ORIGINAL ARTICLE

Prescription Auditing and Study of Drug Utilization Pattern in Outpatient Pharmacy of a Tertiary Care Hospital, Bengaluru, India

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Abstract

Background: Drugs play an important role in disease prevention and health-care delivery. The availability and affordability of good quality drugs along with their rational use are required for effective health care. Prescription audit is one of the important components of clinical pharmacy, where clinical pharmacist plays an important role in optimization of medication use, minimizing number of medication-related problems and improving medication therapy. **Objective:** The main objective of the present study was to perform a prescription audit and detect prescription related errors and rationality of prescription. **Materials and Methods:** This prospective observational study carried out for 6 months in the Department of Pharmacy practice, Karnataka College of Pharmacy, Bangalore Baptist Hospital. The study result shows that majority of patients was female. Moreover, adults between the age group of 20- and 60-yearold were highly affected of patient. Major diagnosis was infection followed by diabetes mellitus and hypertension. It was concluded that almost 33% prescribed drugs were not written in generic name followed by drugs not in capital and without direction type of errors. The most prescribed drug category was antipyretics, followed by antibiotics and antidiabetic It was noted that two drugs such as ofloxacin eye drops and pregabalin topical cream presenting formulary were prescribed in study patient. The most prescribed drug was paracetamol followed by aspirin and pantoprazole **Conclusion:** It was found that almost quarter of drugs prescribed were belonged to high-risk medication group. Antidiabetics were highly prescribed drug category of high-risk medication. Drugs majorly prescribed were in tablet and syrup form. The study shows few drug interactions compared to population size, and the drugs involved were aspirin, clopidogrel, ciprofloxacin, carvedilol, and glimepiride.

Key words: Drug utilization, errors and rationality of prescription, prescription audit pattern

INTRODUCTION

The quality of life can be improved by enhancing the standards of the medical treatment at all levels of the health-care delivery system. A medical audit oversees the observance of these standards. An "audit" is defined as the review and the evaluation of the health-care procedures and documentation for the purpose of comparing the quality of care which is provided, with the accepted standards. There is an ever-present risk of medication errors in community pharmacy and ambulatory care practice, but this risk is even greater when pharmacy labels, which are provided to assist in patient care, are poorly designed. Standardized and well-thought drug labeling practices need to be a part of an overall strategy to improve medication adherence and reduce inadvertent medication errors.[1,2]

Drug-drug interactions (DDIs) are a concern for patients and providers, as multiple medication use is becoming more common to manage complex diseases. The consequences of DDIs can range from no untoward effects to drug-related morbidity and mortality. Although DDIs are considered preventable medication-related problems and Research has also shown that DDIs are associated with increased health care use.[3,4]

A DDI represents a specific type of adverse drug reaction, and the risk of drug interactions is proportional to the number of drugs taken. However, although potential DDIs s may affect 40–65% of all hospitalized patients, the clinical consequences of these drug interactions are highly variable, and adverse

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effect rarely occur. Most of the important drug interactions result from a change in the absorption, metabolism, or elimination of a drug. Drug interactions also may occur when two drugs that have similar (additive) effects or opposite (canceling) effects on the body are administered together.[5-7]

When two drugs that have sedation as side effects are given, for example, narcotics and antihistamines. Another source of drug interactions occurs when one drug alters the concentration of a substance that is normally present in the body. The alteration of this substance reduces or enhances the effect of another drug that is being taken. The drug interaction between warfarin (Coumadin) and Vitamin K-containing products is a good example of this type of interaction. Warfarin acts by reducing the concentration of the active form of Vitamin K in the body. Therefore, when Vitamin K is taken, it reduces the effect of warfarin. Most drugs are absorbed into the blood and then travel to their site of action. Most drug interactions that are due to altered absorption occur in the intestine. There are various potential mechanisms, through which the absorption of drugs can be reduced. Most drugs are eliminated through the kidney in either an unchanged form or as a by-product that results from the alteration (metabolism) of the drug by the liver. Therefore, the kidney and the liver are very important sites of potential drug interactions. Some drugs are able to reduce or increase the metabolism of other drugs by the liver or their elimination by the kidney.[7,8] Metabolism of drugs is the process through which the body converts (alters or modifies) drugs into forms that are more or less active (e.g., by converting drugs that are given in inactive forms into their active forms that actually produce the desired effect) or that are easier for the body to eliminate through the kidneys. Most drug metabolism takes place in the liver, but other organs also may play a role (e.g., the kidneys and intestine). The cytochrome P450 enzymes are a group of enzymes in the liver which are responsible for the metabolism of most drugs. They are, therefore, often involved in drug interactions. Drugs and certain types of food may increase or decrease the activity of these enzymes and therefore affect the concentration of drugs that are metabolized by these

Table 1: Prescription audit

Auditing parameters	Total number of prescriptions *n* (%)
Prescription without generic name	278 (33.3)
Prescription without drug in capitals	139 (16.6)
Prescription not legible	54 (8)
Prescription with inappropriate abbreviations	67 (8.02)
Prescription with dosenot mentioned	23 (2.75)
Prescription with doses form not mentioned	7 (0.8)
Prescription with route not mentioned	48 (5.7)
Prescription with frequency not mentioned	35 (4.2)
Prescription with drug substitution	72 (8.6)
Prescription without direction of use	112 (13.4)
Total	835 (100)

Table 2: Drugutilization pattern

Prescribed drugclass	Male (%)	Female (%)	Total (%)
Antihypertensive	68 (55.7)	54 (44.3)	122 (7.73)
Antidiabetic	96 (53.6)	83 (46.4)	179 (11.34)
Antiplatelet	101 (63.1)	59 (36.9)	160 (10.13)
Antibiotics	128 (56.9)	97 (43.1)	225 (14.25)
Anti-inflammatory	74 (54)	63 (46)	137 (8.68)
Antilipidemic	48 (64)	27 (36)	75 (4.75)
Antipyretics	155 (56.8)	118 (43.2)	273 (17.3)
Hormones	41 (37.3)	69 (62.7)	110 (6.97)
Multivitamins	75 (56.8)	57 (43.2)	132 (8.36)
Minerals	24 (40)	36 (60)	60 (3.80)
PPI	53 (50.5)	52 (49.5)	105 (6.65)
Total	863 (56.9)	680 (43.1)	1578 (100)

PPI: Proton-pump inhibitor

Table 3: HRM in prescription

Prescribed HRM	Male (%)	Female (%)	Total (%)
Antihypertensive 122			
Amlodipine	6 (54.5)	5 (45.5)	11 (9.01)
Carvedilol	6 (60)	4 (40)	10 (8.19)
Enalapril	7 (70)	3 (30)	10 (8.19)
Diltiazem	6 (60)	4 (40)	10 (8.19)
Metoprolol	14 (53.8)	12 (46.2)	26 (21.31)
Nebivolol	16 (53.3)	14 (46.7)	30 (24.59)
Propranolol	11 (36.7)	9 (63.3)	20 (16.39)
Prazosin	2 (40)	3 (60)	5 (4.09)
Antidiabetic 179			
Insulin regular	22 (53.7)	19 (46.3)	41 (22.90)
Insulin mixtard	16 (57.2)	12 (42.8)	28 (15.64)
Insulinglargine	13 (48.1)	14 (51.9)	27 (15.08)
Glimepiride	6 (54.5)	5 (45.5)	11 (6.14)
Glipizide	9 (52.9)	8 (47.1)	17 (9.49)
Metformin	18 (52.9)	16 (47.1)	34 (18.99)
Rosiglitazone	7 (58.3)	5 (41.7)	12 (6.70)
Acarbose	5 (55.5)	4 (4.5)	9 (5.02)
Antilipidemic 75			
Atorvastatin	21 (77.8)	16 (22.2)	37 (49.33)
Rosuvastatin	27 (71)	11 (29)	38 (50.66)

HRM: High resolution melt

enzymes.[9,10]

Drug interactions that are of greatest concern are those that reduce the desired effects or increase the adverse effects of the drugs. Drugs that reduce the absorption or increase the metabolism or elimination of other drugs tend to reduce the effects of the other drugs. This may lead to failure of therapy or warrant an increase in the dose of the affected drug. Conversely, drugs that increase absorption or reduce the elimination or metabolism of other drugs increase the concentration of the other drugs in the body and lead to increased amounts of drug in the body and more side effects. Sometimes, drugs interact because they produce similar side effects. Thus, when two drugs that produce similar side effects are combined, the frequency and severity of the side effects are increased.[11,12]

For all the above cases, prescription auditing and study of drug utilization pattern in the outpatient pharmacy of a tertiary care hospital, Bengaluru, India, are so important and need for the study.

MATERIALS AND METHODS

This study was conducted at Bangalore Baptist Hospital (BBH), Hebbal, a multispecialty tertiary care teaching hospital. BBH is a 300-bedded hospital providing secondary health care to people. The hospital has various Departments such as Medicine, Surgery, Pediatrics, Gynecology and Obstetrics, Orthopedics, Ear Nose Throat, Nephrology, Psychiatry, and Dermatology.

Selection of the topic, literature survey, and approval from the Institutional Ethics Committee and permission from the hospital were obtained before starting the study. All the outpatient's/inpatients prescriptions presented at outpatient pharmacy and collected on daily basis. according to the World Health Organization (WHO) prescription writing guidelines the prescriptions reviewed, and it is noted in a predefined data collection form. The prescription components, drug utilization behavior, and prescribing compliance to hospital formulary were noted and subjected for further analysis.

Indicators used for the assessment of prescription is basically categorized as patient-related information, prescriber's information, and drug-related information which includes patient's name, age and date of birth, gender, address, prescription date, prescriber name and specialty, contact details of prescriber, stamp and signature of prescriber, name of the drug, strength, dosage form, dose frequency, route of administration, number of units to be dispensed, other details (special advice), and any abbreviation used, if used, is it an approved one. The percentage of prescription having this information was calculated. In addition, the complaint and noncompliant components were noted. The percentage of deviation from the WHO good prescription writing guidelines was noted.

The age and sex of patients and doctors profile were recorded. In addition, according to age and gender, the prescriptions were classified. Number of drugs prescribed per prescription, number of drugs prescribed from the national essential drug list, number of drugs prescribed by generic name and the number of antibiotics prescribed, and the percentage of high-risk medication in the prescription were analyzed.

DDI was detected using previously developed online interaction checker (Micromedex) database and Stockley's Drug Interaction book. In addition, classified them accordance with severity, mechanism of action and documented in the drug interaction report form. The Micromedex, Medscape, reference articles, and books were used as the tools to analyze the prescription. Day wise, the data were documented. In addition, kept confidentially, 500 prescriptions were collected and analyzed based on the various objectives, and all the parameters were tabulated and scores were calculated while analysis was performed using Microsoft Excel software.

RESULTS AND DISCUSSION

In this observational study, prescription collected at outpatient department shows that, of 500 patients, 231 (46.2%) of patients were male and 269 (53.8%) were female. The study

Table 4: Potential DDI

Objective drug	Precipitant drug	Interactioneffect	Severity
Aspirin	Clopidogrel	Increased risk of bleeding	Major
	Diltiazem	Risk of GI bleeding	Moderate
Ciprofloxacin	Glimepiride	Hypo-and hyper-glycemia	Major
Iron	Calcium	Decreased absorption of iron	Moderate
Levofloxacin	Combiflame	Increased risk of seizure	Moderate
Insulin	Aspirin	Increased risk GI bleeding	Major
	Carvedilol	Increased blood glucose level	Major
	Levothyroxine	Hypo-and hyper-glycemia, HTN	Moderate
	Metoprolol	Hypoglycemia, HTN	Moderate
	Nebivolol	Hypoglycemia, HTN	Moderate
	Propranolol	Hypoglycemia, HTN	Moderate
Nebivolol	Aspirin	Decreasing the antihypertensive effects	Moderate
Metoprolol	Metformin	Hypoglycemia, HTN	Moderate
	Insulin	Hypoglycemia, HTN	Moderate
Metformin	Carvedilol	Hypoglycemia	Moderate
	Ciprofloxacin	Hypoglycemia	Moderate
	Corticosteroids	Loss of glycemic control	Moderate
	Levothyroxine	Decrease efficacy of propranolol	Moderate
	Metoprolol	Hypo-and hyper-glycemia	Moderate

HTN: Hypertension, DDI: Drug-drug interactions, GI: Gastrointestinal

group is further divided as 150 children (30%, <14 years), of which 80 (53.3%) were male and 70 (46.6%) were female; 25 adolescents (5%, 15–19 years), of which 10 (40%) were male and 15 (60%) were female; 245 adults (49%, 20–60 years), of which 99 (40.4%) were male and 146 (59.6%) were female; and 80 geriatricians (16%, >60 years), of which 42 (52.5%) were male and 38 (47.5%) were female. In this study, it was found that there was very high incidence of infection 120 (24%) case, followed by diabetes 90 (18%) and hypertension (HTN) 75 (15%). Table 1 shows that, in 500 prescriptions, the total number of error found was 835, which are categorized accordingly.

The study has shown that 33.3% of prescription errors were associated with generic name use while righting prescription, which clearly reflects the irrational behavior of prescription righting. Apart from that 16.6% of prescriptions have drugs not written in capital letters, and 13.4% of prescriptions were without the direction of use. Overall, 835 errors were found in 500 prescriptions which make almost 1:2 error ratio.

In our study, we have marked that prescription containing more than four drugs are categories under polypharmacy group. Moreover, the study result has shown that 67 prescriptions (43 prescriptions with five drugs and 24 with six drugs) come under this group.

The drug utilization study shows that patients who receive a very high number of antipyretics were 273 (17.3%), followed by antibiotics 225 (14.25%) and antidiabetic 179 (11.34%), which reviles the most common type of disease among the study population [Table 2].

High-resolution melt (HRM) analysis has shown that antidiabetic drugs were highly prescribed HRM category drugs (179), followed by antihypertensive (122) and antilipidemic (75). A total of 376 HRMs were prescribed in 500 prescriptions.

Table 3 shows the various HRM prescribed and their distribution among the population; the drugs belong to various groups such as antidiabetic drugs (179), antihypertensive drugs (122), and antilipidemic drugs (75). The study shows that the two drugs such as ofloxacin eye drops and pregabalin topical cream were not present in the formulary but were prescribed which indicates the requirement and upgradation of formulary.

A drug dosage form which was highly prescribed was tablet form 984 (62%), followed by 291 (19%), capsule 144 (9%), vial 96 (6%) and creams 63 (4%).

This study shows that paracetamol was highly prescribed drug 273 (17.3%), followed by aspirin 103 (6.5%), pantoprazole 84 (5.3%), zincovit 78 (4.9%), ciprofloxacin 74 (4.7%), combiflam 68 (4.3%), insulin 41 (2.6%), rosuvastatin 38 (2.4%), atorvastatin 37 (2.34%), and metformin 34 (2.15%).

Table 5: Severity and mechanismofdruginteraction

DDI	Type of interaction	Total (%)
Severity	Major	15 (28.8)
	Moderate	37 (71.2)
	Total	52 (100)
Pharmacokinetic interaction	Absorption	5 (14.3)
	Distribution	4 (11.4)
	Metabolism	26 (74.3)
	Excretion	0 (0)
	Total	35 (100)
Pharmacodynamic interaction	Synergism	11 (68.8)
	Antagonism	6 (37.5)
	Neutralization	0 (0)
	Total	16 (100)

DDI: Drug-drug interactions

During the study, it was found that there were 15 major and 37 moderate interactions which were further categorized as pharmacokinetic (35) and pharmacodynamic (6). The drugs involved in these interactions were aspirin, clopidogrel, carvedilol, diltiazem, glimepiride, metoprolol, propranolol, and nebivolol. Table 4 shows that the common drugs involved for potential DDI.

Table 5 shows that the prescription contains 15 major interactions, 37 moderate interaction, of which 35 was pharmacokinetic interactions and 16 were pharmacodynamic interactions.

CONCLUSION

This study is an attempt to evaluate the drugs prescribed and dispensed at the outpatient pharmacy of tertiary care hospital. The study result shows that majority of patients was female. Moreover, adults between the age group of 20 and 60 years old were highly affected.

Major diagnosis was infection followed by diabetes mellitus and HTN. It was concluded that almost 33% prescribed drugs were not written in generic name followed by drugs not in capital and without direction type of errors. The most prescribed drug category was antipyretics followed by antibiotics and antidiabetic. It was noted that two drugs such as ofloxacin eye drops and pregabalin topical cream which were not present in formulary were prescribed. The most prescribed drug was paracetamol followed by aspirin and pantoprazole. It was found that almost quarter of drugs prescribed were belonged to high-risk medication group. Antidiabetics were highly prescribed drug category of high-risk medication. Drugs majorly prescribed were in tablet and syrup form. The study shows few drug interaction compared to population size, and the drugs involved were aspirin, clopidogrel, ciprofloxacin, carvedilol, and glimepiride.

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