

# Monitoring and evaluating pattern of medication errors in general medicine department of a multispeciality hospital Chennai

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## ABSTRACT

### Purpose

**Our aim is to study the role, importance of clinical pharmacist in detecting the incidence of medication errors of inpatient general medicine department.**

### Methods

**A prospective cross sectional study was done with a total of 300 inpatient records of patient receiving treatment / discharge medication from the department of General medicine department were collected and analyzed for medication errors. The data collection was done using Patient profile form and medication error reporting forms along with medical rounds in order to check bedside medication errors and NCCMERP severity assessment index was used to categorise medication errors.**

### Results

**Out of 300 inpatient records, 182 (60.66%) medication errors were identified in which 110(60.43%) were males and 72(39.56%) of them are females. 51(30.5%) errors in number were Errors in medication ordering and transcription, 39 (23.3%) were errors in medication dispensing, 77(46.1%) were Nursing errors in medication administration. The main source of error was found to be physician (62%) among the healthcare professionals. Lack of knowledge/experience (64.83%) was found to be the main cause for the occurrence of medication errors in the hospital. Out of 397 drugs cardiovascular, gastrointestinal and miscellaneous agents 184(46.34%) were found to be more involved in medication errors. The majority of errors 101 (54.49%) belonged to the category Error, Harm.**

### Conclusion

**Our study clearly says that more number of clinical pharmacists to be employed based on the number of in-patients in a hospital so that adequate monitoring of bedside medication use can be achieved.**

**Keywords:** Medication errors, Types, Source, Causes, Drug, Severity.

## INTRODUCTION

Being pharmacists, we are aware of the complexity of drug use and drug related challenges at various levels, involving prescribers, pharmacists, and patients. Medically inappropriate, ineffective, economically inefficient use of pharmaceuticals is commonly observed in the healthcare system throughout the world, especially in developing countries, thus has a clinical and economic impact on the general public. Being a health professional in a developing nation, such as India, the necessity for ensuring safe, effective, economic use of drugs and the role of the clinical pharmacist in ensuring this advocates the need for research.

Medication errors that lead to iatrogenic injuries are a well-known worldwide phenomenon and are common, costly and clinically important. In 1910, Richard Clark published the first study that looked at error rates in clinical diagnosis. Since then, several studies have looked at the problem of medication errors. Medication errors are a common occurrence and continue to be a problem in the health care industry. It is estimated that the annual cost of drug related morbidity and mortality is nearly \$ 177 billion in the United States. Approximately 7,000 deaths occur each year and medication errors occur in just about 1 of every 5 doses given in hospitals. There is at least one death per day and 1.3 million people are injured each year due to medication errors. (1)

Absence of a gold standard for a drug safety surveillance system, variations in culture and clinical practice across countries makes it difficult for India to execute another country's practices.<sup>4</sup> The provision of quality, safe and accessible healthcare became the primary objective of most countries in the world, especially of the developing countries. It has become a trend in discussions at the local, regional and national levels to demand for safe reliable and evidence-based care. This implies that governments in developing countries including India have become more aware of and are becoming more committed to the provision of effective and reliable healthcare for their citizens. (2)

The National Coordinating Council for Medication Error Reporting and Prevention (NCCMERP) defines a medication error as being "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, use. (3)

Medication errors are of four major types:

- a. Prescription error
- b. Administration error
- c. Transcription error
- d. Dispensing error

**a. Prescription error**

Prescribing errors may be defined as the incorrect selection of drug or drug regimen for a patient. Such errors may include dose, indication, or prescribing of a contraindicated drug. Lack of knowledge of the prescribed drug, in terms of its recommended dose, clinical use, of the details of the patient's clinical condition commonly contribute to prescription errors. Prescription errors are divided into two types; omission (neglected or disregarded errors) and commission errors (error due to inadequacy; should not have been committed).

**b. Administration errors**

Administration errors occur when a discrepancy occurs between the drugs received by the patient and the drug therapy intended by the prescriber. Drug administration has long been associated with one of the highest areas in nursing practice, with the five rights" (giving the right dose of the right drug to the right patient at the right time by the right route) being the cornerstone of nursing education. Drug administration errors largely involve errors of omission where the drug is not administered for variety of reasons. Other types of administration errors include an incorrect administration technique and the administration of incorrect or expired preparation.

**c. Transcription error**

It is a specific type of error which occurs due to data entry error that is commonly made by the human operators. It can be defined as any deviation in translating the medication order from the previous step. (Order on the order sheet, medication administration record, nurse's notes/cardex, documentation of the order in the pharmacy database).

**d. Dispensing errors**

In this study, dispensing errors occurred when block pharmacist dispensed medication despite the presence of prescription errors. Dispensing errors usually occur at any stage of the dispensing process from the receipt of the prescription in the pharmacy to the supply of a dispensed medicine to the patient. Dispensing errors include wrong drug, wrong patient, and selection of the wrong strength or product.

The Institute for Safe Medication Practices (ISMP) identifies the following areas as potential causes of medication errors.

- Failed communication: handwriting and oral communications, especially over the telephone, drugs with similar names, missing or misplaced zeroes and decimal points, confusion between metric and apothecary systems of measure, use of nonstandard abbreviations ambiguous or incomplete orders
- Poor drug distribution practices.
- Workplace environmental problems increasing the job stress.
- Complex or poorly designed technology.
- Access to drugs by non-pharmacy personnel
- Dose miscalculations
- Lack of information to prescribers
- Lack of patient information
- Lack of patients' understanding of their therapy <sup>(4)</sup>

### **NCCMERP Severity assessment index**

#### **No error No harm**

**Category A** Circumstances or events have the capacity to cause error.

#### **Error No harm**

**Category B** Error occurred but it did not reach the patient

**Category C** Error occurred that reached the patient but did not cause harm (includes errors of omission)

**Category D** 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 prevent harm

#### **Error Harm**

**Category E** Error occurred that may have contributed to, or resulted in, temporary harm to the patient and required intervention.

**Category F** Error occurred that may have contributed to, or resulted in, temporary harm to the patient and required initial or prolonged hospitalization.

**Category G** Error occurred that may have contributed to, or resulted in, permanent harm to patient.

**Category H** Error occurred that required intervention necessary to sustain life.

#### **Error Death**

**Category I** Error occurred that may have contributed to, or resulted in, patient death.

#### **Harm**

Impairment of the physical, emotional, or psychological function or structure of the body and/or pain resulting there from.

#### **Monitoring**

To observe or record relevant physiological or psychological signs.

#### **Intervention**

May include change in therapy or active medical/surgical treatment.

#### **Intervention Necessary to Sustain Life**

Includes cardiovascular and respiratory support (e.g., CPR, defibrillation, intubation, etc.) \* An error of omission *does* reach the patient.

The preventive measures are as follows:

1. Training and education of nurses: Basic nursing education provides the foundation and necessary skills to be able to handle critical patient's condition and safe medication administration. Practice and continued education programs have placed a heavy emphasis on the administration stage of the medication. They use process that includes types of medication orders, dosage calculations, new medications and applying appropriate equipment to deliver medications. However, the study reveals that errors are traced to the states of prescription and administration as root cause of error. Hence it is suggested that effort should be directed at the development of curricula that target various component of medication use system. In addition, nurses are also found reluctant to report errors to their superior. The reason behind reluctance stems from unfriendly environment and longstanding practices that have been existence in health care, Focused efforts therefore directed at "culture change" within the hospital can reduce this reluctance.
2. Performance deficit: All in-charge nurses must be periodically trained and should be encouraged to report a wide range of safety information and adverse medication events
3. Drug name confusion: To minimize confusion between drug names that look or sound alike must be listed at the nursing station. Educate staff to be watchful of look-alike medications. Post facility-specific list at all nurses/medication stations.
4. Install computer system on nursing station: Control over the medication distribution system should start with entry of the order into the computer and continue through administration to the patient. The computer system must give signals at dosing times: In order to minimize omission errors and wrong time errors, the device should remind the nurse when a dose is due.
5. Computerized Physician Order Entry (CPOE): Various studies have shown that CPOE is effective in reducing medication errors. It involves entering medication orders directly into a computer system rather than on paper or verbally. This avoids misinterpretation of prescription.

6. Pharmacist training: Pharmacists must be trained properly to dispatch proper drug. If prescription is unclear then pharmacist should not dispatch drug by judging the medicine. Computerization will help eliminate many of the errors that occur when pharmacists misunderstand or misrecord medication names or dosages conveyed messily on paper. Hence hospital must create a computerized program that will assist in detecting similar names and that will help adopt more scientific approach to comparing names, " or sound alike.

7. Measures taken to decrease work load on nurses: Nurses mentioned heavy workloads, stress environment , high activities, complexity of the patients' needs, interruptions and poor communication among health care providers as reasons linked to adverse medication event. The majority of nurses felt overburdened by the amount of work they were assigned. "It often seems like I have too much work for one person to do," Of the workplace environment factors examined, statistically significant associations with medication error persisted for adequacy of staffing and resources, role overload, nurse-physician working relations, job security and co-worker support.

8. Motivating staff for effective communication: Between Nurses, Between Duty Medical Officer, Nurse, Between Consultant, Duty Medical Officer and Between Consultant, Nurse. Any changes in the patient medication order must be informed immediately by consultant/resident doctor to in-charge nurse.

9. Health-care workers: WHO report adverse events, near misses and other safety concerns should not be punished as a result of reporting.

10. The identities of reporters should not normally be disclosed to third parties.

11. Reported events should be analyzed promptly and timely.

12. Analyzing Reports: Reported events should be analyzed by experts who understand the clinical circumstances and care processes involved and who are trained to recognize underlying systems causes.

13. The entity that receives reports should be capable of making and disseminating recommendations. Participating organizations should agree to implement recommendations wherever possible. Recommendations for preventative strategies should be rapidly disseminated.

14. Avoid using abbreviations.

The **NCCMERP** recommendations to enhance safe medication administration are the following.

Clarify orders that cause concern

- Perform the following immediately prior to medication administration: the right medication, in the right dose, to the right person, by the right route using the right dosage form, at the right time, with the right documentation
- Provide adequate training regarding medication administration devices, including verifying that users demonstrate competency regarding the device
- Use an electronic infusion control device that prevents free-flow upon removal of the set.
- Use an integrated automated system to facilitate review of prescriptions, increase the accuracy of administration and reduce transcription errors
- Ensure that those who administer medications have adequate access to patient information as close to the point of use as possible
- Ensure that those who administer medications have easily accessible product information as close to the point of use as possible.
- Administer only medications that are properly labeled and that the label is read a total of three times including: when reaching for or preparing the medication, immediately prior to administering the medication, and when discarding the container or returning it to its storage location.
- Discuss with the patient and/or caregiver the name, purpose and effects of the medication at the time of administration.
- Monitor the patient for therapeutic and/or adverse medication effects.
- Consider the role of the work environment when assessing patient safety.
- Collect and analyze data with regards to actual and potential errors of administration.
- Provide initial and ongoing training for staff regarding accepted standards of practice related to accurate medication administration.
- Establish policies and procedures for the medication administration. (5)

## MATERIALS AND METHODS

The study was a prospective cross sectional study conducted in general medicine department of a multispecialty hospital in Chennai, Tamil Nadu for a period of six months. The permission of Institutional Ethical Committee was taken to conduct this study. A total of 300 inpatient records of patients receiving treatment/discharge medication were collected and analysed for medication errors. The data collection was done using Patient profile form and medication error reporting forms along with medical rounds in order to check bedside medication errors. NCCMERP severity assessment index was used to categorise medication errors based on its severity. The type of drugs involved in the medication errors were analysed. The source of errors, cause and gender-wise distribution were also identified and studied in detail.

## RESULTS AND DISCUSSION

The present study is based on data obtained from 300 prescriptions. Table 1 shows that out of 300 patients, 225 (75%) were males and 75 (25%) were female which is similar to the study conducted by Karna *et al.*; 2012 (i.e 77.4% males and 22.6% females)<sup>1</sup>. (6)

The overall incidence of medication error was found to be 60.66% among them Prescription error (37.33%), Transcription error (2%), Dispensing error (1.33%), Administration error (4%), Documentation error (8%) and Drug stability error (7.6 %) as shown in Table 2. Prescription error was found to be more than the other types of errors followed by documentation errors compared to the study conducted by Karthikeyan *et al.*; 2013 in which the order is as follows: Administration errors (28.35%), Prescribing error (22.38%), Dispensing error(8.9%),compliance errors (4%) monitoring error (3.36%),potential errors (30.15%) and other errors (1.86%).(4)

The main source of error was found to be physician (62%) followed by nurse (36%) whereas the least source of error was found to be pharmacist (2%) as seen in Table 3.

Lack of knowledge/experience (64.83%) was found to be the main cause for the occurrence of medication errors in the hospital followed by 21.42% medication errors occurred due to the failure to adhere to the work procedure (Table 4).4.39% medication errors occurred due to peak hour and illegible prescription (6.04%) was found to be another reason for the occurrence of medication error. This when compared to the study conducted by Jhanjee *et al.*;2012 shows the result as illegible prescription 22%, prescription with duplicate items 16%, drugs with the same indication 5%, wrong frequency 4.5%, drug without administration route 20%, drug without doses 30%, dose higher than recommended 14%, wrong drug 2%, wrong dose 13%, drug- drug interaction 4%, prescriber signature missing 8%, abbreviated and non-standard drug names 8% and error prone abbreviations, symbols and dose designation 28%. (6)

A total number of 300 prescriptions were audited out of which 397 drugs were involved in medication errors.(Table 5)While topical agents and antineoplastic agents showed least incidence of medication errors; cardiovascular (13.35%), gastrointestinal (13.35%) and miscellaneous agents (19.64%) were found to be more involved in medication errors than other class of drugs which when compared to the study conducted by Karna *et al.*; 2012 i.e cardiovascular 28(16.7%), infectious 25(14.9%), antibiotics 22(13.1%), gastrointestinal 12(7.1%), respiratory 7(4.1%), endocrine 7(4.1%) NSAIDs 7(4.1%), steroids 6(3.5%), antidiabetic 6(3.5%), musculoskeletal and joint 4(2.3%), diuretics 6(3.5%) and anticoagulants 4(2.9%). (7)

The severity level assessment of medication errors revealed that majority of errors (55.49%) belonged to the category Error, Harm followed by (40.65%) errors belonged to the category Error, No harm and then by (3.84%) errors belonged to the category No error (Table 6). None of the errors belonged to the category Error, Death compared to the study conducted by A.M Kadam *et al.*;2009 in which the results were No error (2.8%), Error No harm (97.2%),Error Harm(0) and Error Death (0). (8)

The study has shown that it is feasible for the hospital to use a web based indenting system. Also we cannot be certain of accuracy or completeness of reported errors-a problem consistent with any spontaneous reporting system. It is feasible to implement a large scale web based medication error reporting system in long term care facilities, such a system can collect a detailed information on the characteristics of medication errors. It would be interesting to study and compare the relative prevalence of medication error in Intensive Care Units (ICU). It would be worthwhile to assess if the prevalence of the medication errors is different in the prescription of other departments like Cardiology, Neurology and Gynecology.

Table 1: Demographic detail of patients encountered with medication error

Patients gender	Prescription without medication errors (N=300)	Prescription with medication errors(N=182)
Male	225	110
Female	75	72

Table 2: Types of Medication Errors.

Types of medication error	No of patients(N=182)	Percentage (%)
Prescription error	112	37.33%
Transcription error	6	2%
Dispensing error	4	1.33%
Administration error	13	4%
Documentation error	24	8%
Drug stability error	23	7.6%

Table 3: Source of error.

Source	Number	Percentage
Physician	112	37.33%
Nurse	65	21.66%
Pharmacist	4	1.33%

Table 4: Underlying causes of medication error.

Underlying cause	No of errors (N=182)	Percentage (%)
Illegible prescription	11	6.04%
Peak hour	08	4.39%
Failure to adhere to the work procedure	39	21.42%
Lack of knowledge/experience	118	64.83%
Others	06	3.29%

Table 5: Drug class involved in errors.

Drug class	No of drugs	Percentage
Anti-infective drugs	51	12.84%
Cardiovascular agents	53	13.35%
Central nervous system agents	36	9.06%
Nutritional products	22	5.54%
Gastrointestinal agents	53	13.35%
Coagulation modifiers	28	7.05%
Metabolic agents	23	5.79%
Hormones	18	4.53%
Respiratory agents	17	4.28%
Topical agents	1	0.25%
Genitourinary tract agents	6	1.51%
Psychotherapeutic agents	10	2.51%
Antineoplastic agents	1	0.25%
Miscellaneous agents	78	19.64%

Table 6: Severity index of medication error based on NCCMERP Scale.

Level of severity	No of medication error (N=182)	Percentage (%)
No error	7	3.84%
Error, No harm	74	40.65%
Error, harm	101	55.49%
Error, Death	0	0

### CONCLUSION

The percentage of errors in a multispecialty hospital with two clinical pharmacists was found to be 60.66% which implies that the percentage of errors might have been more in their absence. Finally this study shows that the prescription errors were found to be the most common followed by documentation error, drug stability errors, administration error, transcription and dispensing error. Our study has proven that there is a specific need for more number of clinical pharmacists based on the number of in-patients in a hospital so that there can be a much improved monitoring of bedside medication use.

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