A Prospective Study of Medication Errors in the Diabetology and General Medicine Department of A Multispeciality Hospital

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ABSTRACT

A medication error is any preventable event that may cause or lead to inappropriate medication use or cause patient harm while the medication is in the control of the healthcare professional, patient or consumer. The patient must actually receive the drug for it to be classified as a medication error. The aim of the present study was to identify medication errors if any in the diabetology and general medicine departments of a multispecialty hospital. The data was collected from both in and out-patients. A total of 1946 prescriptions were selected from diabetes and general medicine departments over 10 months for analysis. Prescriptions from men accounted to 80.3% and that of women were 19.7%. Out of the total 1946 patients, 136 patients experienced at least one type of error. Lack of awareness and improper work procedures made way to medication errors. Errors were mainly caused by clinician (30%) and others (32%). The main cause of medication error was inadequate staff education (41%). These errors could be reduced by simple changes of existing procedures or by implementing automated technologies in the prescription, dispensing and administration processes. The addition of a clinical pharmacist can be considered as an essential requirement in such a scenario to identify and to prevent the medication errors. Medication errors are insidious failures that cause silent damage to the health of the patients as well as the quality of delivery of healthcare to the patients that may be avoided by the intervention of the pharmacist.

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INTRODUCTION

Approximately 1.3 million people get injured annually in the United States following so-called "medication errors". The National Coordinating Council for Medication Error Reporting and Prevention (NCCMERP) defines a 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 consumer. 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, education, monitoring and use."

Medication errors are preventable mistakes in prescribing and delivering medication to patients, such as prescribing two or more drugs whose interaction is known to produce side effects or prescribing a drug to which the patient is known to be allergic. Mistakes in prescribing, dispensing, storing, preparation and administration of a medicine are the most common preventable causes of undesired adverse events in medication practice and present a major health burden. Medication errors that do not cause any harm- either because they are intercepted before reaching the patient are often called potential ADEs (Adverse drug events). An ameliorable Adverse drug event (ADE) is one in which the patient experienced harm from a medication that, while not completely preventable, could

have been mitigated [1-4]. The investigators estimated that nearly 4.5 million ambulatory visits occur yearly due to ADEs, with older patients and patients who take more than 6 medications daily, being at increased risk [5].

Medication errors can significantly affect patient safety and treatment costs and result in hazards for patients and their families [6-9]. Medication errors can lead to adverse outcomes such as increased mortality, increased duration of hospitalization, and increased medical expenses [10,11]. Studies have shown that almost one-third of medical complications are due to medication errors [12,13]. Medication errors lengthen hospital stays, increase inpatient expenses, and lead to more than 7,000 deaths annually in the United States [14]. Giving the wrong drug and using the wrong route of administration each accounted for 16% of the errors. Almost half of the fatal medication errors occurred in people over the age of 60. Older people may be at greatest risk for medication errors because they often take multiple prescription medications [15].

Medication process in a healthcare organization service is an inter disciplinary complex process which includes each aspect of medication related process includes doctor's written prescription , transcribing case sheets followed by pharmacist and they check for appropriateness and nursing administration of the medication order to the patient.

The best way to understand how medication errors happen and how to prevent them is to consider their classification, which can be contextual, modal, or psychological. Contextual classification deals with the specific time, place, medicines, and people involved. Modal classification examines the ways in which errors occur (e.g. by omission, repetition, or substitution). Classification based on psychological theory is to be preferred, as it explains events rather than merely describing them [16].

This is a prospective study of medication error in diabetology and general medicine department of a multispecialty hospital where medication error was seen in each department of the hospital.

MATERIALS AND METHODS

The aim of the study was to evaluate the incidence of medication error and to categorize medication error in the Diabetology and general medicine departments of a multispecialty hospital in Erode. It was carried out over a period of 10 months among both inpatients and outpatients. Data were collected from 1946 prescriptions.

Study criteria
Inclusion criteria
- Patients of age 18 to 70 years were included.
- Selected diabetes mellitus patients and general medicine patients were included.
- COPD Patients on treatment for more than two weeks.
- Patients who are interested in the study.
- All inpatients and outpatients were included during the period of study.

Exclusion criteria
- Patients who were not interested in the study.
- Mentally retarded patients.
- Pregnancy and lactating women were not included.
- Patients who were not interested in taking medication.
- Emergency care patients.
- Type 1 diabetes mellitus patients.

Data collection
The data was collected from prescriptions of both inpatient and outpatient department of diabetology and general medicine with the permission of doctors and the hospital administration. The data was collected in the form of interviewing and counselling the patients.

Study procedure
This prospective observational study was conducted in a tertiary care hospital at Erode in Tamilnadu. The patients were selected as per the inclusion and exclusion criteria from the departments of diabetic medicine and general medicine. It includes both inpatients and outpatients. All inpatients of either sex at any age that are undergoing treatment in the general medicine ward were included in the study. The data collection forms were designed based on the general information of patient's gender, age, current medical

history, prescribed medication details, relevant laboratory data and other information such as type, causes, stages and various incidence of errors. The patient's prescription was collected and was analysed for the expected clinical outcome based on the diagnosis and drug-drug interactions if any between the listed drugs. The data was collected from in-patientcase sheets and then interview to check the medication problems.

Data analysis

Demographic status of patients, age wise distribution of the errors, types of errors, professional involved, error outcomes, cause, incidence and system wise distribution of medication error, were all analysed using Microsoft office excel software.

RESULTS AND DISCUSSION
Demographic data
Gender based medication error data

On the basis of gender, out of 1946 patients 1137 patients (58.4%) were males and 809 patients (41.6%) were females. This study shows that the error cited was 269 in relation to both categories of male and female patients. In male patients, 216 (80.3%) prescription errors were present and 53 errors (19.7%) were present in females.

Table 1: Gender based medication error data

Gender	Total prescriptions (N=1946)	% to total
Male	1137	58.4
Female	809	41.6

Table 2: Error type

Error type	No. of patients (N=1946)	% to total
Diabetes advise not added	32	24%
Duplication of generic	23	17%
Wrong duration	19	14%
Monitoring error drug-drug	18	13%
Wrong patient	15	11%
Wrong time of administration	11	8%
Wrong drug	7	5%
wrong time of administration	6	4%
wrong strength/concentration	3	2%
Wrong dosage form	2	1%
Others*	0	0%

Improper dose, allergic drug, monitoring error clinical, wrong route, wrong frequency, wrong rate.

Error type
In this study, 32(24%) patients had prescriptions with diabetes advise not added, 23(17%) prescriptions with duplication of generic, 19(14%) with wrong duration, 18(13%) with monitoring drug-drug error, 15(11%) with wrong patient, 11(8%) with wrong drug, 6(4%) with wrong time of administration, 3(2%) with wrong strength/concentration and 2(1%) prescriptions with wrong dosage form.

Table 3: Error involvement stage

Error involvement stage	No. of patients (N=1946)	% to total
Ordering	41	30
Dispensing and delivery	26	19
Monitoring	24	18
Transcribing	2	1
Administration	0	0
Others	43	32

This study concluded that 41(30%) patients had prescriptions with ordering errors, 2 (1%) with transcribing errors, 24 (18%) with monitoring errors in terms of drug-drug/food interactions, 26 (19%) with dispensing and delivery error and 43 (32%) prescription error was observed in various other stages.

Table 4: Role of health care providers in error

Error by health care providers	No. of patients (N=1946)	% to total
Clinician	41	30
Pharmacist	28	20
Nurse/Dr. Assistant	24	18
Others	43	32

Role of health care providers

43(32%) prescriptions had other health care professional based errors. 41 (30%) prescriptions had clinician based errors, 28(20%) prescription had pharmacist based errors, 24(18%) had nurse/Dr. Assistant based errors.

Error identifier data

This data was useful to check whether the professionals working in the hospital had better knowledge and it also reveals the strength of the medical team.

The pharmacist identified the maximum no of errors 82(60%), followed by the clinician 35(26%) and then by the nurse 19(14%).

Table 5: Error identification

Error identified by	No. of patients (N=1946)	% to total
Pharmacist	82	60
Clinician	35	26
Nurse	19	14
Others	0	0

Table 6: Error outcome

Outcome of the error	No. of patients (N=1946)	% To total
Error reached patient-no harm	65	48
Error occurred-did not reach patient	47	34
Error reached & req. Monitoring	24	18
Others*	0	0

Error reached-temporary harm, req. Intervention, error reached-temporary harm, req. Hospitalisation, error reached patient-permanent patient harm, error caused death.

65 (48%) patients had prescription with Error reached patient-no harm, 47(34%) patients had prescription with Error occurred-did not reach patient and 24 (18%) patients had prescription with error reached & req. Monitoring. Error reached-temporary harm, req. Intervention, Error reached-temporary harm, req. Hospitalisation, Error reached patient-permanent patient harm, error caused death did not have any related medication error.

Cause of error

In this study, cause of error determines the value range of medications out of total 1946 prescriptions. The causes of error were missing clinical information, drug order miscommunication, drug name, label, packaging problem, drug storage/delivery problem, environmental/staffing problem, staff education problem, patient education problem, lack of independent check system and unavailability of medicines.

Table 7: Cause of error

Cause	No. of prescriptions (n=1946)	% To total
Staff education problem	87	41
Environmental/staffing problem	43	20
Drug order miscommunication	22	11
Missing clinical information	18	9
Drug storage/delivery problem	16	8
Drug name, label, packaging problem	13	6
Patient education problem	11	5
Others*	0	0

Lack of independent check system, unavailability of medicine

87(41%) patients had prescription with staff education problem. 43(20%) prescription had environmental/staffing problem, 22(11%) prescription had drug order miscommunication, 18(9%) patients had prescription with missing clinical information, 16(8%) patients had prescription with drug storage/delivery problem. 13(6%) patients had prescriptions with drug name, label and packaging problem, 11(5%) had patient education problem. Others such as lack of

independent check system, unavailability of medicine had no specific role in cause of error.

Missing clinical information

Missing clinical information have some components such as age, location, pregnancy, vital, weight, diagnoses, ID no., lab and renal/live, not knowing about patient's allergies, drug contraindications. These headings are belonging to the prescription error so that the professionals must take the effective step to overcome.

Table 8: Missing clinical information

Missing clinical information	No. of prescriptions (N=1946)	% to total
Vital	7	39
Lab	7	39
Diagnosis	4	22
Others*	0	0

pregnancy, age, location, weight, ID NO., renal/liver

7(39%) patients had prescription with vital. 7(39%) patients had prescription with Lab. 4(22%) patients had prescription with diagnosis. Other factors in missing clinical information like age, location, pregnancy, weight, ID No. and renal/liver problem didn't have any response in medication error.

It is a common factor that contributes to medication error. Miscommunication of drug orders includes poor handwriting, confusion between drugs with similar names, careless uses of zeroes and decimal points, confusion over metric or other dosing units, use of inappropriate abbreviations, ambiguous orders.

Table 9: Miscommunication of drug order

Drug order miscommunication	No. of prescription (N=1946)	% to total
Illegible	22	100
Incomplete	0	0
Misheard	0	0

This study concluded that 22(100%) patients had prescription with illegible.

Drug name/label/package problem
It includes the inappropriate preparation,

packaging and labelling, especially when the drug is prepared and repackaged into smaller units.

Table 10: Drug name/label/package problem

Problem	No. of prescriptions (N=1946)	% of total
Look-alike package	7	54
Look/sound-alike name	6	46
Others (faulty drug identification, unclear label, no label)	0	0

7(54%) patients had prescription with look-alike package, 6(46%) patients had prescription with look/sound-alike name. Others had no specific role in drug name/label/package problem.

Drug storage/delivery problem
The drug must be stored in the suitable appropriate condition. In drug standardization and stocking confusion arises from stocking multiple concentrations of the same drug or storing

drugs in look-alike containers or in ways that obscure drug labels.

Table 11: Drug storage/delivery problem

Problem	No. of prescriptions (N=1946)	% to total
Multiple concentration	11	69
Slow turnaround time	5	31
Others*	0	0

inaccurate delivery, doses missing or expired

This study concluded that 11 (69%) patients had prescription with multiple concentration and 5(31%) patients with slow turnaround time.
Environmental, staffing or workflow problem
In the hospital, arrange a plan to keep the environment of whole area in the hospital to be clean and sterile in mature. Environmental stress factors such as lighting, heat, noise and interruptions that can distract staff and affect individual performance particularly when transcribing orders.

Table 12: Environmental, staffing, or workflow problem

Problem	No. of prescriptions (N=1946)	% to total
Clutter	23	54
Staffing deficiency	16	37
Interruption	4	9
Others*	0	0

lighting, employee safety, workload, noise

In this study, 23(54%) patients had prescription with clutter. 16(37%) patients with staffing deficiency and 4(9%) patients had prescription with interruption.
Lack of staff education
Lack of staff education is the vital cause of medication error. Limited staff education may leads to lack of awareness of error-prone situations go unidentified and persist in causing problems. Hospitals must have effective programs to be held to educate the professionals who are working to improve the quality of patient's care. The prescription trends, the new drug products and also conduct training programs to prevent the lack of education. Hospitals setup some committee to arrange meeting and take decisions to overcome the lack of staff education.

Table 13: Lack of staff education

Problem	No. of prescriptions (N=1946)	% to total
Orientation process	42	48
Competency validation	27	31
Not familiar with available drug strengths	18	21
Feedback about errors	0	0
New unfamiliar drug/device	0	0

42(48%) patients had prescription with orientation process, 27(31%) patients with competency validation. 18(21%) patients with not familiar with available drug strengths.
Patient education problem
Almost all the patients are without appropriate education. Awareness program of related drug and disease, patient information leaflets or any other additional facilities must be arranged to increase to awareness of medication error otherwise it may lead to severe illness to patients.
7(64%) patients had prescription with lack of information. 3(27%) patients with not encouraged to ask question and 1(9%) patients had prescription with non-compliance.

Table 14: Patient education problem

Problem	No. of prescriptions (N=1946)	% to total
Lack of information	7	64
Not encouraged to ask question	3	27
Non-compliance	1	9
Not investigating patient inquiries	0	0

CONCLUSION

This study helps to assess the incidence and to categorize medication error. This prospective study concluded that the commonly occurring medication error were due to prescription error, lack of drug knowledge and dispensing error, lack of staff education, drug monitoring and improper counselling. Most of the errors reached patients but did not produce any harmful effect. These errors could be reduced by simple changes of existing procedures or by implementing automated technologies in the medication process. Drug monitoring and patient counselling should be improved and programs should be arranged to update the information about new drugs and to increase awareness. The role of a clinical pharmacist in this condition appears to be a strong participation in the identification of medication errors and also must take several steps to prevent the medication errors.

Pharmacists should counsel the patients which should be viewed as an opportunity to verify the accuracy of dispensing and the patient understanding, of proper medication use. Pharmacies should collect and report data regarding actual and potential errors for the purpose of continuous quality improvement. Pharmacists must be trained properly to dispatch proper drug. If prescription is unclear then pharmacist should not dispatch drug by judging the medicine.

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