



## Impact of Clinical Pharmacy Services on Medication Errors in A Multispecialty Hospital

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### ABSTRACT

The study was conducted to improve treatment outcome by detecting, categorizing and minimizing medication errors thereby making aware of clinical pharmacy services to other healthcare professionals and patients. A prospective observational study including 203 patients from both Inpatient and Outpatient department was conducted for a period of 6 months. Medication errors were identified and their severities were assessed using NCCMERP index. Prescription error (48.83%) was identified as the most prominent medication error. It was also observed that medication error increases remarkably with increase in age, length of hospital stay and number of medication per prescription. Other commonly occurring errors were due to drug-drug interaction (41.51%), ADR (2.7%), lack of staff education, drug monitoring and improper counselling. Medication error can be minimized by the active participation of clinical pharmacist. Hospital management should be encouraged to develop a protocol for writing medication orders to improve the quality of healthcare services.

**Keywords:** Medication Error, Clinical Pharmacist, Patient Counselling, ADR.

### INTRODUCTION

Medications play a vital role in health care system and contribute to significant improvement in outcomes when used appropriately. However since medications are so frequently used, they are also one of the most common sources of error and adverse events (AEs).<sup>1</sup>

From prescribing to administration of the drug, errors may occur at any step so that drug delivery is a complex process.<sup>2</sup> In India due to medication errors and AEs, 5.2 million injuries have been reported each year.<sup>3</sup> An increase in morbidity, mortality, cost burden and a decrease in patient's confidence in health care system is likely to occur due to medication error.<sup>4</sup>

The US National Coordinating Council For Medication Error Reporting And Prevention 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 the health care professional, patient, or consumers. Such events may be related to professional practice, health care products, procedures and systems, including prescribing order communication, product labelling, packaging and nomenclature, compounding, dispensing, distribution, administration, education, monitoring and use.<sup>5</sup>

Based on the extremity of outcome NCCMERP classifies medication error categories from A (Circumstances or events that have the capacity to cause error) to I (An error occurred that may have contributed to or resulted in the patient's death).<sup>6</sup>

There are 4 types of medication error including Prescribing Error (PE), Transcription Error (TE),

Administration Error (AE), and Dispensing Errors (DE). Prescribing Error (PE) occurs when there is an inadvertent significant reduction in the probability of treatment being timely and effective or increases in the risk of harm due to prescribing decision or prescription writing process, prescription error occurs. Transcription error is defined as any discrepancy in transcribing medication order from physician's order sheet, administration nursing note, and documentation of order in the pharmacy database.<sup>7</sup>

Administration error is defined as any difference between what the patient received or was supposed to receive and what the prescriber intended in the original order.<sup>8</sup> Dispensing error can be defined as any inconsistencies or deviations from prescription orders such as dispensing incorrect drug, dose, dosage form, wrong quantity, inappropriate, incorrect or inadequate labelling, confusing or inadequate directions for medication use, incorrect or inappropriate preparation, packaging or storage or medication prior to dispensing.

Medication error occur due to inadequate drug knowledge and experience, overworked or fatigued health care professionals, poor communication between health care professionals and with patients, patient characteristics (eg : personality, literacy and language barriers) Complexity of clinical case, including multiple health condition, polypharmacy and high risk medications, lack of standardized protocols and procedures, Naming of medicines, labeling and packaging factors associated with tasks. Patient monitoring (dependent on practice, patient, other health care setting, prescriber) and lack of accuracy of patient records.<sup>9</sup>

According to World Health Organization (WHO, 1972), an



adverse reaction is 'a response to a drug which is noxious and unintended, and which occurs at doses normally used in man for the prophylaxis, diagnosis, or therapy of disease, or for the modification of physiological function'.<sup>10</sup>

A Significant step in identifying an ADR and determining causality is to acquire an accurate patient drug list. Not only is this an opportunity to screen for ADRs that could have led to the hospitalization, but preserving an updated and accurate medication history for each patient can also help prevent ADRs in the future. Two others are more commonly use because of their simplicity and time efficiency; one is the Naranjo ADR Probability Scale. The ADR probability classification can be determined by answering ten questions about the ADR and assigning numeric score to each answer.<sup>11</sup>

Drug interaction can be defined as modification of safety and efficacy profile of a medication following the co-administration of drugs, environmental pollutants, ingredients or additives present in the diet. e.g, potentially life threatening arrhythmia due to terfenadine and ketoconazole interaction It is widely recognized that the risk of developing an adverse drug reaction (ADR) secondary to drug-drug interaction increases undoubtedly with number of medications a patient is receiving.<sup>12</sup>

Therapeutic duplication is the practice of prescribing multiple medications for the same indication or purpose without a clear distinction of when one agent should be administered over another. Therapeutic duplication may lead to unintended or excessive use of prescribed medications, medication errors, and increased adverse drug reactions.

For example, over-sedation might occur when multiple medications are given to treat pain.<sup>13</sup>

Pharmacy practice has changed undoubtedly on introducing clinical pharmacy. Pharmacist consideration has shifted from the medication itself to the interaction between patient and the medication. The concept of the pharmacist as a crucial member of the health care team is still not fully understood by many patients and physicians.<sup>14</sup>

Clinical pharmacy services target on the following activities: ensuring safe and cost effective drug administration, monitoring and management of drug use pattern by providing drug information, training clinical pharmacy residents and pharmacy students providing drug protocols and treatment guidelines, appropriate prescribing. Medication errors being a major concern to health care professionals have been considered for reducing the number of errors and their impact on treatment of patients.<sup>15</sup>

## METHODOLOGY

### Study Design

Prospective Observational study.

### STUDY SITE

Vivekanandha Medical Care Hospital, Elayampalayam, Tiruchengode.

### Ethical Clearance

The approval for conducting the study was issued by the Institutional Ethical Committee (IEC) of Vivekanandha Medical Care Hospital. Ref. No.: VMCH/IEC/FEB/2018/06 dated 12/02/2018. Patient consent was taken from the participants before the start of the study.

### Study Duration

6 months (February 2018 – July 2018)

### Study Population

Total of 203 patients from the departments of General medicine, Orthopaedics, Gynaecology, Ophthalmology, Cardiology, Orthodontics and Surgery were included in the study, after getting the patient consent.

### Study Criteria

#### Inclusion criteria

All Inpatients and Outpatients were included.

#### Exclusion Criteria

Medico Legal Cases (MLC) were excluded

### Study Procedure

The data was collected by chart review method at both Inpatient and Outpatient department for assessment of medication error such as omission errors, commission errors, wrong time errors, improper dose errors, wrong dosage forms, wrong administration techniques and monitoring errors. Inpatient case records reviewed and were followed from date of admission till date of discharge.

All the observed data were documented and analysed for the following parameters such as age and gender, diagnosis of the patient, number of medications per prescription, drug categories, length of hospital stay, comorbidities, type of medication errors, LASA drugs, level of severity of errors by using NCCMERP index, drug interactions by MICROMEDEX software, ADR by Naranjo scale and ADR reporting forms were used to report ADR. Correlation of age versus errors, gender versus errors, number of medications versus errors, length of stay versus errors, comorbidities versus errors was also analysed. Data analysis was done using Microsoft office excel software.



## RESULTS

The study was conducted on 203 subjects in the department of Cardiology, General Medicine, Gynaecology, Ophthalmology, Orthopedics, Orthodontist, and Surgery at a multispecialty hospital. Among the 203 patients analysed, 80 patients were from the in-patient department (IPD) and 123 patients were from out-patients departments (OPD). A total number of 635 medication errors were observed during the study which involves various types of error, adverse drug

reaction and drug-drug interaction.

### Types of Error

A total of 344 medication errors (excluding DDIs and ADR) were observed. Among them 168 (48.83%) were errors in prescription, 48 (13.95%) were errors observed in administration, 57 (16.57%) were errors in dispensing and 71 (20.64%) were errors in transcription. (Table 1)

**Table 1:** Types of Medication Error (n=203)

TYPE OF ERROR	NUMBER OF ERRORS	PERCENTAGE OF ERROR
Prescription Error	168	48.83%
Administration Error	48	13.95%
Dispensing Error	57	16.57%
Transcription Error	71	20.64%

### Severity of Drug-Drug Interactions

270 drug-drug interactions were identified in 203 cases and the severity was assessed in both IP and OP. Of 270 DDIs identified 68.88% and 60.12% of interactions were

found to be major interactions followed by 17.08% and 35.6% of moderate interaction; and minor interactions of 13.76% and 4.29% from IP and OP subjects respectively. (Table 2)

**Table 2:** Severity of DDIs (n=203)

SEVERITY LEVEL	NUMBER OF INTERACTIONS	
	In-patients (n=107)	Out-patients (n=163)
Major	73 (68.88%)	98 (60.12%)
Moderate	19 (17.8%)	58 (35.6%)
Minor	15 (13.76%)	7 (4.29%)

### Number of Drugs per Prescription and Interaction

Out of 270 DDIs observed, prescriptions having more than 11 medications were found to have an average of 3.8 medication errors per prescriptions. It is followed by

prescriptions having 8-11 drugs i.e an average of 3.4 medication error while an average of 2.8 errors were observed in prescriptions having 2-6 drugs. (Table 3)

**Table 3:** Number of Drugs per Prescription Vs DDIs (n=203)

Number of Drugs Per Prescription	Number of Patients		Number of Interaction	Average Medication error per prescription
	IP	OP		
2-6	4	41	123 (44.9%)	2.8
7-11	16	7	75 (27.4%)	3.4
>11	20	-	76 (22.7%)	3.8

### Poly pharmacy

Out of 203 cases 98 were observed to have poly-pharmacy. Majority of the medication errors were observed in prescription having more than 11

medications (average of 5.89) followed by 7-11 medication per prescription (3.81) and 2-6 medication per prescription (2.09). (Table 4)



**Table 4:** Number of Medication per Prescription Vs Medication Error (n=203)

Number of medication	Number of Patients		Number of Error Reported	Average medication error per Prescription
	IP	OP		
2-6	14	110	259 (40.79%)	2.09
7-11	30	13	164 (25.83%)	3.81
≥11	36	-	212 (33.38%)	5.89

### Causality Assessment of Adverse Drug Reaction

A total of 17 ADRs were observed in this study out of which 14 were classified as probable and 3 were classified as possible. (Table 5)

ADR SCORE	NUMBER OF ADR
@DEFINITE	-
POSSIBLE	4
PROBABLE	13
DOUBTFUL	-

### Age Wise Distribution and Medication Error

Out of the total 635 medication errors, majority of errors were observed in the age group of more than 60 years (50.23%) followed by the age group of 46-60 (30.08%), 31-45 years (17%) and 11-30 (2.67%).(Table 6)

**Table 6:** Age Wise Distribution of Patients and Medication Error

Age Group (years)	Number of Patients with Medication Error	Number Of Medication Error
11-30	7	17 (2.67%)
31-45	21	108 (17%)
46-60	51	191 (30.08)%
≥61	77	319 (50.23%)

### Duration of Hospital Stay and Medication Error

The study shows that significant increase in medication error occurs with an increase in hospital stay (Table 7)

**Table 7:** Duration of Hospital Stay and Medication Error (n=203)

Duration of Hospital Stay In Days	No. of Patients	No. of patients with medication Error	No. of error (average)
2-4	40	32	132 (4.13)
5-8	38	36	196 (5.4)
>8	2	2	15 (7.5)

## DISCUSSION

Medication errors are avertible mistakes which may cause harm and are ignored most of the time. Since patient safety plays a crucial role, this topic always remains as an important issue in the health care sector. To build safer system, the first step is to detect medication related errors and perform analysis of the root cause.

A total of 203 cases were observed, among which Inpatient cases were 80 and Outpatients were 123. A total of 635 medication errors including prescription, administration, dispensing, and transcription and monitoring errors were identified.

344 medication errors (excluding DDIs and ADR) were observed in our study. Among which majority of errors were prescription errors that is 48.83% (168). Similar results were reported by Anandhasayanam .A *et al.*<sup>16</sup>

Out of 270 DDIs maximum errors were observed to be major drug interactions 68.88% and 60.12% in IPD and OPD respectively and prescriptions having more than 11

medications were found to have higher rates of drug interaction whereas in a study conducted by Surendar S *et al.* states that majority of the drug interactions belonged to moderate class.<sup>17</sup>

The most frequently cited drug interactions belonged to the class anti-platelets and anti-hypertensive which was similar to the study conducted by Desai M *et al.*<sup>18</sup>

The study reveals that the risk of medication error increases as the number of medication per prescription increases. An increase in medication error was observed when the patients had more than 11 medications which was in accordance with a study reported by Sheik.D *et al.*

In this study, age-wise distribution showed that patients who were above 60 years of age had increased medication error i.e., 47.3% of total errors. Medication error increased among the age group of >61 years in a study conducted by Sheik.D *et al.* High prevalence of medication error among older adults are due to polypharmacy and polymorbidity.<sup>19</sup>

A total of 17 ADRs were observed out of which 14 were



classified as probable and 3 were classified as possible similar to a study conducted by R.Vijaiashri *et al.*<sup>20</sup>

The study shows that duration of hospital stay resulted in significant increase in medication error which was similar to study conducted by Abdulhalim.M *et al.*<sup>21</sup>

The severity level assessment of medication errors report that majority of the medication error belonged to the category Error No Harm (71.18%) followed by No Error (17.95%) and Error Harm (10.86%) where similar results were reported by a study conducted by Sandip P *et al* where majority of errors were under Error No Harm (82.6%).<sup>22</sup>

## CONCLUSION

Our study concludes that medication error occurs at an average of 3.12 in 203 patients. This indicates that the incidence of medication error is significantly high which shows deterioration in patient care. of all the types of medication errors prescription error contributes the most. It was also observed that medication error increases remarkably with increase in age, length of hospital stay and number of medication per prescription. Other commonly occurring medication errors were due to drug-drug interaction, lack of staff education, drug monitoring and improper counselling.

Improved drug monitoring programmes and patient counselling should be arranged in every clinical setting to verify the accuracy of dispensing and patient understanding of proper medication use, clinical pharmacist should counsel the patient.

Clinical pharmacists should encourage the hospital management to develop a protocol for writing medication orders. Medication error reporting system should be developed to improve the quality of healthcare services.

Clinical pharmacist can play a pivotal role in improving patient care by minimising medication error, which is achieved by their active participation in ward rounds, communicating efficiently with other health care professionals, interacting with patients and providing bedside counselling, updating their drug related knowledge and educating fellow pharmacist thereby providing the necessary information with utmost accuracy to other health care professionals.

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