



## Research Article

### **IMPACT OF UNIT BASED CLINICAL PHARMACISTS INTERVENTIONS IN PREVENTION OF MEDICATION ERRORS IN A MULTISPECIALTY HOSPITAL**

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#### **ABSTRACT**

The main aim of this study was to assess the impact of clinical pharmacists interventions in the prevention of medication errors. This retrospective study was carried out in Jaypee Hospital, Noida, Uttar Pradesh, India. All In-patients that were admitted in the hospital over the study duration were included in the study. During their hospital stay medication errors were intercepted by unit based clinical pharmacists through reviewing their prescription and intervention were made and then reported to clinical pharmacology department, this data of the past six months from November 2018 to April 2019 was obtained retrospectively and analyzed using IBM SPSS Version 25. A total 17559 prescriptions were reviewed for medication errors in which 13361 medication errors were intercepted. Among these patients who experienced medications errors 59% were males and 41% were females. The mean age of patients was found to be 50.29. The majority of medication errors intercepted were 70.68% prescription error. On assessment of severity based on NCCMERP Index, it was found that most of the medication errors belonged to category B (62%). Analysis of variance was used to assess the effectiveness of pharmacists interventions which was found to be statistically significant \* $P < 0.05$ . In this study male gender, age group of 50-70 years, medication error category B, prescribing error were found to be more prevalent. There was significant decrease in the incidence of medication errors which clearly indicates the impact of unit-based clinical pharmacists interventions in minimizing medication errors.

**Keywords:** Clinical Pharmacist, Pharmacists Intervention, Medication Errors, Clinical Pharmacy, Prescription Error

#### **INTRODUCTION**

India is a large and socioeconomically diverse country, and there could be evidence of all the stages of epidemiological transition in the country<sup>1</sup>. This epidemiological transition has given birth to life style diseases from which most of the patients suffers nowadays because of these co-morbidities it has become very difficult to manage their treatment with pharmacotherapy which often involves poly pharmacy and these difficulties gives rise to drug related problems. Irrational and unnecessary prescribing is common in India and antibiotic resistance is widespread and a major health issue as well<sup>2</sup>. Among these drug related problems, Medication errors are major contributors and they are under-reported and often goes unrecognized which leads to poor treatment outcomes and increased duration of hospitalization as well as increased cost of treatment<sup>3-5</sup>. According to Institute of medicine, medication errors are the most common type of medical error<sup>6</sup>. The National Coordinating Council for Medication Error Reporting and Prevention (NCCMERP) has given a comprehensive definition of medication error that is "A medication error is 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 consumer. Such events may be related to professional practice, health care products, procedures and systems, including prescribing, order communication, product labeling, packaging, and nomenclature, compounding, dispensing, distribution, administration, education, monitoring, and use"<sup>7</sup>. But when it comes to classification of medication error this topic is still widely debated. Critical appraisal of literature does shows some common types of medication errors<sup>8-17</sup>. We tried to put

together a simple classification of medication errors which is shown in Figure 1.

The NCCMERP has also provided an index which contains categories of medication errors based on their severity and harm<sup>18</sup>. The categorization of medication error is shown in Table 1.

Medication errors including near misses (Medication error that took place but captured before reaching to the patient) must not be taken lightly, and risk reduction strategies and systems should be established to prevent or mitigate patient harm from medication errors<sup>10</sup>. The major contributor in preventing these medication errors can be "Clinical Pharmacists". Although there are many studies which have already shown the significance of clinical pharmacist in preventing these errors but these are conducted in different parts of the world<sup>19-27</sup>. Since Clinical Pharmacy is in its infancy stage in India<sup>28</sup> limited data is available on this topic. In this study we tried to show the significance of having unit based clinical pharmacists who can timely detect, prevent medication errors and enhance the drug safety measures.

#### **Study objectives**

1. To assess the impact of clinical pharmacists interventions in prevention of medication errors.
2. To assess the severity of intercepted medication errors.
3. To find out the most prevalent medication errors in the hospital.

## MATERIALS AND METHODS

This retrospective study was carried out in Jaypee Hospital, Noida, Uttar Pradesh, India which is a multispecialty hospital with 338 bed capacity. The main aim of this study was to assess the impact of clinical pharmacists interventions in prevention and minimization of medication errors in the hospital. All In-patients that were admitted in the hospital over the study duration were included in the study. During their hospital stay medication errors were intercepted by unit based clinical pharmacists through reviewing their prescriptions and interventions were made and then reported to the Department of Clinical Pharmacology. The data was collected based on the Joint Commission International policies<sup>29</sup> and was obtained retrospectively of six months from November 2018 to April 2019 from Department of Clinical Pharmacology. The analysis was done using IBM SPSS Version 25. Descriptive statistics and parametric test such as Analysis of Variance (ANOVA) was used to analyze data. Since the study was retrospective in nature, no ethical permission was required to be obtained from the Institutional Ethics Committee.

## RESULTS

A total 17559 prescriptions were reviewed for medication errors. Among these patients majority of them 10169 (59%) were males and 7058 (41%) were females. The mean age of patients was found to be 50.29 ± 17.99 years. A total 13361 medication errors were intercepted. Details of medication errors intercepted month wise are shown in Table 2.

### Types of medication errors

Out of 13361 medication errors, the majority of them were 9444 (70.68%) prescription error, followed by documentation error 3836 (28.71%), dispensing error 31 (0.23%), indent error 23 (0.17), administration error 14 (0.10), transcription error 13 (0.09) respectively. Details of types of medication errors intercepted are shown in Figure 2.

In total 9444 prescription errors, the majority of errors were found to be non-mentioning of strength that is Prescribed 1 Tablet/Cap/Amp/Vial 2284 (24.18%), followed by use of prohibited abbreviation 2100 (22.23%), prescription not in capital letters 1808 (19.74%), prescription without dose 896 (9.48%) respectively. The rest of the details regarding types of prescription errors intercepted are shown in Table 3.

In total 3836 documentation errors, the majority of the errors were found to be prescriptions without mentioning date and time 1198 (31.23%), followed by prescription without doctor's signature 798 (20.80%), non-mentioning of any known allergy to drug and food in case sheet 610 (15.90%), not highlighting high alert drug 457 (11.91%), drug administration without counter signature 416 (10.84%) and others documentation errors 357 (9.30%). Details of documentation errors intercepted are shown in Table 4.

### Assessment of severity of intercepted medication errors

On categorizing the intercepted medication errors on the basis of their severity as per Index provided by NCCMERP, it was found that most of them belonged to category B (62%) i.e. circumstances or event that has a capacity to cause error, followed by category A (27%) i.e. error occurred but didn't reach the patient and category C (11%) i.e. an error occurred that reached the patient but did not cause any harm. Details are shown in Figure 3.

Analysis of variance (ANOVA) between medication errors and all months data was also observed to be statistically significant \*P < 0.05 at 95% confidence interval. Details are shown in Table 5.

## DISCUSSION

We acknowledge that this study might have some limitations such as absence of control group, missed opportunities and under-reporting. Also medication errors can be reduced with the help of multiple interventions<sup>13,20-23,25-27,30-34</sup>, no single intervention is superior<sup>33</sup>. Occurrence of medication error in our study was found to be very high as compared to other studies conducted in various parts of India and around the world<sup>22,23,31,32,35-38</sup>. In this study medication errors were found to be more prevalent in males (59%) as compared to their female counterparts (41%). Similar observation was made in other studies conducted in Mangalore, India<sup>39</sup> and Tehran, Iran<sup>23</sup> as well. The mean of the patients was 50.29 years, the reason behind this can be poly morbidity and poly pharmacy similar. Other studies have reported that the patients who experienced medication error mostly belonged to the age group of 50-70 years<sup>39,40</sup>. When it comes to the type of medication error, it was observed that prescription error (70.68%) and documentation error (28.71%) were most prevalent in the hospital. These findings are similar to the results reported by many studies<sup>19,32,35,39</sup>. Among prescription error the most common error was non-mentioning of strength for example Cap. Ecospirin AV 1 Cap OD and among documentation error the most common error was non-mentioning of date/time on prescription similar to the finding of other studies<sup>19,31,37,41-44</sup>. The major reason behind prescription error is non-adherence to WHO-core prescribing indicators and good prescribing practices<sup>45-47</sup> which was also observed in studies conducted in Jordan<sup>48</sup>, Pakistan<sup>49</sup>, India<sup>39</sup>, Saudi Arabia<sup>50</sup>. Another reason behind these errors can be suggests presence of depression and burn out syndrome in prescribers which is likely to cause these errors<sup>36</sup>.

While assessment of severity of medication errors as per NCCMERP index showed that most of the medication errors belonged to category A (62%) i.e. circumstances or event that has a capacity to cause error, followed by category B (27%) i.e. error occurred but didn't reach the patient and category C (11%) i.e. an error occurred that reached the patient but did not cause any harm which is quite opposite as compared to the observations made by other studies<sup>39,51</sup> if we bare the category B. Analysis of variance between medication error and all months data was statistically significant which reflects the impact of clinical pharmacist interventions that decreased the incidence of medication errors. The main driving force behind this is timely interception of errors as well as increased physician-pharmacist interaction.

## CONCLUSION

In this study male gender, age group of 50-70 years, medication error category B, prescribing error were found to be more prevalent. There was significant decrease in incidence of medication errors which clearly indicates the impact of unit-based clinical pharmacists interventions in minimizing medication errors.

### Directions for future research

1. Minimization of medication errors using single intervention and multiple interventions should be explored.
2. A large multicentre study using case-control group in assessing the impact of clinical pharmacists in minimizing the incidence of medication errors should also be explored by future researchers.

**Table 1: Categorization of Medication Errors as given by NCCMERP Index**

Category	Event	Outcome
A	Circumstances or event that has a capacity to cause error.	No Error
B	Error occurred but didn't reach the patient.	Error, No harm
C	An error occurred that reached the patient but did not cause any harm.	
D	An error occurred that reached the patient and required monitoring to confirm that it resulted in no harm to the patient and /or required intervention to preclude harm.	
E	An error occurred that may have contribute to or resulted in temporary harm to the patient and required intervention.	Error, Harm
F	An error occurred that may have contribute to or resulted in temporary harm to the patient and required transfer to other unit/critical care.	
G	An error occurred that may have contribute to or resulted in permanent harm of the patient.	
H	An error occurred that required intervention to sustain life.	
I	An error occurred that may have contribute to or resulted in patient death.	Error, Death

**Table 2: Medication Errors intercepted month wise**

Types of Medication Errors	November	December	January	February	March	April	Total
Prescription Error	1569	1754	1701	1678	1345	1397	9444
Transcription Error	4	0	4	3	2	0	13
Indent Error	15	0	7	0	1	0	23
Documentation Error	952	510	877	404	663	430	3836
Administration Error	2	0	2	3	7	0	14
Dispensing Error	8	3	15	5	0	0	31
<b>Total no. of Medication Errors</b>	<b>2550</b>	<b>2267</b>	<b>2606</b>	<b>2093</b>	<b>2018</b>	<b>1827</b>	<b>13361</b>

**Table 3: Type of Prescription Error intercepted**

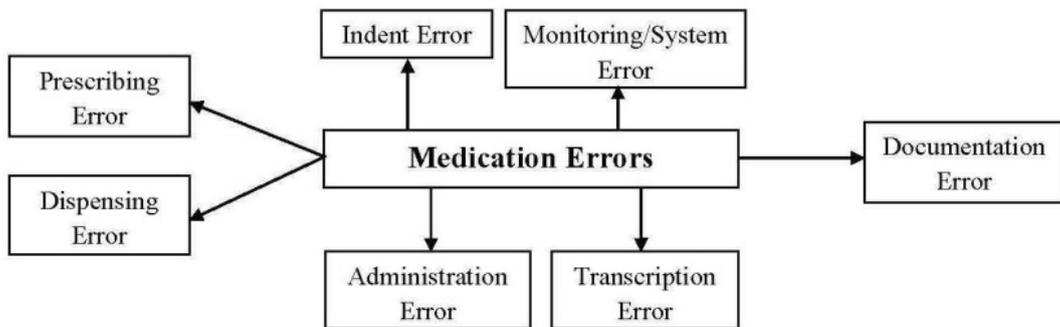
Prescription Errors	Frequency (n = 9444)	Percentage (%)
Drug Written illegibly	526	5.76
Prescription Not In Capital Letter	1808	19.74
Without Dose	896	9.48
Without Unit	786	8.32
Without/Wrong Route	365	3.86
Dosage Form Not Mentioned	305	3.22
Frequency Not Mentioned	266	2.81
Prohibited Abbreviation Used	2100	22.23
Prescribed 1 Tablet/Cap/Amp/Vial	2284	24.18
Duration of Therapy	76	0.80
Drug Duplication	32	0.33
<b>Total no. of Prescription Error</b>	<b>9444</b>	<b>100</b>

**Table 4: Type of Documentation Error intercepted**

Type of Documentation Errors	Frequency (n = 3836)	Percentage (%)
Prescription Without Dr's Sign.	798	20.80
Prescription Without Date/Time	1198	31.23
Admin. Without Counter Sign.	416	10.84
High Alert Drug Not Highlighted	457	11.91
Allergic Documentation	610	15.90
Other	357	9.30
<b>Total no. of Documentation Errors</b>	<b>3836</b>	<b>100</b>

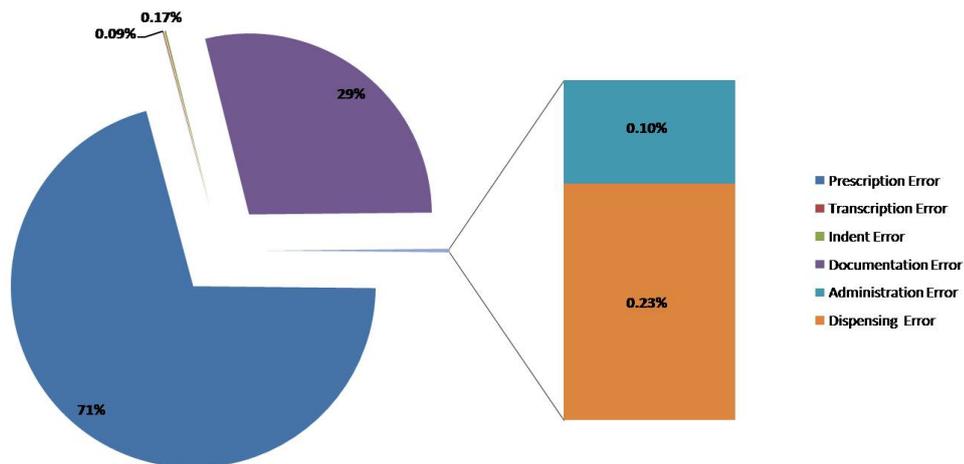
**Table 5: Analysis of variance (ANOVA) between medication errors and all months data**

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Total Dispensing error	Between Groups	.027	5	.005	2.708	.019
	Within Groups	34.909	17221	.002		
	Total	34.937	17226			
Total Documentation error	Between Groups	13.576	5	2.715	7.348	.000
	Within Groups	6363.688	17221	.370		
	Total	6377.264	17226			
Total Administration Error	Between Groups	.015	5	.003	3.472	.004
	Within Groups	14.972	17221	.001		
	Total	14.987	17226			
Total Indent Error	Between Groups	.007	5	.001	2.108	.061
	Within Groups	11.987	17221	.001		
	Total	11.994	17226			
Total Prescription Error	Between Groups	349.495	5	69.899	105.841	.000
	Within Groups	11373.024	17221	.660		
	Total	11722.519	17226			
Total Transcription Errors	Between Groups	.006	5	.001	1.599	.157
	Within Groups	12.984	17221	.001		
	Total	12.990	17226			

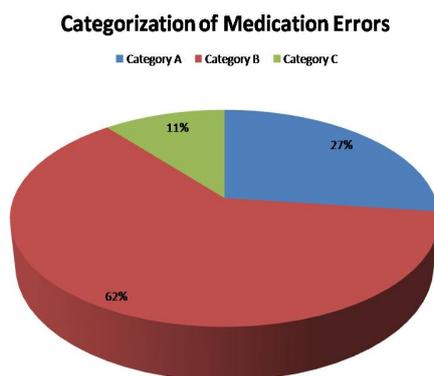


**Figure 1: Classification of Medication Errors**

**Types of Medication Errors**



**Figure 2: Types of Medication Errors intercepted**



**Figure 3: Severity of intercepted Medication Errors**

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