



## A Study on Drug Related Problems Among Hospitalized Patient

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### ABSTRACT

**Background:** Drug therapy will improve health-related quality of life in the majority of disorders. However, using medications improperly can be dangerous and cause issues with drug therapy. A Drug-Related Problem is an event or circumstance involving drug therapy that actually or potentially interferes with desired health outcomes. Such undesirable consequences due to the use of medicinal products (MPs) are common in medical institutions.

**Objectives:** Primary objective is to assess the incidence and types of drug related problems among hospitalized patients and secondary objectives is to detect the factors contributing to the DRP's. To identify the drugs or drug classes most frequently causing the problems.

**Materials and Methods:** An Observational Cross –Sectional Study in General medicine ward was carried out for a duration of 6 months. The study was carried out in 66 patients admitted to Department of General medicine Ward. Drug Related Problems were identified using standard PCNE classification system based on the patient's medical order. We conducted semi- structured interviews, collected the data followed by data analysis using Excel.

**Results:** A total of 66 subjects included in the study. 236 drug related problems were identified. Clinical pharmacist intervention was done. After the intervention, out of 236 problems, 178(75.40%) of the problems were solved, 12(5.80%) problems were partially solved, 25(10.50%) of the problems were not solved, 21(8.89%) outcomes were unknown.

**Conclusion:** The participation of clinical pharmacists into the multidisciplinary team promotes the detection and solution of DRP in the majority of cases, and should be considered as a rule in general clinical practice.

**Keywords:** Pharmaceutical Care Network Europe's classification system (PCNE), Drug Related Problems (DRP), World Health Organization (WHO), Anatomical Therapeutic Classification (ATC).

### INTRODUCTION

The rise in drug availability, drug users, and drug regimen complexity have all contributed to an increase in adverse effects, drug interactions, and follow-up complications.<sup>1</sup> Drug therapy will improve health-related quality of life in the majority of disorders.<sup>2</sup>

According to the World Health Organization (WHO), medication errors are a major source of unnecessary harm in the medical field, and organizational adverse events happen in about one out of every ten hospitalizations. As the trend towards ageing accelerates, older people with chronic conditions are challenged by the complexity of polymedicine. Polypharmacy has been associated with a higher likelihood of DRP incidence.<sup>3</sup>

A Drug-Related Problem is an event or circumstance involving drug therapy that actually or potentially interferes with desired health outcomes.<sup>2</sup> Such undesirable consequences due to the use of medicinal products (MPs) are common in medical institutions both at the stage of primary medical care (in hospitals) and at the stage of outpatient (ambulatory) treatment of patients. Most of these problems are revealed at the stage of prescribing, dosing or intake of drugs by patients.<sup>4</sup>

Globally, the incidence of DRPs among hospitalized patients has been reported in studies as ranging from 15.5%- 81.0% with half being potentially preventable.<sup>5</sup>

About 70% of older adults have multimorbidity, which is the presence of multiple cooccurring illnesses. Multimorbidity presents a significant clinical and financial issue for healthcare systems. Pharmacotherapy has been linked to bad health outcomes include side effects, interactions, adherence issues, functional decline, cognitive issues, falls, urine incontinence, and metabolic or nutritional issues.<sup>6</sup>

Clinical Pharmacy is a branch of medicine in which pharmacists optimise medication therapy and encourage health, wellness, and illness prevention. Pharmacist interventions not only have an impact on patient treatment, but they also reduce unnecessary medical outflow. When clinical pharmacists conduct medication reviews, it has been shown that they enhance the use of high-risk drugs and the accuracy of prescription regimens in geriatric patients.<sup>7</sup>

Pharmacists that specialise in clinical pharmacy advocate wellness, good health, and illness prevention while optimising pharmaceutical therapy. Pharmacist interventions not only affect patient care but also cut down on wasteful medical spending. It has been



demonstrated that medication evaluations performed by clinical chemists improve the usage of high-risk medications and the precision of prescription regimens in geriatric patients.<sup>7</sup>

The DRPs are divided into eight categories by the Hepler and Strand Classification, which includes drug usage without a prescription, wrong drug choice, drug interaction, adverse drug reaction, excessive dosage, the need for additional drug therapy, subtherapeutic dosage, and improper use of the drug. Choosing a medicine and untreated symptoms.<sup>1</sup> There are an infinite number of DRPs because of the fast-expanding range of drug items that are readily available, the growing number of diseases that are being discovered and diagnosed, and the growing number of individuals who are utilising the healthcare system.<sup>2</sup>

The purpose should not only be to reduce the risks of pharmacotherapy, but also to maximize its efficacy (ensuring that the goals of treatment are reached). DRPs are primarily preventable through appropriate pharmacotherapy (medication selection and formulation, dosing scheme, and duration of treatment—both prescribed and over-the-counter medications), appropriate medication use and administration, appropriate medication adherence, appropriate monitoring (whether treatment goals are met, risk factors for disease complications, occurrence of ADR and risk factors for ADRs), and appropriate lifestyle measures. (e.g., fluid and food intake, smoking, alcohol consumption, sunscreen use).<sup>8</sup>

Any level of treatment may experience DRPs. Just 25% of DRPs are unforeseen or brought on by an allergic reaction.[18] DRPs are typically (more than 70% of the time) connected to the pharmacological dosage used. DRPs could be caused by medications, diagnostic tools, nutrition, fluids, electrolytes, or even generic parts of drug delivery systems. Regardless of the route and manner of drug administration, a problem may occasionally be caused by more than one agent. Harmful unexpected medication reactions are a factor that affect morbidity and mortality, and they occur almost every day in hospitals.<sup>9</sup>

The World Health Organisation (WHO) established "The Global Patient Safety Challenge: Medication Without Harm" to reduce avoidable pharmaceutical harm. The third Global Patient Safety Challenge on Medication Safety aims to mobilise global support and action to reduce severe, preventable medication-related harm by 50% over the following five years, with a focus on harm brought on by mistakes or unsafe practises as a result of flaws in health systems. The Challenge aims to improve the prescription, dispensing, administration, monitoring, and use phases of the medical process.<sup>10</sup>

Identification and study of drug related problems, as well as the identification of the main groups and individual representatives of the drugs with a high risk of developing DRP's are important stages in the treatment of patients.

They can reduce morbidity and mortality.<sup>11</sup> Therefore, patients with serious illnesses must consider the effectiveness and safety of their medications. Less study has been done on improper drug use in internal medicine wards, where younger patients are admitted.<sup>12</sup>

Thus, the current study aims to examine the prevalence and characterize DRPs as well as to determine those factors associated with a higher risk of DRPs in the hospital setting.

## METHODOLOGY

### Study design and patients

This study was an observational cross-sectional study conducted from December to May 2023 at Adichunchanagiri Hospital and Research Centre (AH&RC), a 1000- bed tertiary hospital in BG Nagara Mandya. A consecutive sampling technique was employed to select patients based on the study period. Patients aged >18 years admitted to general medicine ward, hospitalized for more than >48hr and received at least 2 medications including all routes of administration like topical, oral, inhaled etc. were included. Patients were excluded if they were discharged before collected data was cross checked, patients who were transferred to other unit or died within 24 hours prior to completing the data collection and participants who were not willing to participate.

The study was approved by the Institutional Ethical Committee, AH&RC, BG Nagara (AHRC No: IEC/AH&RC/AC/018/2022)

### Data collection

The study included patients in general medicine wards. Study participant's data were observed from admission to discharge throughout their hospital stays. Patients data were collected by pharmacist and potential DRP were identified. For the initial collection of data from qualified prescriptions, a pre-structured data collection form was used, followed by an Excel sheet for analysis. Patients' demographic information (age and gender), physical examination, laboratory results, comorbidities, length of hospitalization, relevant previous medical and medication histories were recorded as well as information about their medications (drug name, dose, duration of treatment) were collected on data collection forms.

Potential DRP was identified and classified according to their types using Pharmaceutical Care Network Europe's classification system (PCNE V5.1) and Hepler and Strand classification system. The PCNE system attributes 4 items to each observations. Coding for the problem itself, the actual or suspected cause of the problems, the intervention required to resolve the DRP, and its outcome. Drugs involved in DRPs were recorded and coded in accordance with Anatomical Therapeutic Classification (ATC) system. Drug interactions are checked using a drug interaction checker Micromedex.



## Statistical Analysis

The data collected was entered in Microsoft Excel spread sheet and cross checked for its accuracy. Frequency and percentage were calculated for categorical variables.

## RESULTS

An observational cross-sectional study was conducted among 67 subjects who admitted to general medicine ward in AH & RC hospital. Totally 236 DRP's were identified throughout the study period.

### Distribution of baseline characteristics

In our study, out of 66 individuals, 52 (78%) are men and 14 (22.2%) are women in total. The majority of the patients, 44 (66.66%), were over the age of 45, followed by the age group 31-45 17 (25.75%), and the remaining 5 (7.57%) were between the ages of 18 and 30. Most of the patients were married 61(92.42%), 4(6.06%) were single and remaining 1 (1.50%) was divorced. Most of the patients included in the study were literate and employed 36(54.50%), whereas remaining 30 (45.40%) were illiterate and unemployed. Most of the patients were having past medical history 55(83.30%), were 11(16.60%) were not having any past medical history. Most of the patients had a past medication history 50 (75.70%), 16(24.24%) were not having any past medication history.

### Distribution of drug related problems

Our study found that drug interaction accounted for (48.9%), followed by drug choice problem (25.35%), dosing problem (13.35%), drug use problem (4.08%) and adverse drug reaction accounted for (8.32%) of the identified drug related problem.

**Table 1:** Baseline characteristics of the patients – PROBLEMS

AGE	Frequency (n)	Percentage (%)
18-30	5	7.59
31-45	17	25.75
>45	44	66.66
<b>GENDER</b>		
Male	52	78
Female	14	22
<b>MARITAL STATUS</b>		
Married	61	92.5
Single	4	6.00
Divorced	1	1.50
<b>EMPLOYMENT STATUS</b>		
Yes	36	54.50
No	30	45.50
<b>EDUCATIONAL STATUS</b>		
Literate	36	54.50
Illiterate	30	45.50
<b>PAST MEDICAL HISTORY</b>		
Yes	55	83.30
No	11	16.70
<b>PAST MEDICATION HISTORY</b>		
Yes	50	75.70
No	16	24.30
<b>LENGTH OF STAY</b>		
>5	4	6.60
6 to 10	21	31.80
11 to 15	5	7.10
>15	36	54.50
<b>NO. OF COMORBITIES</b>		
1	16	24.24
2	16	24.24
3	21	31.81
4	13	19.71
<b>NO. OF DRUGS</b>		
1-5	52	78.70
6-10	6	9.20
>10	8	12.10

## Baseline characteristics

**Table 2:** Problems of drug related problems identified among hospitalized patients - CAUSES

P1 ADVERSE DRUG REACTION	Frequency (n)	Percentage (%)
P1.1 Side effect suffered (non-allergic)	11	91.60
P1.2 side effect suffered (allergic)	1	8.33
<b>P2 DRUG CHOICE PROBLEM</b>		
P2.1 Inappropriate drug (not most appropriate for indication)	5	7.54
P2.3 Inappropriate duplication of therapeutic group or active ingredient	6	8.60
P2.4 Contra-indication for drug (incl.Pregnancy/breast feeding)	11	15.90
P2.5 No clear indication for drug use	20	28.90
P2.6 No drug prescribed but clear indication	27	39.10



<b>P3 DOSING PROBLEM</b>		
P3.1 Drug dose too low or dosage regime not frequent enough	16	66.60
P3.2 Drug dose too high or dosage regime too frequent	8	33.30
<b>P4 DRUG USE PROBLEM</b>		
P4.1 Drug not taken/administered at all	12	100
<b>P5 INTERACTION</b>		
P5.1 Potential interaction	108	91.50
P5.2 Manifest interaction	10	8.40
<b>P6 OTHERS</b>		
P6.2 Insufficient awareness of health and diseases	1	100

**Table 3:** Causes of drug related problems identified among hospitalized patients - **INTERVENTION**

<b>C1 DRUG SELECTION</b>	<b>Frequency (n)</b>	<b>Percentage (%)</b>
C1.1 Inappropriate drug selection available	49	25.10
C1.2 Inappropriate dosage selection	5	2.50
C1.3 More cost-effective drug available	14	7.17
C1.4 Pharmacokinetic problems, incl. ageing/ deterioration in organ function and interactions	87	44.60
C1.5 Synergistic/ preventive drug required and not given	13	6.66
C1.6 Deterioration/ improvement of disease state	1	0.51
C1.7 New symptom or indication revealed/ presented	15	7.69
C1.8 Manifest side effect, no other cause	11	5.64
<b>C2 DRUG USE PROCESS</b>		
C2.1 Inappropriate timing of administration and/or dosing intervals	7	33.30
C2.2 Drug underused/ under-administered	5	23.80
C2.3 Drug overused/ over-administered	9	42.80
<b>C3 INFORMATION</b>		
C3.1 Instructions for use/taking not known	2	66.60
C3.2 Patient unaware of reason for drug treatment	1	33.30
<b>C4 PATIENT/ PSYCHOLOGICAL</b>		
C4.1 Patient forgets to use/take drug	4	23.50
C4.8 Burden of therapy	3	17.60
C4.10 Patient takes food that interacts with drugs	10	58.80

**Table 4:** Intervention and outcome of drug related problems identified among hospitalized patients

<b>INTERVENTION</b>	<b>Frequency (n)</b>	<b>Percentage (%)</b>
<b>I1 AT PRESCRIBER LEVEL</b>		
I1.1 Prescriber informed only	5	2.60
I1.2 Prescriber asked for information	3	27.70
I1.3 Intervention proposed, approved by Prescriber	174	91
I1.4 Intervention proposed, not approved by Prescriber	5	2.61
I1.5 Intervention proposed, outcome unknown	4	2

<b>I2 AT PATIENT LEVEL</b>		
I2.1 Patient (medication) counselling	5	83.30
I2.4 Spoken to family member/caregiver	1	16.60
<b>I3 AT DRUG LEVEL</b>		
I3.1 Drug changed to ....	2	5.10
I3.2 Dosage changed to ....	6	15.30
I3.5 Drug stopped	19	48.70
I3.6 New drug started	12	30.70
<b>OUTCOME</b>		
<b>O0 OUTCOME INTERVENTION UNKNOWN</b>		
O0.0 Outcome intervention not known	21	100
<b>O1. SOLVED</b>		
O1.0 Problem totally solved	178	100
O2. Partially solved		
O2.0 Problem partially solved	12	100
<b>O3. NOT SOLVED</b>		
O3.1 Problem not solved, lack of cooperation of patient	5	20
O3.2 Problem not solved, lack of cooperation of prescriber	5	20
O3.4 No need or possibility to solve problem	15	60

**Table 5:** Major problems identified among drug related problems.

Top 10 problem-related drugs, according to number of problems identified.

<b>MOST COMMON PROBLEMS</b>	<b>COMPOUNDS</b>
Drug - Drug Interaction	T. Aspirin – T. Spironolactone. Carvedilol, T. Ramipril
Subtherapeutic dose	T. Carvedilol, T. Prazosin
Adverse drug reaction	INJ. Pantoprazole (PAN EASY)
Inappropriate drug selection	T. Metformin
Inappropriate drug selection	T. Pantoprazole
Supratherapeutic dose	T. Sitagliptin, T. Amoxicillin- Clavulanate
Side effect suffered	T. Tenofovir disoproxil fumarate (RICOVIR- EM)
Inappropriate drug selection	T. Paracetamol
Practical problems	T. Ondansetron

## DISCUSSION

It has been demonstrated that clinical pharmacy activities lower the frequency of medication-related issues, hospitalization, readmission, and overall cost of drug therapy. Clinical pharmacy is a new and developing field in India. Clinical pharmacy is clearly needed, yet the level of acceptability by the medical community varies. The clinical pharmacists' role in drug therapy decision-making and DRPs in an Indian hospital are discussed in more detail in this article.

The goal of drug therapy is to achieve defined therapeutic outcomes and improve the patient's quality of life while

minimizing patient risk. However, inappropriate use of drugs during disease management may lead to drug therapy problems. An observational cross-sectional study was conducted among 67 subjects who admitted to general medicine ward in AH & RC hospital. Totally 236 DRPs were identified throughout the study period. The study, during the hospital stay, majority of the patients 52(78.70%) received 1-5 drugs per day, 6(9.09%) patients received 6-10 drugs, 8(12.10%) patients received more than 10 drugs which is similar to the study conducted by *Bhagavathula A et al.*<sup>1</sup>

The major DRPs identified were related to drug interaction in 50%(n=108). Most of the DRPs were caused by drug drug



interaction (50%), whereas *Oki T et al*<sup>4</sup> reported that most frequently detected DRP was Supratherapeutic dosage. drug choice problem (39.10%), dosing problem (10.10%), drug use problems (5.08%) and adverse drug reaction (5.08) of the identified drug related problems. Out of 236 problems, 178(75.40%) of the problems were solved, 25(10.50%) of the problems were not solved, 21(8.89%) outcome were unknown, 12(5.80%) problems were partially solved. *Garin N, et al*<sup>[13]</sup> reported that intervention was proposed and approved in two thirds of the cases, while not approved in only 5.8% of cases. Outcome was unknown in 13.9% interventions were as in our study out of 236 DRP's 175(93.7%) intervention were approved by the prescriber while 5 (2.60%) were not approved by the prescribed and 3(27.70%) intervention was proposed but outcome was unknown.

In this study Nonsteroidal anti-inflammatory drugs (NSAID's), antidiabetic, and antihypertensive drugs were common drug classes involved in DRP. From our study it was found that, a total of 71 drugs were involved in different types of DRPs. The study on DRPs at *Jimma* University specialized hospital, Ethiopia<sup>1</sup> found antimicrobials were the top ranking drug classes involved in DRPs.

Special preference ought to be given to elder patients who are at a higher risk of developing DRP. Thus, these domains should be prioritized in both pharmaceutical care programmes and general educational activities. The participation of clinical pharmacists into the multidisciplinary team promotes the detection and solution of DRP in the majority of cases, and should be considered as a rule in general clinical practice. Finally, only a limited number of factors may be associated with a higher risk of developing DRPs in the hospital setting, such as polypharmacy, allergies and renal function < 30 mL/min, which could be useful to prioritize actions. Better understanding of these issues may facilitate the implementation of general approaches in diverse settings and the study of these interactions in the future.

Present study shows the wide spread presence of DRP's inside the hospital. The clinical pharmacist in the inpatient scale have shown reduction in medication errors and enhance patient treatment outcomes, thus the incorporation of clinical pharmacy services inside the hospital is of prime necessity in current scenario in India.

#### Limitations of the study

Insufficient information on disease duration, loss of Follow up of the patient. Further study is needed to identify the most frequently implicated drugs and risk factors for drug-related hospitalizations in other hospitalized populations, community patients, and nursing home resident. The study was done for a short period that is 6 months; this study can be done for a longer duration.

#### CONCLUSION

This study revealed that DRPs were high among elderly patients admitted to the medical ward. The most prevalent

were Drug interaction, followed by Untreated Indication, Drug use without indication, Subtherapeutic dose, Supratherapeutic dose and ADR. Non adherence to the drug therapy caused the DRP's among hospitalized patients. The most common class of drug causing the drug related problem was found to be non-steroidal anti-inflammatory drugs (NSAID's), Antidiabetic and Antihypertensive. Comorbidity, length of hospitalization, poly-pharmacy were more likely to develop DRPs. In addition, treatment optimizations were done by clinical pharmacists, and interventions were well accepted by prescribers. Special preference ought to be given to elder patients who are at a higher risk of developing DRP. Thus, these domains should be prioritized in both pharmaceutical care programmes and general educational activities. The participation of clinical pharmacists into the multidisciplinary team promotes the detection and solution of DRP in the majority of cases, and should be considered as a rule in general clinical practice.

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