



Clinical Research: Medication Errors and its Root Cause Analysis in Multispecialty Hospital

Chaital Nikhil Shah¹, Nilay Solanki²

¹Department of Clinical Pharmacy, Ramanbhai Patel College of pharmacy, Charusat, Changa.

²Department of Pharmacology, Ramanbhai Patel College of pharmacy, Charusat, Changa.

Research Article

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Corresponding Author:

Chaital Nikhil Shah

B/22 Purshottam Nagar, Harni Warasia Ring Road, Vadodara – 390022.

Contact: (M) +91-9426974224, +91-9574172227, (R) 0265-2490554.

E-Mail: chait473@gmail.com

Abstract

Potential activation of clinical pharmacist role is of great importance in reducing medication errors which are a well-known problem in hospital. The medication error could be prescribing error, dispensing error, transcription error and administering errors. Present study was aimed to detect and evaluate the incidence, types of medication errors and to find the root cause analysis of medication errors in the multispecialty hospital, Baroda. Prospective study was carried out from June 2012 to April 2013. Inpatients records of patients from three different departments were reviewed during their stay in hospital. Detected medication errors were documented and evaluated. A total of 300 cases of the patients were selected, among them 38% were male and 62 % were females. 51% of them were in the age group of 40 to 60 years. 117 medication errors were detected in patients. The overall incidence of medication error was found to be 39 %. A total of 117 medication errors were observed, among them Transcription error accounts for 28(24%), Prescription error holds maximum 62 (53%), Dispensation error accounts for 11 (9%) & Administration error holds for 16 (14%). This study concluded that 39 % medication errors were detected during study period and revealed that clinical pharmacist can play a major role in preventing these errors by early detection.

Keywords: Medication error, Inpatient ward, Hospital, root cause analysis, patient safety

Introduction

The National Coordinating Council for Medication defined a "Medication Error" as follows:

"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."^[3]

Types of Errors:

Prescribing Errors

Prescribing errors may be defined as the incorrect drug selection for a patient. Such errors can include the dose, quantity, indication, or prescribing of a contraindicated drug. Lack of knowledge of the prescribed drug, its recommended dose, and of the patient details contribute to prescribing errors.^[4,5]

Dispensing Errors

Dispensing errors 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.^[6]

Dispensing errors occur at a rate of 1–24 % and include selection of the wrong strength or product. This occurs primarily with drugs that have a similar name or appearance. Lasix® (frusemide) and Losec® (omeprazole) are examples of proprietary names which, when handwritten, look similar and further emphasise the need to prescribe generically. In the US, the Food and Drug Administration has insisted that the proprietary name of Losec® be changed as a result of a number of fatalities associated with this confusion. Elsewhere, the name Losec® remains.^[6,7]

Administration Errors

Administration errors occur when a discrepancy occurs between the drug received by the patient and the drug therapy intended by the prescriber.



Drug administration has long been associated with one of the highest risk 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 a variety of reasons.^[8]

Transcription Errors

Transcription involves both the orders that are manually transcribed onto manual record (e.g., medication administration record (MAR)) and electronically transcribed into computer systems (MAR).

Types of transcription errors include: wrong medication, time, dose, frequency, duration, rate patient/chart, verbal order misunderstanding, verbal orders not entered into SCM system, orders entered into SCM that are discrepant from the medication history, order not manually transcribed onto MAR, wrong scheduling of doses in the MAR.^[9,10]

➤ Role of clinical pharmacist for study of Medication Error^[11]

- Examine and evaluate causes of medication errors.
- Analyze aggregate data to determine trends, significance, frequency, and outcomes of medication errors.
- Communicate the results of the medication error program to healthcare practitioners, patients, and caregivers as appropriate.
- Medication use is a complex process in an institutional setting, it starts with physician prescribing, followed by nurse transcribing, pharmacist dispensing, medication administration, and patient monitoring.
- Many safeguards have been recommended for each of these phases, including the application of a computerized physician order entry system (CPOE), point-of-care unit dose-dispensing cabinet, and bar-coding technology.
- They can also play a leadership role in educating other healthcare professionals and advocating safe medication use.
- There is an important role for pharmacists, both in leading research efforts and in implementing best and safe practice in the hospital setting.

The main objective is to evaluate different types of **medication error** by studying drug prescribing, dispensation, administration and transcription error by improving safety aspects of medication used by patient. To study evaluate of medication error for improvement in patient safety and health at multispecialty hospital in Baroda.

Material and Method

Study setting:

The study was carried out at in-patient Department at multispecialty Hospital during the period of June 2012 to April 2013 Research work.

Study Design:

This study is Cross sectional and Observational study in which patients receiving medication during treatment were included and studied.

Study criteria:

Patients of General ward, Semi ward, ICU ward were considering for the study by selecting following criteria:

Inclusion Criteria:

- Case sheets of Patients who admitted to General ward, Semi ward, ICU ward Departments.
- Patients who were willing to participate in the study.
- Genders Eligible for Study: Both

Exclusion Criteria:

- Patients who refused to take medication.
- Patients who were not willing to participate in the study

Sample size: 300 cases collected from variety of diseased patient and accidental condition.

Study Timeline:

- From the file of Inpatient department Data collection
- Data scrutiny and statistical analysis
- Reporting procedures- report to pharmacy and quality department.

Source of data:

Hospital and medical records, Case sheet of the inpatient department who were admitted in General ward, Semi ward, ICU ward department.

Ethical clearance:

- The study was approved by Institutional Ethics Committee for Human Research of Ramanbhai Patel College of Pharmacy, CHARUSAT, and Changa, and issued ethical clearance certificate.

- Permission from CEO of multispecialty hospital is consider regarding study, and issued certificate.

Study Procedure:

I.The medication errors were analyzed through a Cross sectional observational study conducted over a period six months at General ward, Semi ward, ICU ward under department of multi-specialty Hospital at Baroda, Gujarat, India.

II.Prior approval from Institutional Ethics Committee of Human Research at Ramanbhai Patel College of Pharmacy, CHARUSAT, and Changa, is obtained and documented. Also Permission from CEO of Sterling hospital is already taken regarding study/project work.

III.The prescriptions are chosen randomly and/or the details are collected of the patients. The data for present study is collected by review method. During the study inpatients case records was reviewed,



which includes patients case history, diagnosis, physician medication order sheets, nurse medication administration records, laboratory investigations and report of other diagnostic tests. This information is documented in the patient profile form. Whenever Medication error is identified, during the review data from patient profile form is transferred to medication error reporting and documentation form.

IV. All medication errors documented are analyzed for following parameters such as demographic status of patients, age wise distribution of the errors, professionals involved in the errors, Causes of medication errors, Incidence of medication errors, types of medication errors and system wise distribution of errors.

V. Medication errors are also assessed for its severity level by using the national coordination council for medication error reporting prevention proposed medication error index.

VI. Each prescription is checked twice for medication errors. All the data was represented as percentages.

Results and Discussion

Medication Error

A medication error is an episode associated with use of medication that should be preventable through effective control system. The factors that that increases the chance of medication errors are the attributes of complex mechanisms involved in the prescribing, transcription dispensing and administration of drugs. Many authors have reported mechanisms for reducing medication error include reduced reliance on memory, improved asses to drug information, simplification, standardization and training. Substantial evidence suggests that pharmacists in decentralized patient care setting can reduce the frequency of medication errors.

Demographic status of the patients A total of 300 patients were considered & analyzed in General ward, Semi ward, ICU ward Departments During the following study period. The cases were analyzed based on the following parameters,

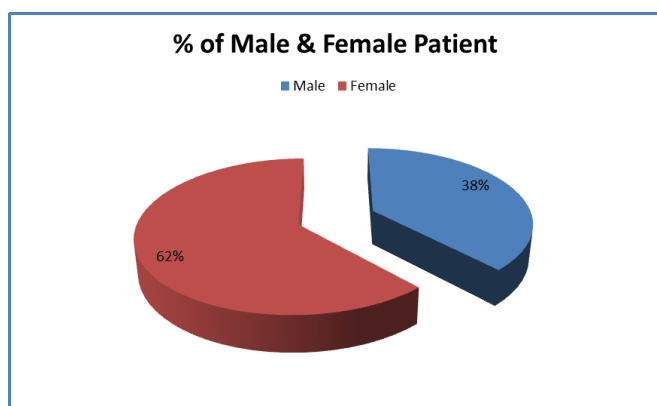


Figure 1: Demographic status of the patients Male - Female distribution

The demographic reports of our study showed total 300 patients were evaluated for Medication error, out of these 300 cases 62 % were Female & 38 % were male cases. Total 117 cases out of 300 patients were found with the medication

errors found which were 39 % of the total sample size show in figure 1. Similar result obtained in study which was conducted by *Khavane Karna1 et al* [2]. Prospective study was carried out from February 2012 to August 2012. it was concluded that Inpatients records of patients from six units of medicine department were reviewed during their stay in hospital and detected medication errors were documented and evaluated. A total of 500 cases of the patients were selected, among them 60.4% were male and 39.6% were females. [2]

Medication Error Age -Wise Distribution

Table 1: Age – Wise Distribution of Medication Errors

No of patients	< 20 years	20-40 year	40-60 year	> 60 year
300 (Total number of patients followed)	16	73	126	85
117(Patients with medication errors)	5(4%)	18 (15%)	60 (51%)	34 (29%)

The demographic reports of our study showed age-wise distribution (tables 1), 4% of patients were found below 20 years of age, 15% of patients were found between 21 to 40 years of age group, 51% of patients were found between 41 to 60 years of age group, and 29% of patients were found above 61 years of age group (table 1). Similar study was conducted by Massachusetts Board of registration in pharmacy showed that higher incidence of medication errors in patients ranged between 31-40 years of age but in the study conducted by *Leelavati D.Acharya et al* [12] year 2012 similar results in showed higher incidence of medication errors in age group of 40-60 years and our study also showed the higher incidence of medication errors in age group between 40-60 years. This can be attributed to the fact that more number of patients (37.1%) visited the hospital during study period was also ranged between 40-60 years of the age groups. [12]

Medication Error Wise Distribution of Male-Female Patients

In Table 2 Transcription error occurrence rate gender wise accounts for 16 in male & 12 in female patient, Prescription error accounts for 40 in male & 22 in female patient, Administration error accounts for 11 in male & 5 in female patients, & Dispensation error accounts for 7 in male & 4 in female patients



Table 2: Medication Error Wise Distribution of Male-Female Patients

Types of Medication Error	Male Patient	Female Patients	All Patients
Transcription error	16	12	28
Prescription error	40	22	62
Dispensation error	7	4	11
Administration error	11	5	16
Total error Occurrence	74	43	117
Percentage (%) Distribution	62% (74/117)	38% (43/117)	100%

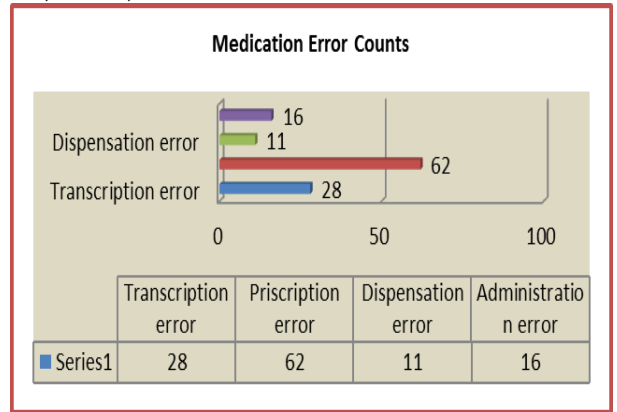


Figure 3 : Type-wise Counts of Medication Errors

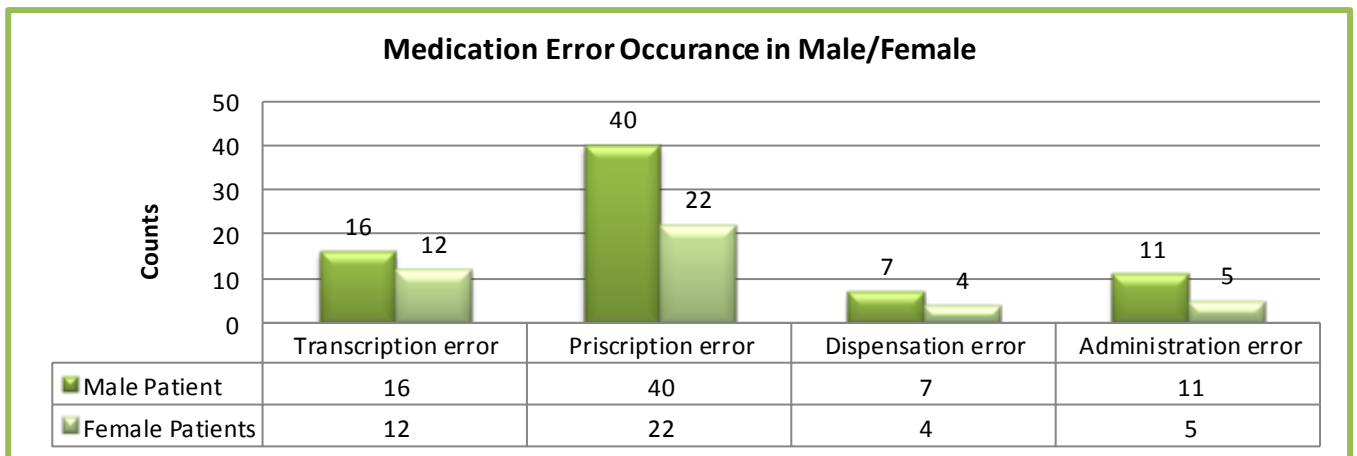


Figure 2: Medication Error Wise Distribution of Male-Female Patients

Our study shows (Table 3) that out of 117 medication errors, Transcription error accounts for 28(24%), Prescription error holds maximum 62 (53%), Dispensation error accounts for 11 (9%) & Administration error holds for 16 (14%). Similar results The study conducted by the *Almut G. Winterstein et al.* [2] Showed that prescription errors are the most common among all the types of errors which was also supporting our study results of higher numbers of prescription error.

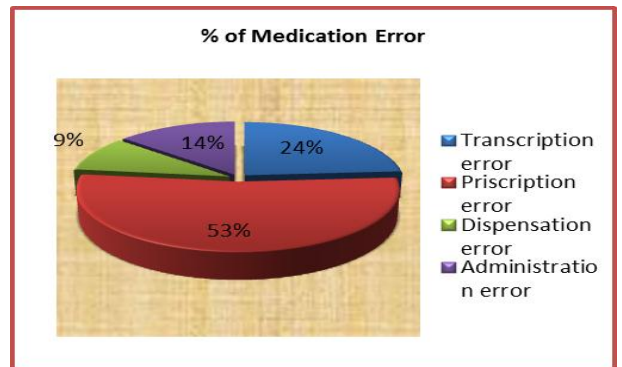


Figure 4: Percentagewise Distribution of Medication Errors

Table 3 : Type-Wise Distribution of Medication Errors

Types of Medication Error	Total Cases	Medication error Counts	% of Medication Error WRT total no. cases (300)	% of Error WRT total M.E occurred
Transcription error	300	28	9% (28/300)	24% (28/117)
Prescription error	300	62	21% (62/300)	53% (62/117)
Dispensation error	300	11	4% (11/300)	9% (11/117)
Administration error	300	16	5% (16/300)	14% (16/117)
		117	39	100

Root causes of medication errors

- Root Cause Analysis (RCA) method is used for analysis of data, as it is a way to identify the cause that is most directly responsible for errors. The Joint



Commission on Accreditation of Health Care Organizations (JCAHO) now requires all institutions to undertake RCA (Root Cause Analysis) of all sentinel events. RCAs are multidisciplinary reviews of serious errors, which help to identify underlying causes or factors that may have contributed to the medication errors, details shown in table: 4.

Table 4 : Root Causes of Medication Errors

Prescription error 62 (53%)	
Illegible handwriting.	21 (34%)
No dosage form prescribed.	33 (53%)
Wrong Brand name prescribed	8 (13%)
Transcription error 28 (24%)	
Wrong drug is transcribed	28 (100%)
Administration error 16 (14%)	
Wrong dose is administered	9 (56%)
Drug administered through wrong route	1 (6%)
Wrong drug is administered	5 (31%)
Drug administered which is not appropriate for Indication	1 (6%)
Dispensation error 11 (9%)	
Urgent dispensation not done within 10 to 15 minutes	3 (27%)
Wrong dose dispensed	7 (64%)
Wrong form of drug dispensed	1 (9%)

The root cause analysis of different types of medication error showed various cases report found to be 117 (39%) cases as in Table 4, factors responsible for Prescription error were Illegible handwriting holds for 21 (34%), No dosage form prescribed accounts for 33 (53%) & Wrong Brand name prescribed holds for 8 (13%) cases, factors responsible for Transcription error were Wrong drug is transcribed accounts for 28 (100%), factors responsible for Dispensation error were Urgent dispensation not done within 10 to 15 minutes holds for 3 (27%), Wrong dose dispensed accounts for 7(64%) & Wrong form of drug dispensed holds for 1 (9%) & factors responsible for Administrative errors were Wrong dose is administered holds for 9 (56%), Drug administered through

wrong route accounts for 1 (6%), Wrong drug is administered holds for 5 (31%) & Drug administered which is not appropriate for Indication holds for 1 (6%). Similar results obtained in the study conducted by *Mr. Khavane Karna B^[2]*, studied root cause analysis of the total 54 medication errors identified in the study, out of which 36(66.6%) errors were due to nurses, however 10(18.8%) errors were due to Pharmacists in this (20%) were due to illegible handwriting by physician, (30%) were due to high workload, in this (62.5%) were due to unclear order, (37.5%) were due to wrong order which may due to the fact that most of time post-graduates were involved in writing medication order. Our study result supports above mentioned data.

Firstly in illegible handwriting found to be 34% in our result, supported by study of *Mr. Khavane Karna B^[2]* which was found 20%, Secondly Medication error due to physician involvement in our study showed 53%, study conducted by *Mr. Khavane Karna B^[2]* was found 62.5% which supports our study results.

Our study contains higher numbers of medication error cases of 117 compare to the study conducted by *Mr. Khavane Karna B^[2]* which had 54 cases that contraindicated to our study.

Conclusion

Most of the medication errors were of Prescription error & Transcription error were accounts for almost 77% of the total error. In nutshell almost 80% error were happening due to these two types of problems, which according to Pareto Principle (80:20 Principle).

The root cause analysis of Medication error, Prescription error holds for 53% & the main causative factor is No dosage form prescribed, Transcription error accounts for 24% & the main causative factor is wrong drug transcribed.

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AUTHORS' CONTRIBUTIONS

Authors contributed equally to all aspects of the study.

PEER REVIEW

Not commissioned; externally peer reviewed.

CONFLICTS OF INTEREST

The authors declare that they have no competing interests.