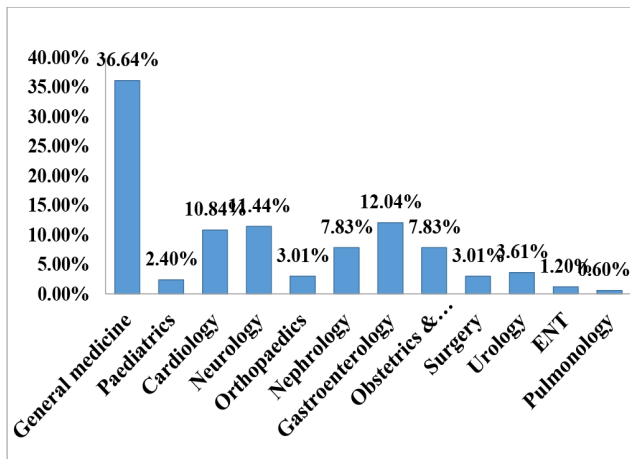


Figure 2: Prescribing errors based on departments.

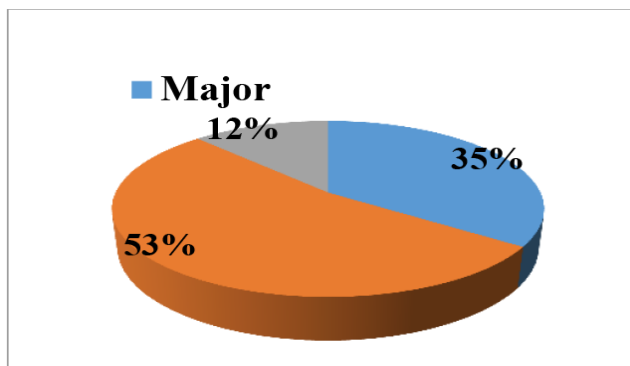


Figure 3: Severity of Drug-drug interaction.

In this study, we analysed whether the error is accepted by the physician or not. Out of 200 prescriptions audited 166 prescriptions contained errors of which 150 (90.36%) were accepted by the physicians and 16 (9.64%) were not accepted by the physicians.

The association between the Number of Errors and Number of Drugs per prescription was identified by analysing the prescriptions and we observed that errors increased with an increase in a number of medications. Karl- Pearson correlation coefficient method was used to calculate the correlation coefficient,  $R$  (0.601206858). This means there is a moderate positive correlation.  $P$  (0.0001) was found out using two-tailed  $P$  test and showed that the study is statistically significant, i.e. Number of Error increases with Number of Drugs per prescription.

## DISCUSSION

A prescription is a Healthcare tool employed by a physician or other qualified Health Care practitioner in the form of instruction that governs the plan of care for an individual patient.

The overall percentage of prescription error observed in our study was 83 percentage, these results may be due

to the busy schedule of the physician, inadequate drug knowledge and experience, poor handwriting of the treating physician. This can leads to major dispensing and administration errors. The findings on prescribing errors showed similarity to study finding of A. Ramya *et al.*<sup>4</sup>

Among the different types of a prescription error, the most common one was the omission of unit and formulation of dosage. Such missing data may create confusion for the nursing staff and patient may receive irrational drug therapy. The Dose and Frequency were not mentioned in some of the prescriptions and this can lead to an increase in the financial burden to the patient and may lead to therapeutic failure or toxicity. A few numbers of prescriptions had inadequate information on Instruction for use, which may lead to poor compliance. In this study more than half of the prescriptions were legible. In some of the prescriptions, Route of administration was not mentioned which may lead to the faulty administration of the drug to the patient especially in case of parentals. The pattern of prescription errors reported in this study shows some similarity with the study findings of Sara Al Khansa *et al.*<sup>5</sup> We also analysed the frequency of errors per prescription, from which we understood that Unit not mentioned and Formulation dosage not mentioned were frequently occurring errors. Our study findings differ from some other study were the Omission of the drug was the most frequently reported error Darren M. Ashcroft *et al.*<sup>6</sup>

The present study showed that more than half of the prescriptions had more than one error. This will leads to the reduction in the probability of treatment being timely and effective and leads to increased risk of harm.

Our study could not detect the causes of errors, but it was observed that errors increased with an increase in a number of medications. In our study, most of the errors are noted under general medicine, which constituted most of the sample and reflected the hospital admission pattern. This could have been due to the presence of new interns and residents, training and adaptation to this system helps to decrease the number of errors thereby optimizing the drug therapy. The findings of our study are similar to the study conducted by Sara Al Khansa *et al.*<sup>5</sup>

Prescribing error may lead to a reduced probability of effective treatment being timely or increase in the risk of harm among patients due to drugs related adverse effect or drug interaction. A total of 49 drug-drug interactions were identified, 17 (34.69%) were found to be major, 26 (53.06%) were moderate and 6 (12.24%) were found to be minor; the observation of DDIs made in this study is comparable with the results obtained by Jacqueline. M. *et al.*<sup>7</sup> where the major, moderate and minor DDIs



were 17%, 56% and 27% respectively and also similar to the results of Satish. A *et al.*<sup>8</sup> Where major was 25.82%. Hence awareness among prescribers regarding drug-drug interaction and frequent audit of prescription to avoid medication error is required.

In this study, most of the recommendations made were drug dose modifications (24.69%) followed by a change in frequency (9.03%). These findings correlate with the study findings of A. Ramya *et al.*<sup>4</sup> However, differs from some other study were the drug discontinuation or cessation was the most frequent recommendation Satish Kumar BP *et al.*<sup>9</sup>

In our study, most of the physicians were ready to accept their errors, acknowledged it and tried to minimize them. Some of the physicians have not accepted the errors.

The present study revealed that the risk of medication error increases as the number of medications for prescription increases. The findings of the study along with the previously conducted studies highlight the disparity in the nature and content of the layout of the prescriptions throughout India which shows that there is a need to use a standardized ideal prescription format throughout the country.

**Directions for further research:** The present study reviews the prescription errors and the current prescribing trends at the study site and the role of clinical pharmacist in patient Health Care. The study can be utilised as a tool by researchers in order to carry out the same at a larger scale

## CONCLUSION

Our study identified the different types of errors in prescriptions, the overall incidence of medication error was found to be high even though there were no life-threatening events. Our study identified the different type of errors in prescription, it can be seen from the present study that most of the prescription screened were incomplete with one or more aspects missing and some of the prescriptions had poor legibility. The clinical pharmacist can play an important role in the prevention of these errors by working with other health care professionals. In our study, it was found that the number of prescription errors increases with a number of drugs. Prescribing errors are a major threat to patient safety, they not only lead to increased hospital stay and cost of treatment but also increase the mortality and morbidity rates. Thus, our study concluded that clinical pharmacist involvement in patient care can identify, resolve and prevent prescription errors and drug-related problems in the hospital. Development of medication error reporting and management system at the hospital can

prevent further occurrence of medication errors. Hence there is a need for clinical pharmacist in the hospital for improving the rational use of drugs and provide optimal drug therapy for improving the patient's quality of life.

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## CONFLICT OF INTEREST

We declare that this research does not have any conflict of interest with anyone or any institute.

## ABBREVIATIONS

**NCCMERP:** National Coordinating Council for Medication Error Reporting and Prevention; **ME:** Medication Errors; **ADE:** Adverse Drug Events; **ENT:** Ear, Nose and Throat; **DDI:** Drug-Drug Interaction; **SPSS:** Statistical Package for the Social Sciences; **IV:** Intravenous.

## SUMMARY

We can overcome the medication error by educating physicians, nurses, and other healthcare professionals on the areas where medication errors are more prone to occur. The objective of the study was to identify the prescription errors, categorize the types of error and demonstrate the common therapeutic interventions and reduce the prescription errors.

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