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Prospective study on hospitalization due to drug related problems in a tertiary care hospital.

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ABSTRACT
Background: Drug related problem (DRP) can be identified as an event or circumstance involving drug therapy that actually or potentially interferes with the desired health outcomes. The aim of this study was to determine the prevalence of drug related problems resulting in hospitalization and to investigate the type, nature and incidence of drug related problems in in-patients of a tertiary care hospital.
Methods: The in-patients case records including patient demographics, past medical history, and treatment chart of admitted patients under the cardiology and general medicine department were collected and reviewed for drug related problems by clinical pharmacist. If in case a drug related problem was identified it was noted and reported to the concerned physician and suitable intervention were provided and documented.
Result: A total of 50 patient case records were reviewed during the study period and 150 DRPs were identified and documented. The most common drug related problem were found to be wrong effect of drug (32%), unnecessary drug treatment (20%) and treatment duration too long (12.6%). The most recurring suggestions provided by the intervening pharmacist were patient counseling (27.33%), prescriber informed only (24%), side effect reported to authorities (13.33%) and cessation of drug (9.33%). The grade of severity for majority a DRPs was seen to be moderate. Although the outcome of intervention suggested remain unknown (60%).
Conclusion: This study shows the importance of a pharmacist required in regular reviewing of drug therapy and identifying and resolving drug related problems for better therapeutic results and patient care.

Keywords: Drug related problems, Pharmaceutical Care Network Europe classification, Clinical Pharmacist, Intervention, Cardiovascular drugs

I. INTRODUCTION

The effects of Medicinal drugs are twofold aid, mainly designed to prevent, diagnose and heal. However, if used inappropriately they have a downfall of causing illness that could lead to fatal conditions in patients. Thus, making drug therapy more complex and demanding proper patient management. While a drug product is an important aspect for aiding a disease, it simultaneously also leads to chances of **drug-related problems** also known as **DRP**s. Economic, physical, and psychological burdens are the major concerning factors related to DRPs which affect the patients and the society directly. While providing drug therapy it is vital to determine and settle issues related to the concerned drug. Hence, various classification and identification systems are used to classify the DRPs. Among them, the Pharmaceutical Care Network Europe's (PCNE) classification, version 6.2 system has been used in this study and it defines DRP as an event or circumstance involving drug therapy that actually or potentially interferes with the desired health outcomes. Incorrect dosing, improper schedule and missing information are the few commonly found DRPs. Recent elaborate data shows that adverse drug events, insufficient medication knowledge, non-compliance, drug events, drug interactions, dose problems and practical issues can lead to a DRP. Moreover, another important cause of DRPs are the use of OTC drugs by patients without any consultation from a pharmacist. Patient awareness, post hospital discharge medications and poly-pharmacy are linked to such DRPs. Various repercussions of DRPs are prolonged hospital stay, extra visits to the doctor's office, new sets of prescriptions and their substantial (sizeable) costs along with a risk of depletion of the patient's health.

Timely identifying and resolving a DRP

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can help reduce the money spent on healthcare by the patient, expand their standard of living and most importantly it can save lives. The healthcare professionals involved are held responsible for errors occurring with unnecessary use of drugs, though patient compliance plays a major role for effective treatment as well. The World Health Organization (WHO) guidelines state that cardiovascular diseases (CVD) are one of the major causes for heart related problems and causality within patients. Co-morbidities associated with CVD have caused a rise in incidence of polypharmacy among patients. DRPs caused by drug therapy is largely affected by poly pharmacy.

Medication error: It is defined as an error during a treatment that may result to potential or lasting damage.

Adverse drug reaction: Also known as ADR, it is a term defining a response to a drug that is noxious and unintended and occurs at doses normally used in man for the prophylaxis, diagnosis or therapy of disease, or for modification of physiological function.

Problems related to drug therapy can be reduced by preventive approaches. To avoid medical incorrectness several preventive measures can be adopted for example usage of computerized doctor's order entry. Using barcode technology and automated dispensing system can avoid errors in prescribing, recording, analyzing of drugs prescribed to the patients. Providing adequate training to nurse's in-charge of drug delivery process can help reduce the margin of prescription errors as well. Pharmacists both in community and in hospitals have a vital part in ensuring that the medications are used properly. The pharmacist can identify a DRP and apply principles of rational drug use by giving drug- related consultancy services. During the medical treatment process a clinical pharmacist can aid by providing better therapeutic care and improving patient health.

SUBJECT AND METHODS

A prospective, observational study was conducted to determine DRPs resulting in hospitalisation and how patient counselling works to resolve risk factors of DRPs. This study was run for a duration of 6 months on patients with cardiovascular diseases admitted to the general medicine and cardiology ward of Maharishi Markandeshwar Institute of Medical Science and Research Hospital - which is a 830 bedded tertiary care teaching hospital with various medical disciplines and provides various health care facilities for people residing in Ambala and nearby areas. A study protocol was designed and has been approved by Institutional Ethics Committee of the Institute. Inclusion criteria includes patients who were willing to indulge in the study, aged >18 years of age, either gender with or without co-morbid conditions in general medicine and cardiology wards. Exclusion criteria includes out patients, pregnant patients, paediatrics and patients who were not interested to indulge in the study.

Study procedure and data analysis

A sum of 50 patients (n=50) who fit the inclusion criteria were chosen for the study. A specifically designed Patient Profile Form was used to collect information such as patient demographics, reason for admission, medical and medication history. Through the duration of the study period, the patients were reviewed on a daily basis and any changes in their drug charts or laboratory parameters were noted as well. The data collected was further categorized and interpreted for the evaluation of DRPs by applying the Pharmaceutical Care Network Europe (PCNE) version 6.2 classifications. The incidence of DRPs was calculated from the number of DRPs found in each patient. The severity of a DRP and its associated risk factors were determined and lastly the category of drugs used for treatment that can commonly cause a DRP were noted.

II. RESULTS

A sum of 50 patients were examined and evaluated through the course of the study period. They were checked for DRPs and a total of 150 DRPs were identified in our study. Out of the study population of 50, 27 (54%) were females and the remaining (46%) were males. Majority of DRPs were found in the age group of 50-59 and 60-69 being 38% each respectively. A significant majority of 70 % the patients/study participants belonged to the rural while the remaining were from the urban area. The gender, age-wise and demographic distribution of the study patients is given in table 1.

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Table 1: Demographic details of patient population

Variable	Frequency (n=50) (%)
Gender	
Male	23 (46%)
female	27 (54%)
Age (years)	
40-49	7 (14%)
50-59	19 (38%)
60-69	19 (38%)
70-79	4 (8%)
>80	1(2%)
Demographic	
Rural	35 (70%)
Urban	15 (30%)

Among the study participants 42% presented with less than or equal to 2 co morbidities whereas 58% had more than 2 co morbidities. 24% study patients were moderately severe, 60% mildly severe and 16% were severely severe. Majority of the patients 27 (54%) admitted, stayed in the hospital for 5-7 days. Number of co morbidities, hospital stay days and the severity of DRPs are presented in Table 2.

Table 2: Number of comorbidities, stay days in hospital and severity of drug related problems

Variable	Frequency (n=50) (%)
No. Of co morbidities	
Less than or equal to 2	21 (42%)
More than 2	29 (58%)
Severity	
Mild	12 (60%)
Moderate	30 (24%)
Severe	8 (16%)
No. Of stay days in hospital	
2-4 days	9 (18%)
5-7 days	27 (54%)
8-10 days	14 (28%)

The number of medications given to the study patients and their category of drugs were also noted through the study period. 34% of patients received 11-14 drugs for their treatment followed by 22% receiving 15-18 drugs and 20% receiving 7-10 drugs, remaining received 7 or fewer drugs. 39% (18) DRPs were caused by CVS category of drugs followed by 18.8 % (10) by antibiotics and 11.3% (6) by anticoagulants. On comparison 40% (20) patients themselves were responsible for the cause of DRP followed by 22% (11) where the respective patient's caretakers were the cause and for the 12% (6) patients and the pharmacist were the cause. Table 3, table 4 and table 5 show the number of drugs given to the patients during their hospital stay ,the various categories of drugs involved and the people responsible for the cause of the DRPs respectively.

Table 3: Number of medications given to the study population

Number of medications	n (%)
3-6	7 (14%)
7-10	13 (20%)
11-14	17 (34%)
15-18	11 (22%)
19-22	2 (4%)

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Table 4: categories of drugs used in the study population

Drug category	n (%)
CVS drugs	18 (33.9%)
Antibiotics	10 (18.8%)
Anticoagulants	6 (11.3%)

Abbreviations: [cardiovascular drugs]

Table 5: Person responsible for a DRP

Person responsible for DRP	n (=50) (%)
Patient	20 (40%)
Patient caretaker	11 (22%)
Patient and patient caretaker	10 (20%)
Patient and pharmacist	6 (12%)
None	3 (6%)

A total of 150 DRPs were observed among the study participants and according to the PCNE classification of DRP, the most common problems related to DRP were wrong effect of drug 16 (32%), unnecessary drug treatment 10 (20%), and effect of drug not optimal 6 (12%). The problems related to DRPs are reviewed in Table 6.

Table 6: Problems associated with DRPs as per the PCNE classification system version 6.2

Code Detailed classification	n (%)
P1. Drug effect	
P1.2 Effect of drug treatment not optimal	6 (12%)
P1.3 Wrong effect of drug treatment	16 (32%)
P2. Adverse reaction	
P2.2 Adverse drug event (allergic)	5 (10%)
P3. Treatment cost	
P3.1 Drug treatment more costly than necessary	2 (4%)
P3.2 Unnecessary drug treatment	10 (20%)
P4. Others	
P4.1 Patient dissatisfied with therapy	4 (8%)
P4.2 Therapy failure (unknown reason)	4 (8%)

The most common causes of drug related problems were treatment duration too long 19 (12.6%), deterioration/improvement of disease 15 (10%), no therapeutic drug monitoring 12 (8%). A summarized view of the causes related to DRP can be seen in Table 7.

Table 7: The causes associated with DRPs as per the PCNE classification system version 6.2

Code Detailed classification	n (%)
C1.1 Inappropriate drug	7 (4.66%)
C1.4 Inappropriate duplication	8 (5.33%)
C1.5 Unnoticed indication	7 (4.66%)
C3.4 Dosage regimen too frequent	7 (4.66%)
C3.5 No therapeutic drug monitoring	12 (8%)
C3.7 Deterioration/improvement of disease	15 (10%)
C4.2 Treatment duration too long	19 (12.66%)
C5.3 Drug overused/administered	10 (6.66%)
C7.2 Patient uses unnecessary drugs	8 (5.33%)

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C8.2 no obvious cause	24 (16%)

The recurring interventions made by the intervening pharmacist were patient counselling 41 (27.3%), prescriber informed only 36 (24%) and side effects reported to the authorities 20 (13.3%). The outcomes made by the intervening pharmacist for the concerning drug related problem were outcome intervention unknown 30 (60%) and problem partially solved 10 (20%). The interventions and outcomes to a DRP are summarized in Table 8.

Table 8: The interventions and outcomes associated with DRPs as per the PCNE classification system version 6.2

Code Detailed classification	n (%)
I0 No intervention	27 (18%)
I1.1 Prescribed informed only I1.4 Intervention proposed, not approved by prescriber	36 (24%) 2 (1.33%)
I2.1 Patient(medication) counselling I2.3 Patient referred to prescriber	41 (27.33%) 8 (5.33%)
I3.5 Drug stopped	14 (9.33%)
I4.2 Side effects reported to authorities	24 (13.33%)
O0.0 Outcome intervention not known	30 (60%)
01.0 Problem totally solved	4 (8%)
O2.0 Problem partially solved	10 (20%)
O3. Problem NOT solved O3.1 Lack of cooperation of patient O3.2 Lack of cooperation of physician O3.3 Intervention not effective O3.4 No need or possibility to solve problem	 2 (4%) 2 (4%) 1 (2%) 1 (2%)

III. DISCUSSION

Among 50 patients, followed during the study period, a total of 150 DRPs were identified. Out of the 50 patients 27 (54%) were females while 23 (46%) were males. This might be due to the increase number of medications for their various co morbid conditions and certain risk factors such as age, sedentary lifestyle, smoking etc. This result is similar to a study carried out by Adepu R et al. The incidence of DRP was higher in patients of age groups 50-59 years and 60-69 years i.e. 38%. The reason for higher DRPs in these age groups could be due to multiple co morbid conditions and age related pharmacokinetic and pharmacodynamic parameters. Majority of the patients (70%) belonged to the rural areas while remaining were from the urban area. majority of the drug related problems were seen in the patients from the rural areas. The low economic status and standard of living of these patients along with the poor disclosure of the health-related problems by the patients acts as a major cause and hindrance for their required drug therapy. A similar result was reported by Adepu R et al and Konuru V et al in their studies.

In our study, 21 (42%) patients admitted had 2 or less than 2 co morbidities and 29 (52%) patients had 2 or more than 2 co morbidities. At least 34 patients had HTN, 28 had type 2 DM as one of their co morbid conditions. Out of 150 DRPs, the severity of DRPs that was the highest was found to be 'moderate' (60%), followed by 'mild' severity (24%). The DRPs in the moderate category required some adjustments which helped enhance effectiveness of drug therapy causing minor reductions in patient morbidity or treatment costs. From our study, we concluded in majority patients themselves (40%) were found to be highly responsible for a cause of a drug related problem followed by patient caretaker (22%). This may be due to inaccurate and insufficient knowledge and awareness of improper medication use. In our study, maximum patients (54%) were admitted to the hospital for 5-7 days followed by (28%) for 8-10 days. The long duration of hospital stay of patients were due to either their multiple co morbidities or their delaying hospital visit. The medication chart review showed that 34% patients were given 11-14 drugs and 20% patients were given 7-10 drugs. It was observed that higher the number of drugs prescribed, higher the risk of an occurrence of a DRP. Poly-pharmacy has a higher chance of

accordance in patients who were admitted for more than 1 co morbidity. Of the total drugs prescribed, the majority of the drugs belonged to CVS category (33.9%) followed by antibiotics (18.8%) and then anticoagulants (11.3%). High incidence of DRP was observed in patients with a medical history of any cardiovascular conditions. A similar finding was reported by Mohammed S et al. From the drugs given to the patients in the study, 86% caused actual medication related problem (manifest), while 14% were the actual cause of the potential medication related problem (potential). Out of the 150 DRPs found, the most recurring problem leading to a DRP was wrong effect of drug treatment (32%), unnecessary drug treatment (10%) and ADR (14%). Hypersensitivity adverse reactions were seen in patients who were prescribed with anticoagulants like heparin, enoxaprin.

In this study, the commonly occurring causes for a drug related problem were treatment duration too long (12.6%), deterioration/improvement of disease (10%) and no TDM (8%). Poly-pharmacy and co morbid conditions along with patient non-compliance can be a cause for prolonged duration of treatment as well as worsening/improving of a disease condition. The acceptance rate of patient counselling by the intervening pharmacist was found to be high (27.3%) and 24% of the pharmacist intervention was found where the prescriber was informed only. A recurring suggestion made by the intervening pharmacist was cessation of drug (9.33%) followed by intervention proposed, not approved by prescriber (1.33%) and this could be due to the lack of proper information which needs to strengthen the suggestion provided.

IV. CONCLUSION

Drugs if used under proper administration are lifesaving. However, if used without proper consultation, expertise and knowledge they can lead to DRPs. A timely intervention by a clinical pharmacist can play an important role in preventing and reducing the occurrence of such DRPs. Healthcare professionals carrying out patient counselling regarding proper usage of medications and spreading awareness regarding DRPs to the patients admitted in the hospital as well as the general public at community are required to curb the incidents of DRPs.

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CONFLICT OF INTEREST
There are no conflicts of interest.

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