ISSN : 2320 4850

BI MONTHLY

Asian Journal of Pharmaceutical Research And Development

(An International Peer Reviewed Journal of Pharmaceutical Research and Development)

AJPRD

Volume - 01 Issue - 02 MAR-APR 2013

website: www.ajprd.com
editor@ajprd.com

Asian Journal of Pharmaceutical Research and Development
(An International Peer-Reviewed Journal of Pharmaceutical Research and Development)
www.ajprd.com
ISSN 2320-4850

Research Article

A STUDY ON DRUG UTILISATION PATTERN OF ACEI IN AN INDIAN MULTISPECIALITY HOSPITAL

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Received: 19 February 2013, Revised and Accepted: 20 March 2013

ABSTRACT

Irrational drug use mainly affects the patient safety and efficacy. Coordinated effects between healthcare workers are essential to make rational drug use a reality.To promote appropriate drug use in multispeciality hospital for ramipril and enalapril [Angiotensin converting enzyme inhibitors (ACEI's)]. A randomised observational and interventional study was carried out for six month period for ramipril and enalapril.We monitored drug use, drug efficacy and cost effectiveness of two drugs. Study results showed that inappropriateness was high in monitoring adverse events and drug-drug interactions in contrast dose and medication adherence was found to be appropriate; ACEI's were compared for their efficacy using blood pressure and found ramipril had more activity. Incremental cost effective ratio analysis was done for two drugs; ramipril was more cost effective with lowest cost ratio when compared to enalapril. The obtained results were disseminated along with criteria to physician; Feedback was obtained from the physician in the form of standard questionnaire.This study proved that drug utilisation studies are effective in improving prescribing practice and reducing treatment errors that directly helps to promote appropriate drug use.

Keywords: *ACE Inhibitors; Drug Utilisation; Enalapril; Incremental cost effective ratio; Physicians Feedback; Ramipril.*

INTRODUCTION

Drug use (DU) is a complex process; uncertainties in diagnosis, treatment and medication adherence contribute to wide variations in the way drugs are used for any given condition. The complexity of drug use means that optimal benefits of drug therapy in patient care may not be achieved because of underuse, overuse or misuse of drugs. Inappropriate drug use may also lead to increased cost of medical care, adverse effects and patient mortality.Drug utilization evaluation plays a key role in helping the healthcare system to understand, interpret and improve the prescribing, administration and use of medications.

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The principle aim of DU research is to facilitate rational use of drugs, which implies the prescription of a well documented drug in an optimal dose on the right indication, with correct information and at an affordable price. It also provides insight into the efficacy of drug use i.e. whether certain drug therapy provides value for money. DU research can help to set priorities for the rational allocation of health care budgets.Our activities aimed at problem detection and quantification; which includes the concept of appropriateness that must be assessed relative to indication for treatment, concomitant diseases (that might contraindicate or interfere with chosen therapy) and the use of other drugs (interactions), and even the associated adverse and economic consequences. It can also explore the percentage of drugs that adhere to the evidence-based recommendations.We define the drug use problems in name of appropriateness and inappropriateness for each drug specification. The problems are addressed to physicians by providing feedback from our results.

Educational interventions are made by using standard drug protocols, which help in providing rational drug therapy.

DUR studies are a time limited investigations that interpret patterns of drug use in relation to predetermined criteria, but do not attempt to change practice, which is designed to review drug use and prescribing patterns, provide feedback of results to clinicians and other relevant groups, develop criteria and standards which describe optimal drug use, promote appropriate drug use through developing drug criteria which leads to prevent irrational use of drug and promote rational drug usage[1].

AIM AND OBJECTIVE OF THE STUDY

1.To promote an appropriate drug use by developing a criteria.

2.To observe whether the drug therapy is according to developed criteria.

3.To assess the percentage of appropriateness and inappropriateness for each specification.

4.To compare the efficacy of selected drugs with respect to monitoring parameters.

5.To report which drug is cost effective among two compared drugs.

METHODOLOGY

Phase: I (Feb – Mar)

- Literature survey.
- Pilot study.
- Disease selection based on pilot study.
- Drug selection based on FSN analysis.
- Ethical approval.

Phase II (Apr – Jun)

- Developing criteria of selected drugs based on FDA Guidelines
- Preparation of data collection form based on specific drug criteria
- Data collection from cardiology.

Phase III (Jun – Aug)

- Cross check the developed criteria and present prescribing pattern.
- Compare the usage of two drugs based on criteria.
- Compare the efficacy of two drugs using blood pressure.
- Compare cost effective among two drugs using ICER.
- Report which drug is safe and cost effective with respect to incremental cost effectiveness analysis.
- Provide our results to the physician along with predetermined criteria.
- Feedback from physician by developing questionnaire.

Disease selection based on pilot study

Before initiating a proposed study, pilot study was conducted in the medical record department where the patient will register and we observed that majority of registration in general medicine, pulmonology, and cardiology. We selected speciality ward like cardiology as per our interest. From that department, we selected chronic diseases like Systemic Hypertension (SHT) and Congestive Heart Failure (CHF).

Drug selection based on FSN analysis

FSN (Fast Slow and Non moving) analysis is committed by assessing information from Hospital Information System (HIS) software for selected department. Based on our inclusion and exclusion criteria, we selected ACE Inhibitors (Ramipril and Enalapril). A detailed data collection form was prepared which includes patient demographics, social habits, prescriber indicators and consumer indicators.

The entire study population was used for the assessment of rational drug use with respect to predetermined criteria which is prepared by using FDA Guidelines for each drug.

The prepared drug criteria and present prescribing of selected drugs were cross checked by using Prescriber and Consumer indicators.

Prescriber indicators include **process** indicator and **outcome** indicator.

Process indicator

During process of the therapy for selected drug, we observed whether the physician has given the specific drug to right indication, right dose, and right person with appropriate monitoring, having no contra- indication, adverse effects and drug – drug interaction.

Outcome indicator

We observed whether the patient's health status has improved or not by using specific disease monitoring parameters and medical records.

Consumer indicator

We observed whether the patients are adhering to given medication or not by using nursing chart.

Study population: 50 patients for each drug.

Comparison of efficacy

Efficacy of ramipril and enalapril is compared using mean of systolic blood pressure and diastolic blood pressure (SBP and DBP). Efficacy was determined using following formula

Cost effective analysis:

We have compared drug cost (DC) and drug efficacy (DE) of two drugs using incremental cost effectiveness ratio (ICER) Formulae:

ICER = DC/DE

A drug which has lowest ICER was taken as cost effective drug.

The obtained results from the study were disseminated along with developed drug criteria of two drugs to concerned physicians. Feedbacks from physicians were obtained using standard questionnaire form.

RESULTS AND DISCUSSION

The study was analysed for gender, diagnosis, department wise classification, age wise classification, social status, co- morbid condition, and appropriateness of therapy, efficacy and economics for each of the following drugs - Tab.Ramipril (Drug R), and Tab. Enalapril (Drug E).

Age Wise Distribution

Drug R and Drug E taken by 34% of patients were aged between 51 – 60 years. Therefore the study proves that these drugs are taken by adult patients because they are more prone to hypertension. Details are presented in **Table: 1.**

Gender wise classification

The male population were prescribed more than females i.e. Drug R and Drug E each 62%.Therefore both of our selected drugs were given more in men because of their high disease state which may be due to social habits and stress. Details are presented in **Table: 1.**

Social Status

Majority of the patients taking Drug R and Drug E were uneducated and non- vegetarians, smokers and alcoholics. Details are presented in **Table: 1.**

Diagnosis wise classification

Patients with hypertension had high usage of Drug R and Drug E. Details are presented in **Table: 2.**

Co- morbid conditions

The most common co-morbidities of the two drugs were diabetes mellitus, coronary heart disease and chronic obstructive pulmonary disease. In Drug R, diabetes mellitus and coronary artery disease were high, where as diabetes mellitus was high in Drug E. Details are presented in **Table: 3.**

Table1: PATIENT DEMOGRAPHICAL DETAILS

Patient demographics		**Drug R**	**Drug E**
Age		34% (51 – 60)	34% (51 – 60)
Gender	Male	62%	62%
	Female	38%	38%
Social Status	Alcoholics	36%	38%
	Un- educated	78%	74%
	Non -veg	70%	78%
	Smokers	40%	56%

USAGE OF DRUGS

The Usage of drugs was evaluated based on prescriber indicators (process and outcome indicators) and consumer indicator.

Justification of the indicators:

The percentage of appropriateness and inappropriateness of each specification of prescriber and consumer indicators were discussed with respect to indication, dose, monitoring, adverse events, contraindication, drug – drug interaction, medication adherence. Outcome indicators with respect to disease monitoring parameter were also discussed. Details are presented in **Table: 4 and Figure: 1.**

Process indicators

Indication

From 50 patients, Drug R was indicated to HTN 26(52%) and CHF 3(6%) which was found to be 58% appropriate and inappropriate in CAD 21(42%) as per the study criteria.

Out of the 50 patients, Drug E was indicated to HTN 33(66%) and CHF 4(8%) which was found to be 74% appropriate while 26% inappropriate in CAD 10(20%), RHD 1(2%) and PAH 2(4%) patients as per the study criteria. Details are presented in **Table: 4 and Figure: 1.**

Dose

In case of Drug R the oral dose range was 5 – 20 mg/day, while for Drug E oral dose range was 5 – 40 mg/day which was indicated for HTN and CHF as per FDA Guidelines. Drug R and Drug E also has 100% appropriate which is shown that all the 50 patients of each drug receive dose within its range. Details are presented in **Table: 4 and Figure: 1.**

Monitoring

Monitoring of Efficacy

In case of Drug R and Drug E, B.P (Blood Pressure) should be done before and after therapy to know its efficacy. For Drug R and E, blood pressure was monitored before and after therapy for all the 50 cases of each drug which was shown to be 100% appropriate for both drugs. Details are presented in **Table: 4 and Figure: 1.**

Monitoring of Adverse events

For Drug R & Drug E, two parameters were considered to be checked - electrolytes (Hyperkalemia) and RFT (Renal Function Test) as per the FDA Guidelines.

For Drug R, 32 (64%) patients checked electrolytes during therapy and 48 (96%) checked RFT before therapy, the average patients of 40 (80%) were monitored as per FDA Guidelines to avoid adverse events which was taken as appropriate.

For Drug E, 28(56%) patients checked electrolytes during therapy and 31(62%) checked RFT before therapy, the average patients 29 (58%) were monitored to avoid adverse events which was taken as appropriate. Details are presented in **Table: 4 and Figure: 1.**

Contraindication

Contraindication is a condition or factor that might contraindicate or interfere with chosen therapy.

Drug R and Drug E are contraindicated in bilateral renal artery stenosis, pregnancy, volume depletion patients, history of angioedema as per the FDA Guidelines.

Each of Drug R and Drug E was given to 3(6%) patients who were having renal disease, which was taken as 6% inappropriate for each drug. Details are presented in **Table: 4 and Figure: 1.**

Adverse effects

In Drug R and Drug E, therapy was evaluated for cough, hyperkalemia, angioedema, dry mouth, and neutropenia. We found for Drug R, 8(16%) patients had cough in which 5 patients were females and 3 patients were male and 2(4%) has hyperkalemia and a total of 10 (20%) patients Drug R therapy was taken as inappropriate[4][8].

On the other hand, Drug E causes cough in 10(20%) patients in which 6 patients were females and 4 patients were males and hyperkalemia 2 (4%) patients and angioedema 3 patients (6%) and a total of 15 (30%) was found to be inappropriate as per the study criteria[2][3]. Details are presented in **Table: 4 and Figure: 1.**

Drug – Drug interaction

For Drug R, 1 (2%) patient had severe interaction with Tab. Spironolactone, 25 (50%) patients had moderate interaction with Tab. Aspirin, and 14 (28%) patients had mild interaction with Tab. Furosemide. From a total of 50 patients , 40 (80%) patients had been prescribed with interacting drugs which is found to be inappropriate as per the study criteria.

For Drug E, 4 (8%) patients had severe interaction with Tab. Spironolactone, 8 (16%) patients had moderate interaction with Tab. Aspirin, 19 (38%) patients had mild interaction with Tab.

Furosemide which is shown that a total of 31 (62%) patients had been prescribed with interacting drugs which was found to be inappropriat as per the study criteria. Details are presented in **Table: 4 and Figure: 1.**

Outcome indicator

In this, patient outcome was measured by using medical records and disease monitoring parameters.

For Drug D and Drug T , the disease monitoing parameter was blood pressure . For Drug R and Drug E, 50 (100%) patients has shown improvement taken as 100% appropriate. Details are presented in **Table: 4 and Figure: 1.**

Comparison of efficacy

Patients who have undergone specific disease monitoring test before and after therapy of the two selected drugs were taken to compare efficacy. Drug R and E are ACE inhibitors, were compared by using Blood pressure values. Details are presented in table: 5.

Cost effective analysis

Cost effective drug determined by Incremental Cost Effective Analysis. Details are presented in table: 6.

STUDY LIMITATIONS

The study may be extended to other departments of the hospital including a larger sample size.A comparative study can also be carried out to assess the risks and benefits in patient groups following and not following FDA guidelines. Comparing outcomes could give us an idea to what extent these criteria are relevant in clinical practice and influence the prognosis of patients.For identifying safety and efficacy profile of selected drug long term study is required.Identifying appropriateness for indications should include all uses of drugs i.e., in our study ACE inhibitor have been taken in patients with the treatment for hypertension and heart failure but guidelines saying it can be useful in post myocardial infarction and prophylaxis of cardiovascular events in high risk patients.

Table 2: DIAGNOSIS WISE CLASSIFICATION

Diagnosis	Ramipril		Enalapril	
	Frequency	Percent	Frequency	Percent
HTN	26	52.0	33	66.0
CCF	3	6.0	4	8.0
CAD	21	42.0	11	22.0
RHD	**	**	1	2.0
PAH	**	**	1	2.0

** : Not Applicable HTN: Hypertension, CCF: Congestive heart failure ,CAD: Coronary artery disease, RHD: Rheumatic heart disease, PAH: Pulmonary Arterial Hypertension

Table 3: CO MORBID CONDITION:

Co morbid illness	Ramipril		Enalapril	
	Frequency	Percent	Frequency	Percent
IHD	**	**	1	2.0
DM	28	56.0	15	30.0
Seizure	1	2.0	6	12.0
CAD	36	72.0	6	12.0
COPD	11	22.0	2	4.0

** : Not Applicable, IHD: ischemic heart disease, DM: Diabetes mellitus, CAD: Coronary artery disease, COPD: Chronic obstructive pulmonary disease

Table 4: INAPPROPRIATENESS OF EACH DRUG:

INDICATORS		Drug R	Drug E
Indication		42%	26%
Dose		0%	0%
Monitoring	Efficacy	0%	0%
	Adverse events	20%	42%
Contraindication		6%	6%
Adverse effects		20%	30%
Drug – Drug interaction		80%	62%
Out come		0%	0%
Medication Adherence		0%	0%

Table 5: AVERAGE MEAN REDUCTION IN BLOOD PRESSURE FOR RAMIPRIL AND ENALAPRIL:

Efficacy	Group 1(Drug R)	GROUP 2(Drug E)
Systolic Mean	50.80	15.80
Diastolic mean	37.20	11.10
Average Mean	44	13.45

Table 6: COST EFFECTIVE DRUG AMONG RAMIPRIL AND ENALAPRIL DONE USING ICER

	Tab. Ramipril	Tab. Enal
Drug cost	Rs. 6.7	Rs. 2.60
Drug efficacy	44	13.45
DC/DE	15.35 %	19.33%
Lowest ICER was seen in Drug R which was said to be cost effective		

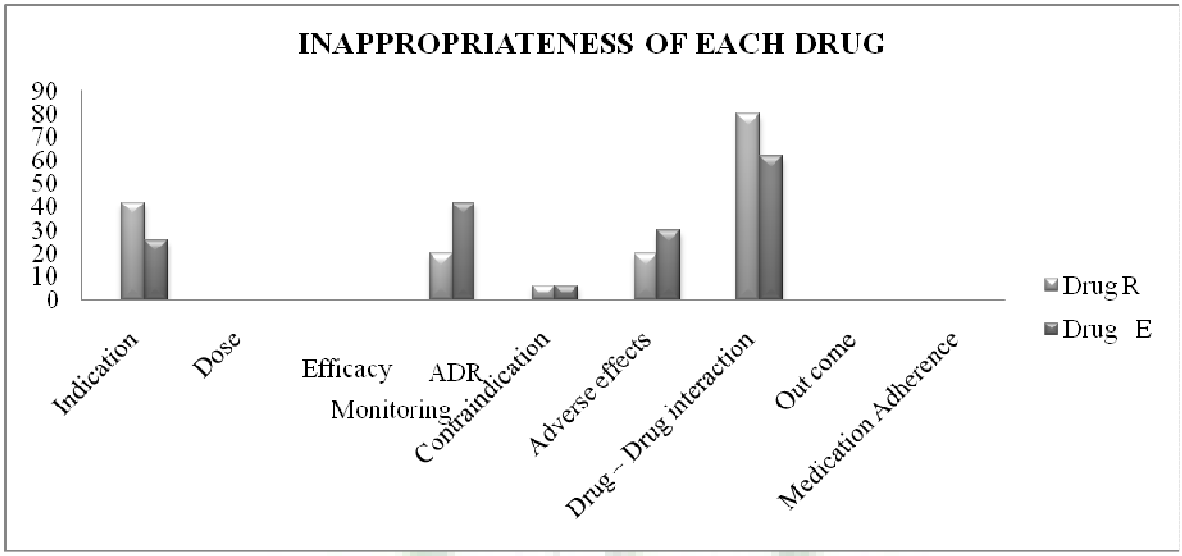

Figure 1: Inappropriateness of each drug

CONCLUSION

In this study, prescriber and consumer indicators of two drugs were monitored. The majority of patients in the study were 51 – 60 years; most of them are men who were uneducated, smokers and alcoholics. Inappropriateness was found to be high in indication, monitoring adverse events and drug-drug interactions as per study criteria. In contrast dose and medication adherence was found to be appropriate. Selected drugs were compared for their efficacy, Drug R had more activity almost 3 times more than Drug E. Incremental cost effective ratio analysis was done, and ramipril was more cost effective with lowest cost effective ratio. Education is the most immediate current need; concerned physicians in cardiology have been given a copy of developed criteria for two drugs along with our obtained results. Feedback was obtained from the physician in the form of standard questionnaire, in which most of physicians accepted our criteria for both drugs, Hence this study proved that drug utilisation studies are effective in improving prescribing practice and reducing treatment errors.

CONFLICT OF INTEREST

The author(s) declare(s) that they have no conflicts of interest to disclose.

FUNDING

This research received no specific grant from any funding agency in the public, commercial or not – for-profit sectors.

ACKNOWLEDGEMENTS

The authors thank head of the department of cardiology in PSG hospitals for their constant support and PSG College of pharmacy for provided all facilities.

REFERENCES

1. *David Lee and Ulf beg. Studies of Drug utilisation, In; Brain L.Strom. pharmacoepidemology, 4th edition, USA;2007: 401-417.*
2. *Chih-Sheng Chu, Kai-Hung Cheng, Kun-Tai Lee, Tsung-Hsien Lin, Shuo-Tsan Lee, Ho Ming Su, et al. Tolerability of Ramipril 10 mg daily in High-risk cardiovascular patients in Taiwan: Experience from Kaohsiung medical university Chung-ho memorial hospital. Kaohsiung J. Med Sci. 2005; 21:511-516.*
3. *L. E. Visser, B. H. CH. Stricker, J. van der velden, A. H. P. Paes and A. Bakker. Angiotensin Converting Enzyme Inhibitor Associated Cough: A Population-Based Case-Control Study. J Clin Epidemol.1995; 48: 851-857.*
4. *Abdelmoneim Ismail Awad and Hossam Ahmed Himad. Drug-use practices in teaching hospitals of Khartoum state, Sudan. European Journal of Clinical Pharmacology. 2006; 62: 1087-93.*
5. *Bapna JS, Jain A, Hussain M, Bhargava J, and Lalvani P. Rational drug management in private sector through intervention. Indian Institute of Health Management Research.2004; (Accessed on 14th Sep 2007).*
6. *Bernadette A. Tumanan-Mendoza, Antonio L. Dans, Lourdes Lucienne Villacin, Victor L. Mendoza, et al. Dechallenge and rechallenge method showed*

different incidences of cough among four ACE-Is. Int. J.clinical Epidemiology. 2006; 60: 547 – 553.

7. *Javier García Del Pozo, Eduardo Ramos Sevillano, Francisco J. de Abajo et al. Use of Antihypertensive Drugs in Spain (1995-2001). Rev Esp Cardiol, 2004; 57(3): 241-9.*
8. *Jeffrey R Schein. Cigarette Smoking and clinically significant Drug interactions. The Annals of pharmacotherapy.1995; 29: 1139 – 1147.*
9. *Molly Thomas. Rational Drug use and the Essential Drug Concept. In: G.parthasarathi, Nyfort – Hansen, Milap C Nahata, A Text book of clinical pharmacy practice, 4 Th*
10. *Molly Thomas. Rational Drug use and the Essential Drug Concept. In: G.parthasarathi, Nyfort – Hansen, Milap C Nahata, A Text book of clinical pharmacy practice, 4 Th edition, England; 2007; 72-83.*
11. *Thomas Moore, Alexander Bykov, Tony Savelli, Andrei Zagorski. Guidelines for implementing drug utilization review programs in hospitals. Rational Pharmaceutical Management Project.1997;1-56.*
12. *Sean Hennessy, Stephen B. soumerai et al. Drug utilisation Review. In: Brian L. Strom. Pharmacoepidemiology, 4th edition, 2007; USA; 439 – 453.*