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Medication Error type, Frequency, Rate and Prevention in a NABH accredited Indian Multi-Specialty Hospital

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ABSTRACT

Aim: *The study was aimed to evaluate type, frequency and rate of medication error in a NABH accredited hospital. This detects different categories of medication error, gives a ring of awareness to healthcare professionals including Physicians, Nursing and Pharmacists to ensure ethical, effective and rational drug use to the patients. It suggests to process medication after prescription review.*

Methods and Material: *This observational study was carried out in a well established, NABH accredited tertiary care multispecialty hospital with all clinical facilities as similar in developed countries. It's an observational study where a total of 900 active patient records i.e. 300 files in each month were audited and reviewed after random, unannounced control visits over a period of three months for presence of medication errors in all inpatient departments including Cardiology, Urology, Nephrology, General medicine, Endocrinology, Gynaecology , ICUs and Paediatrics. The data was collected using different forms including medication audit tool and medication error reporting form after reviewing prescription charts, administration chart, and drug storage, labelling, dispensing and interviewing patients where ever required. The medication error rate (MER) was calculated.*

Results: *MER was found to be 7.96% against the standard acceptable error rate of 5%. An average of 4.5% of ME were observed related to prescription only, and rest were 1.15% administration, 0.57% monitoring error and 0.39 % dispensing errors. Among prescription errors, therapeutic duplication (analgesics, beta blockers, calcium channel blockers, multivitamins, and bronchodilators) was a major subclass of medication error being observed in this study.*

Conclusions: *The study concludes that medication errors are occurring at high frequencies and rate, which needs unbiased attention. There is a need to give more emphasis to medication errors which reaches to patient (ME). Also every healthcare institution must make medication error reporting their priority thus patient safety.*

Key-words*: Therapeutic Duplication, Patient Safety, Training and Education, Clinical Pharmacists.*

INTRODUCTION

Almost everyone in the modern world takes medication at one time or another. Medication is a broad term which not only includes prescription medicines but also the over the counter (OTC) medicines and dietary supplements.

Ethical, effective and rational drug therapy had just remained a goal of healthcare providers on hoardings, as with time our healthcare system has advanced but patient safety is still an area of concern. In recent times the patient safety has been highlighted for the wrong reasons as medication errors reports are increasing [1]. 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 healthcare professional, patient or consumer [2]. Most of the time medication errors are human made and occur when planned actions are either incorrect or are not properly executed. Medication errors need serious concern as they have the potential to cause patient harm, and their severity ranges from small injuries to death of the patient.

Approximately, 30% of problems occurring during hospitalization are related to medication error [3]. India records 5.2 million medical injuries a year; 43 million people are injured worldwide each year due to unsafe medical care [4]. A number of studies have shown that medication errors and adverse drug reactions (ADRs) are one of the main causes for adverse events in hospitals leading to disability and death in up to 6.5% of hospital admissions [5-9].

The main pillars of healthcare are Physician, Nurse and Pharmacists, when all of them will work in a stream line way, the chances of medication error will automatically decrease. Medication error occurs when there is miscommunication among physician, nurse, pharmacist, patient and other healthcare staff. This might be due to lack of knowledge, improper drug storage, labelling, Packaging, confusion or unawareness to Look Alike Sound Alike (LASA) drugs, handling of High risk drugs (Insulin, Potassium chloride, Heparin, Narcotics and anticancer drugs etc). Other causes of medication error include non adherence to established standard protocols and practices. Sometime medication error could also occur due to noncompliance of patient to given instructions.

Few years back there was no medication error reporting system available in any of Indian healthcare institutions, but because of increasing competition, medication error reports and patients awareness about use of medicine has provoked the need of quality improvements in healthcare. For this reason, every hospital or healthcare institution are trying to meet the specifications of different accreditation bodies like National Accreditation Board for Hospitals and Healthcare Providers (NABH), JCI (Joint commission international) etc. Some healthcare institution had made it a priority to reduce medication error, for the same they are adopting various strategies like giving regular training to their staff on medication management and uses, safe practices in every step from procurement of a drug to administration and monitoring in patients, also they are referring standard protocols like National Coordinating Council for Medication Error Reporting and Prevention (NCC-MERP), Institute for the safe medication practices (ISMP), world health organization (WHO) etc.

METHODOLOGY

This observational study was carried out in a 675 bedded well established, NABH accredited tertiary care hospital with all clinical facilities as similar in developed countries. Study

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population consists of hospital staff Doctor, Pharmacist, Nurses and inpatient.

A total of 900 active patient records i.e. 300 files in each month were audited and reviewed after random, unannounced control visits over a period of three months for presence medication errors in all inpatient departments including Cardiology, Urology, Nephrology, General medicine, Endocrinology, Gynaecology , ICUs and Paediatrics. The focus was mainly made on different steps of medication process including prescribing, dispensing, administering, monitoring and documentation. Medication errors were classified both on the basis of, process involved (Prescription error, Duplication error, Indenting error, dispensing error, administration error, documentation error & monitoring error) and NCCMERP index (Type A to Type I) [2]. As per outcome medication error were also classified as actual medication error (ME) and near miss medication error (NM). ME is medication error which reaches to the patient and NM is opportunities for errors or error which were either stopped and corrected before reaching to patient.

To collect data related to both ME and NM two standard protocols, Form 1 medication audit tool (MET), Form 2 Medication error reporting form (MERF) were prepared and used. Different locations in the hospital were visited daily and an average of 12 active patient files were reviewed, but no closed or discharge patient file was audited. Any discrepancy in the medication process was registered according to the criteria in Form 1.

Form 1

Medication Audit Tool

Date, Pt. Name, Age, Reg. No.
Error due to Illegibility
Without Date
Without Time
Wrong Drug
Wrong Dose
Without Dose
Wrong Route
Without Route
Wrong Frequency
Without Frequency
Therapeutic Duplication
Without Dilution and Drip Rate
Error Prone Abbreviation Used
Without Dr Name Sign/ID
Wrong Drug Dispensing
Delayed Dispensing
Wrong Administration
Delayed Administration
Without Insulin Sliding Scale
Without culture sensitivity
Verbal Order
Allergy Documentation not Done

Form 2

Medication Error Reporting Form

Pt. Name (Initials)…… Age/Sex……..Reg. No……. Location……
Date of error ……/……/… Date of Reporting ……. /…. /……
Name of Drug (Generic)……
Therapeutic Class of Drug……
Detail of Error ……..
Error reaches to pt. Yes No

Error Type	**Subclass of Error**	**NCCMERP Index**
Prescription error	Wrong Drug	Type B
Duplication error	Wrong Dose	Type C
Transcription error	Wrong Frequency	Type D
Indenting Error	Wrong Route	Type E
Dispensing error	Allergic Drug	Type F
Administration error	Therapeutic Duplication	Type G
Documentation error	Drug – Drug Interaction	Type H
Monitoring Error	Drug- Food interaction	Type I
Other……	Other……	

Brief Explanation or Comments of Staff Concern (if applicable): ……..
Reason of Error: ……
Comments of reporting person "How this error could be prevented": ……..
Reporting person (Name)…… **Sign/ ID**……
Root cause analysis (if applicable):
Action Plan to avoid such medication error (If applicable): ……..

The medication error rate (MER) was calculated (Table 2) by using formula: Number of Actual medication error (ME) / No. opportunities for errors (NM) x 100. MER of 5% or above indicates that the facility has systemic problems with its drug distribution system and a deficiency should be written [10].

1. Action taken to prevent medication error:

When a ME was encountered, the MERF (Form 2) was filled and for NM data was compiled on MET (Form 1). The filled MERF was sent to concerned staff within 24 hours, so as to bring the active error in to staff notice; could be prevented as soon as possible. And MAT was sent on every 15th day basis. Also, little education and training was given to nursing, pharmacists on medication error and patient safety, in which they were taught definition of medication error, types of medication errors, difference between medication error and adverse drug reaction (ADR), drug storage, standard protocols and practices necessary to be adopted during medication process.

2. Data analysis and interpretation:

2.1. Medication error as per process involved:

The collected data **(Table 1)** was analyzed and the rate of change in medication error incidence was calculated **(Table 1, Chart 1).** Among all type of errors four were found most active, the frequency of occurrence was: prescription errors > Administration errors > monitoring errors > Dispensing errors.

Table No. 1: showing data of three months on actual and near miss medication errors based of process involved

		ME (%)	Avg. ME (%)	NM (%)	Avg. NM (%)
Prescription error	1st Month	**6.1**	**4.19**	73.7	72.65
	2nd Month	**3.61**		76.1	
	3rd Month	**2.86**		68.16	
Dispensing error	1st Month	**0.4**	**0.39**	0	0.12
	2nd Month	**0.36**		0.36	
	3rd Month	**0.41**		0	
Administration error	1st Month	**1.2**	**1.15**	0.8	0.67
	2nd Month	**1.44**		0	
	3rd Month	**0.82**		1.22	
Monitoring error	1st Month	0	**0.57**	0	0.27
	2nd Month	**0.36**		0	
	3rd Month	**1.63**		0.82	
Documentation error	1st Month	0	**0**	12.6	8.66
	2nd Month	0		10.11	
	3rd Month	0		3.27	

2.1a Actual Medication Errors (ME):

In the 1st month 6.1% prescription, 1.44 % administration, 0.4% dispensing and no monitoring errors were encountered. Most of the prescription errors were related to therapeutic duplication for analgesics, beta blockers, calcium channel blockers, multivitamins, and bronchodilators and administration, dispensing errors were related to wrong drug, wrong dose and wrong time. But a significant decrease in all type of medication error was seen in 2nd and 3rd month except monitoring errors which were found increased to 1.63 % (mainly for Insulin); a matter of concern.

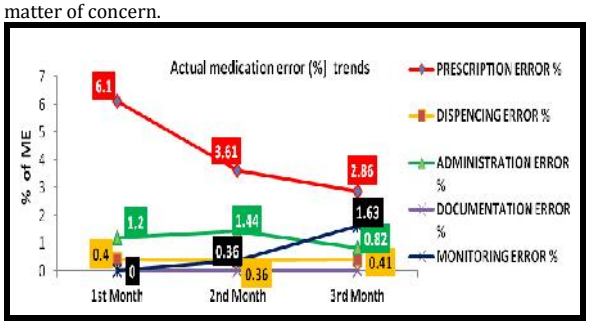

Chart 1: Representing trends of actual medication error on the basis of process involved

2.1b Near miss medication errors (NM):

Most of these errors were prescription, documentation related but few of them were encountered during administration, dispensing and monitoring. They mainly include use of error prone abbreviation, without date, time, doctor sign, dilution, drip rate, wrong drug, frequency, and verbal orders etc. a decrease in these errors can also be seen from Table. 1.

Table No. 2: Month wise MER and Average MER data

Month	MER (%)	Avg. MER (%)
1st month	8.80	7.96
2nd Month	7.50	
3rd Month	7.59	

3. Medication errors as per NCC-MERP Index:

NCCMERP index defines the potential of error to cause harm. According to NCCMERP index circumstances or event that have capacity to cause error are classified as Type A to Type I. Type A to Type D has no harm , Type E to I has capacity to cause harm. Data was compiled and analyzed **(Table 3, Chart 2)**. The order of occurrence was: Type A > Type B > Type C > Type E. Fortunately none of type D, F, G, H and I errors were encountered.

Table No. 3: Medication error data as per NCC-MERP Index

Type of Error as per NCCMERP	1st Month	2nd Month	3rd Month
TYPE A (No actual error)	61.9	49.8	45.31
TYPE B (Actual error not reached to pt.)	**23.5**	**26.35**	**28.57**
TYPE C (Actual error reached to pt. but no harm)	**7.3**	**5.03**	**4.49**
TYPE D(No harm but require monitoring)	0	0	0
TYPE E(Temporary harm but require intervention)	**0**	**0.36**	**0.82**
TYPE F (Error require prolonged hospitalization)	0	0	0
TYPE G (Error leads to permanent harm)	0	0	0
TYPE H (Error require intervention to sustain life)	0	0	0
TYPE I (Error contribute to Death)	0	0	0

Data **(Table 3, Chart 2)** shows that most of the errors were harm free (Type A to type C), except fewer (0.36% in 2nd month and 0.82 % in 3rd month) in which patient need monitoring and interventions i.e. Type E errors. A fall in trends was seen in Type A, Type C but rise was seen in Type B and Type E errors **(Table 3, Chart 2),** which needs to be pointed out and controlled.

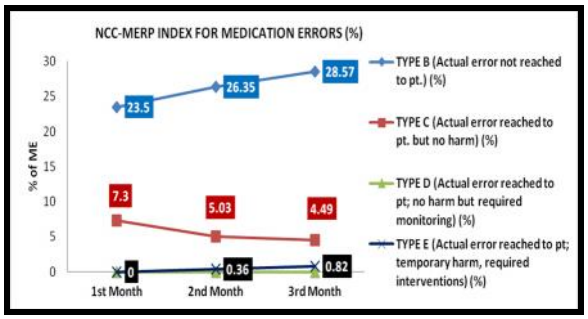

Chart 2: Medication error trends as per NCC-MERP Index: showing Type B, Type C and Type E medication error

RESULT

MER was found to be 7.96% against the standard acceptable error rate of 5%. An average of 4.5% of ME were observed related to prescription only, and rest were 1.15% administration, 0.57% monitoring error and 0.39 % dispensing errors. Decrease in ME was observed **(Chart 1)**, might be due to intimation and training of concerned staff against medication error reports. Among prescription errors, therapeutic duplication was a major class of medication errors being observed in this study. The most common class of drugs whose therapeutic duplication was seen includes Antipyretic/Analgesics, Calcium channel blockers, beta blockers, multivitamins, and bronchodilators.

Overall the study represents that the action taken to prevent medication errors were not sufficient to control medication errors and there is a need of some more concrete actions.

CONCLUSION

The study helps to detect medication error in a medication process and to categorize them on the basis NCCMERP index. Many medication errors were noted, which go against rational treatment. The study concludes that medication errors are occurring at high frequencies and rate, which needs unbiased attention. This study recommends health institutions to make patient safety a priority, establish monitoring committee of containing Physician, Nurses and Pharmacists. Healthcare institutions must appoint clinical pharmacist, pharmacologists on 24 hour basis for prescription review, Medication error, ADR reporting and management. The data collected on medication must be discussed monthly and training to prescriber, nurses and pharmacist must be given routinely. The standard methods, guidelines and practices should be established, adopted and implemented strictly. Punishment free medication error reporting must be encouraged. These are some noble ways through which we could avoid medicines illicit financial and clinical impact on the health of general public.

DISCUSSION

Improving patient safety in healthcare institutions has been at forefront of public interest. It has become compulsion to have discussion on patient safety about whether emphasis on medication variances (wrong patient, drug, dose, time or route) or harm to patients (outcomes). James Reason's "Swiss cheese model [11] illustrates how mishaps occurs when several safety nets fail and each layer of safety procedure is not rigorously applied. When all the defences fail and an organization's latent vulnerabilities are exposed, an incident occurs [12]. It suggests that each and every step of medication system has a challenge and indeed requires careful

monitoring which is possible only after awareness programs, training and education on medication errors to all health professionals.

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