ISSN- 0301-1216
Indian J. Prev. Soc. Med. Vol. 56, No.2, 2025

A Pharmacoeconomic Approach in Comparison of Cilnidipine and Metoprolol Succinate, Telmisartan and Hydrochlorothiazide in the Treatment of Hypertensive Patients by application of Cost-Effective Analysis

Gundampati Satheesh[1], K. Jagadeesh[2], N. M. Vageesh[3], Y Naveen[4]

ABSTRACT

Objective: A study was conducted to evaluate and compare the cost-effectiveness of telmisartan and hydrochlorothiazide compared with cilnidipine and metoprolol in reducing blood pressure by one mm of Hg per day in hypertensive patients. **Materials and Methods:** It was a prospective experimental analysis of cost-effectiveness, to compare the cost of telmisartan (40 mg), hydrochlorothiazide (12.5mg) and cilnidipine (10 mg) and metoprolol (50 mg) in hypertensive cases using either of the medicines. An aggregate of 98 cases recently detected hypertensive cases were considered for the comparison, of which 49 cases were specified telmisartan, hydrochlorothiazide and the other 49 were specified cilidipine, metoprolol as per the recommended dosage. Data were analyzed using paired and unmatched T-tests in MS- Excel soft earthenware. **Results**: The cost of reducing 1mm of Hg blood pressure per day with telmisartan, hydrochlorothiazide was 0.21(SBP), 0.31 (DBP) INR, whereas that of cilidipine, metoprolol was 0.23 (SBP), 0.28 (DBP) INR. **Conclusion**: This pharmaco-economic analysis shows that Telmisartan, Hydrochlorothiazide is further cost-effective as compared to Cilnidipine, Metoprolol succinate when the cost per reduction in blood pressure per day is considered. This may affect the cases economically during their long-term use of these motes for the hypertension

Keywords: Cost-effectiveness, Hypertension, Cilnidipine, Metoprolol succinate, Telmisartan, Hydrochlorothiazide

Authour(s) Details:

1. Pharm. D Intern, Department of Pharmacy Practice, St. Johns College of Pharmaceutical Sciences, Yerrakota, Yemmiganur, Andhra Pradesh, India.
2. Associate Professor, Department of Pharmacy Practice, St. Johns College of Pharmaceutical Sciences, Yerrakota, Yemmiganur, Andhra Pradesh, India.
3. Professor, Department of Pharmaceutics, St. Johns College of Pharmaceutical Sciences, Yerrakota, Yemmiganur, Andhra Pradesh, India.
4. General Medicine, Sree Shakthi Nursing Home, Yemmiganur, Andhra Pradesh, India

Correspondening Address: Dr. K. Jagadeesh, Associate Professor, Department of Pharmacy Practice, St. Johns College of Pharmaceutical Sciences, Yerrakota (village) Yemmiganur 518360 Kurnool, Andhra Pradesh, Tel:+8555968094, **E-mail:** jagadeeshpharmd2011@gmail.com

Citation: Satheesh G., Jagadeesh K., Vageesh NM, Naveen YA Pharmacoeconomic Approach in Comparison of Cilnidipine and Metoprolol Succinate, Telmisartan and Hydrochlorothiazide in the Treatment of Hypertensive patients by application of Cost-Effective Analysis. Indian J Prev Soc Med, 2025; 56 (1): **267-273. DOI https://doi.org/10.5281/zenodo.15811086**

Sequence of Article:

Submission: 27.12.2024 | Revision: 22.01.2025 | Accepted: 18.03.2025 | Published: 30.06.2025

Prior Publication: Nil; Source of Funding: No; Conflicts of Interest: None, Article # 621/859

Introduction

Pharmacoeconomics: The field of study that evaluates the gestures of individualities, enterprises and requests applicable to the use of pharmaceutical products, services and programs, and which constantly focuses on the costs(inputs) and consequences(issues) of that use.'[1] therefore, Pharmacoeconomics (PE) is a subfield of health economics. Operationally, the field of Pharmacoeconomics consists of comparing issues (clinical, profitable or humanistic) and costs (resource consumption) of pharmaceutical products, programmes and/ or services to the coming stylish druthers from named perspectives.[2] The end of this approach is to identify, measure, value and establish a link between both resource consumption and issues so that the relative worth of named pharmaceutical products, programmes and/ or services can be established. The combination of cost and issues analysis may take numerous forms including cost minimization analysis (CMA), cost-benefit analysis (CBA), cost-effectiveness analysis (CEA), cost mileage analysis (CUA) and/or cost –consequences analysis (CCA). The discipline of Pharmacoeconomics draws upon colorful areas similar to economics, epidemiology, drug, drugstore and the social lores.[3]

Cost Effectiveness Analysis (CEA)

- Compares the value of an intervention its effectiveness measured in natural health units
- Costs unit of dimension
- Consequences Natural units (Times of life saved, cases averted)
- CEAs used when druthers produce a standard health outgrowth of interest but are achieved to different degrees.
- Generally expressed as a rate
- Cost per natural unit effect (C/E)
- Goods per cost (E/ C)
- Substantially employed in situations where a decision maker, operating with a given budget is considering a limited range of options within a given field.[4]

Steps of Cost-Effectiveness Analysis

1. Identification of two or further druthers and issues
2. Identification of perspectives for going
3. Determination of costs
4. Determination of cost-effectiveness rate
5. Decision making[5]

Cilnidipine and Metoprolol succinate

- Cilnidipine may be a calcium channel blocker that works by relaxing blood vessels while metoprolol is a beta-blocker that works specifically on the heart to decelerate the heart rate.
- Together, they produce the heart more effective at pumping blood throughout the body.[6]

Telmisartan and Hydrochlorothiazide

- Hydrochlorothiazide may be a thiazide diuretic (water lozenge) that helps help your body from absorbing too important swabs, which may beget fluid retention.
- Telmisartan is an angiotensin II receptor antagonist.
- Telmisartan keeps blood vessels from narrowing, which lowers vital signs and improves blood inflow.
- Hydrochlorothiazide and telmisartan are admixture drugs used to treat high blood pressure (hypertension). Lowering vital signs may lower your risk of stroke or heart attack.[7]

Methodology

***Sources of data*:** Initial assessment form, Medication chart, Investigation results charts (patient case file).

Study site: The study was conducted in Sree Shakthi nursing home, yemmiganur.

Study duration: The study will be conducted for 6 months.

Sample size*:* Total numbers of 98 patients were recruited from the departments of General medicine in sree-shakthi nursing home, Yemmiganur.

Study design*:* Prospective experimental study conducted over an amount of six months

Study criteria

Inclusion criteria*:* Patients of either sex, between 18-65years, newly detected hypertensive patients.

Exclusion criteria: Patients with pregnancy and lactation, and patients with comorbidity conditions.

Statistical analysis: The collected knowledge can analyze by victimization paired and unmated T check in MS-EXCEL software. Statistics to provide results from the info.

Result and Discussion

A total of a hundred patients United Nations agency met the choice criteria listed within the study. Among them, one from the blood group and one from B were born out as are salt of loss of follow-up. Therefore, a complete of ninety-eight patients, forty-nine from the blood group and forty-nine patients from B completed the study as shown in Table 1.

Table-1: Enrollment of patients in both treatment group

Particulars	**Telmisartan+ Hydrochlorothiazide (Group Tenwin H)**	**Cilnidipine + Metoprolol Succinate (Group Cilicar M)**
	Group A	**Group B**
Patients enrolled in study	50	50
Patients dropped out	1	1
Patients completed in study	49	49

Figure -1: Gender-wise distribution in our study includes both groups A and group B. Among 98 patients 50 (51%) patients are males and 48 (48%) patients are females as shown in Fig. 1 and also shown in table representation in tab.2.

Figure-1: Gender wise categorization

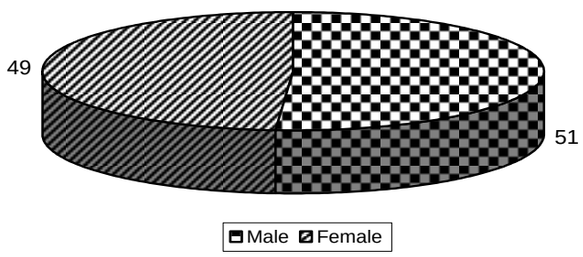


Table-2: Gender distribution

	Male	**Female**
No. of patients	50	48

Fig.-2: Gender and age wise distribution in Telmisartan (40mg) + Hydrochlorothiazide (12.5mg)

Fig.-3: Gender and age wise distribution in Cilnidipine (10mg) + Metoprolol succinate (50mg)

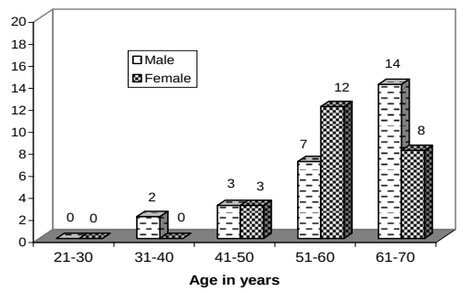


Fig.-2 Represents that gender in different age groups is as follows years, 21-30 years age groups 0 male and 0 females are 0, 31-40 years age groups 1 male and 2 females are 41-50 year age groups 3 males and 7 females are 51-60 years age groups 13 males and 10 females are 61-70 years age group males 6 and females are 7.

Fig.-3 represents that gender in different age groups is as follows years, 21-30 years age groups 0 males and 0 females are 31-40 years age groups males 2 and 0 female are 41-50 year age groups 3 males and 3 females are 51-60 years age groups male are 7 and females are 12, 61-70 years age group males 14 and females are 8.

Table 3, represents the age-wise distribution in both groups, ***Tenwin H*** 21-30 years age patients are 0, 31-40 years age patients are 3, 41-50 years age patients are 10, 51-60 years age group patients are 23, 61-70 years age groups patients are 13 and ***Cilcar M*** 21-30 year age patients are 0, 31-40 years age patients are 2, 41-50 years age patients are 6, 51-60 years age group patients are 19, 61-70 years age groups patients are 22.

Table-3: Age wise distribution in both groups

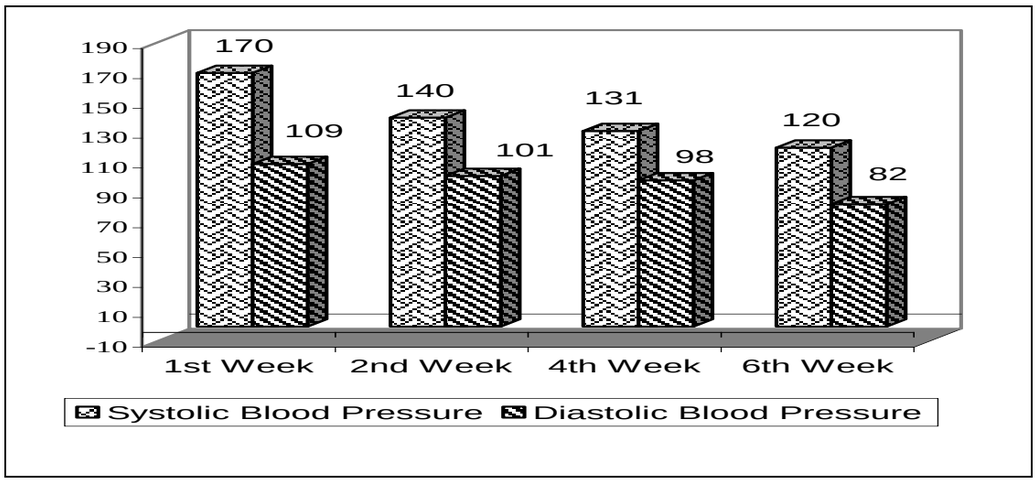
Age in years	No. of patients in each group	
	Tenwin-H	Cilcar-M
21- 30	0	0
31- 40	3	2
41- 50	10	6
51- 60	23	19
61-70	13	22

Table- 4: Baseline characteristics of the hypertensive patients

No. of visits	Measured parameters	Mean ± SD		P Value
		Tenwin-H	Cilcar-M	
1st visit	Systolic blood pressure (SBP)	170.8 ± 2.34	170.64 ± 3.71	0.767
	Diastolic blood pressure (DBP)	110.6 ± 1.69	109.02 ± 2.92	
2nd week	Systolic blood pressure (SBP)	154.04± 1.90	140.31 ± 9.88	0.000
	Diastolic blood pressure (DBP)	98.12 ± 3.39	101.79 ± 4.51	
4th week	Systolic blood pressure (SBP)	137.9 ± 6.38	131.02 ± 5.61	0.000
	Diastolic blood pressure (DBP)	93.33 ± 1.66	98.12 ± 4.15	
6th week	Systolic blood pressure (SBP)	121.27± 7.35	120.77 ± 8.74	0.762
	Diastolic blood pressure (DBP)	81.97 ± 6.13	81.79 ± 4.39	

Figure 4 and Table 5 represent changes in systolic and diastolic blood pressure from baseline to 8 weeks on treatment with Telmisartan and Hydrochlorothiazide and there was a great proportion of reductions in blood pressure from week to week in our study, we observed that there was a significant reduction in blood pressure.

Fig.-4: Changes in Systolic Blood Pressure (SBP) and Diastolic Blood Pressure (DBP) from the 1st visit to 6 weeks with Telmisartan (40mg) + Hydrochlorothiazide (12.5mg)



Systolic blood pressure from the first visit to 2 weeks period there was a reduction in an average of 30mm of Hg and from0-4 weeks accumulatively there was a reduction in blood pressure on an average of 39 mm of Hg and 50 reductions are observed at 0-6 and weeks respectively.

Diastolic blood pressure (DBP) is also reduced in great proportions on treatment with Telmisartan and Hydrochlorothiazide. We observed that from the first visit to 2 weeks period there was a change of DBP is about 8mm of Hg and from the first visit to 4 weeks there was a change of 11 mm of Hg and from the first visit to 6 weeks about 27 mm of Hg.

Table-5: Changes in Systolic Blood Pressure and Diastolic Blood Pressure from the first visit to 6 weeks with Telmisartan (40 mg) + Hydrochlorothiazide (12.5mg).

Visits	Mean ± SD	
	Systolic Blood Pressure (SBP)	Diastolic Blood Pressure (SBP)
1st visit	170 ± 3.71	109 ± 2.92
2nd week	140 ± 9.88	101± 4.51
4th week	131 ± 5.16	98 ± 4.15
6th week	120 ± 8.74	82 ± 4.39

Fig.-5: Changes in systolic blood pressure and Diastolic blood pressure from the first visit to 6 weeks with Cilnidipine (10mg) + Metoprolol succinate (50mg)

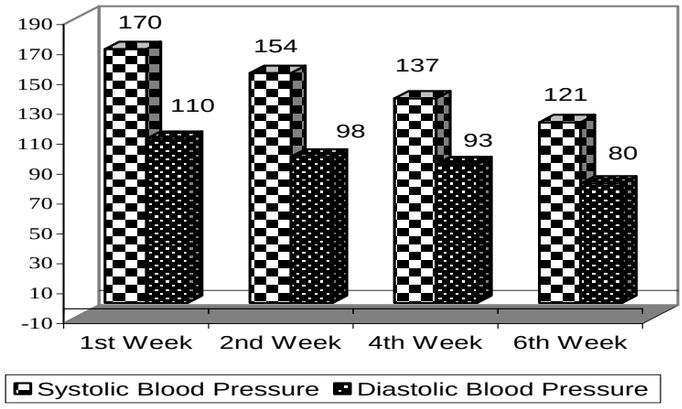


Table-6: Changes in systolic blood pressure and Diastolic blood pressure from the first visit to 6 weeks with Cilnidipine (10mg) + Metoprolol succinate (50mg).

Visits	Mean ± SD	
	Systolic Blood Pressure (SBP)	Diastolic Blood Pressure (SBP)
1st visit	170±2.34	110±1.69
2nd week	154±1.90	98±3.39
4th week	137±6.38	93±1.66
6th week	121±7.35	80±6.13

Figure 5 and Table 6 represent changes in systolic and diastolic blood pressure from baseline to 8 weeks on treatment with Cilnidipine (10mg) + Metoprolol succinate (50mg) and there was a great proportion of reductions in blood pressure from week to week and In our study, we discovered that there was a major reduction in vital sign. Systolic blood pressure from the first visit to 2 weeks period there was a reduction in an average of 16mm of Hg and from 0-4 weeks accumulatively there was a reduction in blood pressure on an average of 37 mm of Hg and 49 reductions are observed at 0-6 and weeks respectively. Diastolic blood pressure (DBP) is also reduced in great proportions on treatment with Cilnidipine and Metoprolol. We observed that from the first visit to 2 weeks period there was a change of DBP is about 12mm of Hg and from the first visit to 4 weeks there was a change of 17 mm of Hg and from the first visit to 6 weeks it was about 30 mm of Hg.

Table 7 represents the costs of both drugs, The cost of the Cilnidipine (10mg) + Metoprolol succinate (50mg) (Cilcar- M) is 114/- Rs and the cost of the Telmisartan (40mg) + Hydrochlorothiazide (12.5mg) is 85/- Rs.

Table-7: Cost of both drugs

Cost of both drugs	Tenwin-H	Cilcar-M
Cost per 10 tablets	Rs. 85/-	Rs. 114/-

Table-8, represents the cost evaluation of both drugs in hypertensive patients, Clinidipine + Metoprolol succinate cost for reducing 1.0 mmHg of SBP (INR) is 13.02 and for BDP (INR) is 21.28 per day cost per mmHg SBP (INR) 0.23 and for BDP (INR) 0.38. Telmisartan (40mg) + Hydrochlorothiazide (12.5mg) cost for reducing 1mmHg of SBP (INR) is11.90 and for BDP (INR) is 17.00.Per day cost per mmHg SBP (INR) 0.21 and for BDP (INR) 0.30.

Table-8: Cost evaluation of both drugs in hypertensive patients

Treatment	Cost for reducing per mmHg		Per day cost per mmHg	
	SBP (INR)	DBP (INR)	SBP(INR)	DBP(INR)
Cilnidipine + Metoprolol succinate	13.02	21.28	0.23	0.38
Telmisartan + Hydro- chlorothiazide	9.52	17.62	0.71	0.31

Discussion

Hypertension is outlined as an SBP of one hundred forty mmHg or additional or a DBP of 90 mmHg or additional or taking medicinal drug medication. High blood pressure is assessed as either hyperpiesia (EH) or high blood pressure and EH accounts for concerning 90-95% of the cases characterized by a high sign with no obvious underlying medical causes.8 In developing countries, it is a major medical concern that the high rate of undiscovered and untreated EH. In clinical trials, hypertensive medical care has been associated with a reduction in (1) stroke incidence, an average of 35-40%;(2) myocardial infarction (MI) average of 20-25%; and HF, an average of>50%.[9]

The study reported here may be a pharmaco-economic approach in comparison of cilnidipine and metoprolol succinate, telmisartan, and hydrochlorothiazide within the treatment of hypertensive patients by application of cost-effective analysis. The 10mg of cilnidipine and metoprolol succinate of 50mg combination therapy, 40mgof telmisartan, and hydrochlorothiazide 12.5mg were utilized in this study. one of the objectives was to identify the best drug combination treatment approach that reduces blood pressure by 1mm of Hg per day in terms of cost It had been reported that telmisartan, Esidrix is a smaller amount pricey as compared to Cilnidipine, beta- adrenergic blocker succinate once the worth per reduction in vital sign per day is taken into account.[10]

Cilnidipine is also a Ca channel blocker that works by restful blood vessels whereas a beta-adrenergic blocking agent maybe a beta-blocker that works specifically on the centre to slow the centre rate. Together, they produce the centre additional economical at pumping blood throughout the body. Hydro DIURIL is also a diuretic drug (water pill) that helps stop your body from interesting an excessive amount of salt, which can cause fluid retention. Telmisartan is associate degree angiotensin II receptor antagonist. Telmisartan keeps blood vessels from narrowing, which lowers signs and improves blood flow. Hydro DIURIL and telmisartan are a mix of drugs employed to treat high vital signs (hypertension). Lowering signs could lower your risk of stroke or heart failure.[11] Patel et al. carried out a study on cost-effective analysis of nebivolol and metoprolol in essential hypertension: A pharmaco-economic comparison of the antihypertensive efficacy of beta blockers, last, the pharmaco-economic analysis shows that nebivolol is less expensive as compared to metoprolol when the cost per reduction in blood pressure per day is considered. This might affect the patients economically during their long-term use of these molecules for the treatment of hypertension.[12]

This Pharmaco-economics study was administered for a comparative analysis of the cost-effectiveness of Cilnidipine, Lopressor succinate and telmisartan, and Hydro DIURIL in hypertensive patients. There was a clinically important distinction among the affectivity of each drug molecule. As per this comparative analysis, it had been found that Telmisartan, Hydro DIURIL is a smaller amount overpriced as compared to Cilnidipine, Lopressor succinate in terms of reducing each pulsation additionally as heartbeat force per unit area.

The study results showed an enormous distinction within the price of each drug molecule. The worth per reduction in pulsation pressure in a metric linear unit of Hg per day was found to be zero.23 authority by Cilnidipine, beta-adrenergic blocker succinate, same being zero. 21 authorities by telmisartan, Esidrix the worth per reduction in pulsation pressure in mmHg per day was found to be 0.38 authority by Cilnidipine, beta- adrenergic blocker succinate, same being 0.30 authority by telmisartan, Hydrochlorothiazide.

Conclusion

This pharmacoeconomic analysis shows that Telmisartan, thiazide is more cost-effective as compared to Cilnidipine, beta-adrenergic blocking agent succinate once the price per reduction in pressure level per day is taken into account. This may affect the patients economically throughout their long use of those molecules for high blood pressure.

Acknowledgement: I would wish to categorical my thanks of feeling to my guide Dr K. Jagadeesh and my special due to Dr Y. Naveen for his ready steerage and support in finishing my project. Thanks to my seniors G. Narendra, K. Mahesh, K. Praneeth K. Nagaraj, and U. Ravi Teja for advising me in my project work.

Ethics Statement: Institutional ethical committee has accepted our project.

References

1. G Parthasarathi, a text book of clinical pharmacy practice, essential concepts and skills, 2nd edition
2. Sathvik B. Duncertainties in diamond is treatment in appropriate drug use may also lead you rug use is. A Text Book of Clinical Pharmacy Practice: Essential Concepts and Skills. 2004.
3. Mistry H. Systematic review of studies of the cost-effectiveness of telemedicine and telecare. Changes in the economic evidence over twenty years. Journal of telemedicine and telecare. 2012 Jan;18 (1):1-6.
4. Russell LB, Gold MR, Siegel JE, Daniels N, Weinstein MC. The role of cost-effectiveness analysis in health and medicine. 6 Oct 9; 276 (14):1172-7.
5. Shepard DS, Thompson MS. First principles of cost-effectiveness analysis in health. Public Health Reports. 1979 Nov; 94 (6) : 535.
6. Sankar PR, Babu S, Ravi P. Development and Validation Of Novel UV And RP-HPLC Methods For Determination Of Cilnidipine (A New Generation Ca Channel Blocker) In Pharmaceutical Dosage Form. International Journal of Pharmaceutical Sciences and Research. 2019; 10: 1886-94.
7. Lacourcière Y. A new fixed-dose combination for added blood pressure control: telmisartan plus hydrochlorothiazide. Journal of international medical research. 2002 Aug., 30 (4):366-79.
8. Zhao Q, Fan Z, He J, Chen S, Li H, ZhangP, WangL, Hu D, HuangJ, Qiang B, GuD. Renalase gene is a novel susceptibility gene for essential hypertension: a two-stage association study in northern Han Chinese population. Journal of Molecular Medicine. 2007 Aug; 85 (8):877-85.
9. Wang J, Xiong X, Yang G, Zhang Y, Liu Y, Zhang Y, Zhang Z, Li J, Yang X. Chinese herbal medicine qi ju di huang wan for the treatment of essential hypertension: a systematic review of randomized controlled trials. Evidence-Based Complementary and Alternative Medicine. 2013 Oct; 2013.
10. Yao G, Freemantle N, Flather M, Tharmanathan P, Coats A, Poole-Wilson PA. Long- term cost- effectiveness analysis of Nebivolol compared with standard Carein Elderly Patients with heart failure. Pharmacoeconomics. 2008 Oct; 26 (10): 879-89.
11. Reddy KS, Srinivasan N, Reddy CR, Kolla N, Anjaneyulu Y, Venkatraman S, Bhattacharya A, Mathad VT. An efficient and impurity-free process for telmisartan: Anantihypertensive drug. Organic process research & development. 2007 Jan 19;11(1):81-5.
12. Patel RS, Sharma KH, Kamath NA, Patel NH, Thakkar AM. Cost-effectiveness analysis of Nebivolol and metoprolol in essential hypertension: A pharmacoeconomic comparison of antihypertensive efficacy of beta blockers. Indian Journal of Pharmacology. 2014 Sep; 46 (5): 485.