

Research Article



A Study on Safe Use of Drugs in Elderly Patients in an Indian Teaching Hospital by Using BEERS and STOPP Criteria

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ABSTRACT

Potentially inappropriate prescribing in elderly patients is a major health issue because it can lead to negative outcomes and increases healthcare costs. The current study was designed to assess the potentially inappropriate medications (PIMs) prescribed in elderly patients in an Indian teaching hospital. A prospective cross sectional study was conducted on prescriptions of patients aged 65 and above visiting the outpatient general medicine department between August 2016 and March 2017. These prescriptions were reviewed for potentially inappropriate medication use by using beers criteria and STOPP criteria. A total of 200 prescriptions consisting of 131 (65.5%) males and 69 (34.5%) females were reviewed during the study. The mean age of the patients was found to be 72 years \pm 4.986 S.D and the mean medication prescribed per patient was 3.83 \pm 1.660 S.D. The beer's criteria identified potentially inappropriate medication use in 17% of the patients whereas 8.5% of patients used at least one inappropriate medication according to STOPP criteria. The most frequently prescribed inappropriate drugs according to beers criteria were found to be antidepressants (23.6%) followed by benzodiazepines (18.42%) and calcium channel blockers (15.78%). STOPP criteria identified benzodiazepines (33.3%) as the most frequently prescribed inappropriate medications followed by calcium channel blockers (27.7%) and beta blockers (16.6%). The study shows that identifying inappropriate medications by using beers and STOPP criteria may contribute to improve prescribing practices in the elderly patients. Clinical pharmacist can play a key role in decreasing potentially inappropriate medicine use by suggesting appropriate alternatives thereby improving the quality of care.

Keywords: Elderly patients, Safe use of medications, Beers criteria, STOPP criteria.

INTRODUCTION

Elderly populations are one of the fastest growing populations worldwide. Sizable percentages of elderly populations suffer from multiple health problems and their management with pharmacotherapy is a predominant aspect of healthcare in elderly. Age related changes in body composition, kidney and liver functions and Inter individual differences in age related pharmacokinetics and pharmacodynamics render the selection of appropriate pharmacotherapy a challenging and complex process. Lack of awareness of these changes can contribute to inappropriate medicines leading to adverse drug events, frequent hospital admissions resulting in increased morbidity and mortality^{1, 2}. A potentially inappropriate medication (PIM) refers to drugs at risk of causing more side effects than benefits in the elderly, especially when safer or more effective alternative therapy is available for the same condition³. Such potentially inappropriate medications can be identified and avoided by using published explicit indicators developed by consensus approaches. The tool consists of lists of medications to avoid, to use cautiously or to actively recommend in the elderly. Several validated instruments are available in the literature, having different structures and medications: the Beers criteria, the STOPP/START (Screening Tool of Older Person's Prescriptions/ Screening Tool to Alert Doctors to Right, i.e.; appropriate, indicated Treatment) criteria, and the

PRISCUS (Latin for "old and venerable" list⁴. Various studies have shown that prescribing inappropriate medication to elderly can lead to adverse outcomes with frequent hospital admissions and increased healthcare expenditure. This underscores the need for regular reviews and adjustments of the treatment received by this geriatric population^{5, 6}. Assessing the appropriate prescribing in the elderly by using the explicit indicators could suggest potential directions for safety and efficacy in optimizing drug therapy and thereby improving the quality of care⁷. Pharmacist can play a very important role in identification of potentially inappropriate medications through pharmaceutical care services and thereby ensuring appropriate drug therapy in the elderly. So the present study was undertaken with the aim of assessing potentially inappropriate medications by using Beers and STOPP criteria in an Indian teaching hospital.

MATERIALS AND METHODS

Study Design/Settings

This cross sectional observational study was conducted in a tertiary care teaching hospital located in the Dakshin Kannada district, Mangalore, Karnataka, India. The study was carried out on prescriptions of outpatients visiting the general medicine department for a period of 8 months from August 2016 to March 2017.



Inclusion Criteria

Patients of either gender aged 65 years and above visiting the outpatient general medicine department and are prescribed with a minimum of one or more medications were included in the study.

Exclusion criteria

Patients with incomplete case records and those who are not willing to participate in the study were excluded.

Ethical Considerations

The study was approved by the human institutional ethics committee.

Data collection

All the patients demographic characteristics, chief complaints, diagnosis, past medical history, past medication history and detailed information about the drugs prescribed were obtained from case sheets and treatment charts. Data was collected till the required sample size was achieved. The medications received by the patients were compared for appropriateness with the Beers criteria and STOPP criteria. For the purpose of this study, potentially inappropriate medications (PIMs) were identified as medication contained in the AGS 2015 updated Beers criteria and STOPP criteria. Patients were allocated as having received an inappropriate drug if they had received one or more medication in the Beers criteria or STOPP criteria. The STOPP criteria provided assessment of PIMs and prescribing omissions.

Statistical analysis

All data were gathered using Microsoft excel 2010. SPSS 17.0 was used for statistical analysis. Continuous variables in the text and tables were expressed by mean \pm S.D and categorical data were presented as percentage and cumulative frequency.

RESULTS

Demographic characteristics

A total of 200 geriatric patients who met the study criteria were reviewed during the study period. Among them, 131 (65.5%) were males and 69 (34.5%) were females and the mean age was found to be 72 years \pm 4.986 S.D (Range: 65-87 years). There were 137 (68.5%) patients belonging to the age between 65-74 years followed by 58 (29%) patients in the age group 75-84 years and 5 (2.5%) patients in the age group \geq 85 years. Majority of the [96(48%)] patients received 4-6 drugs per prescription followed by 92 (46%) patients who received 1-3 drugs per prescription. The mean medication prescribed per patient was 3.83 ± 1.660 S.D (Range: 1-9). The most common co-morbidities identified in the study population was found to be hypertension (35.4%) followed by diabetes mellitus (21.6%) and ischemic heart disease (8.10%). Table 1 shows the baseline characteristics of the populations included in the study

Table 1: Baseline characteristics of study populations

Characteristics	Frequency (n)	Percentage (%)
<u>Gender</u>		
Male	131	65.5
Female	69	34.5
<u>Age(Years)</u>		
65-74	137	68.5
75-84	58	29
\geq 85	5	2.5
<u>No of drugs</u>		
1-3	92	46
4-6	96	48
7-9	12	06
<u>Disease conditions</u>		
Hypertension	118	35.4
Diabetes Mellitus	72	21.6
Dyslipidemia	13	3.90
COPD	27	8.10
Asthma	11	3.30
Peptic ulcer	25	7.50
UTI	10	3.00
IHD	27	8.10
Thyroid	7	2.10
CKD	2	0.60
Dermatological Diseases	1	0.30
LRTI	3	0.90
Osteoarthritis	3	0.90
Psychiatric Disorders	14	4.30

Inappropriate prescriptions

After applying the inappropriateness criteria, it was found that 25% (51 patients) of the total 200 prescriptions were prescribed at least one potentially inappropriate medications. Table 2 summarizes the potential inappropriate medications according to the beers and STOPP criteria.

A total of 17% of potentially inappropriate prescriptions were found using Beers criteria. The most common potentially inappropriate prescriptions according to beers criteria were the prescribing of prazosin and clonidine as antihypertensive there by high risk for orthostatic hypotension, use of calcium channel blocker given for hypertensive patients with chronic constipation, use of antihistamines in the elderly and short acting benzodiazepines prescribed to an elderly patient with a history of falls. Table 3 shows the identified potentially inappropriate medicines using beers criteria.



Table 2: Number of patients identified with a potential inappropriate medicine according to the Beers and STOPP criteria in 51 patients.

Number of patients	Beers	STOPP
One inappropriate	30	16
Two	4	1
3 or more	-	-
Patients with any potentially inappropriate medications	34 (17%)	17 (8.5%)

Table 3: Potential inappropriate prescriptions identified using the beers criteria.

BEERS CRITERIA: Independent of diagnosis			
	Prazocin		4
	Clonidine		3
	Amitriptyline		6
	Nitrofurantoin		9
	Risperidone		1
	Total		23
BEERS CRITERIA: Considering side effects			
	Diagnosis	Drug	
	Constipation	Calcium channel blockers and tricyclic antidepressants	6
	Syncope or falls / fractures	Benzodiazepine: Alprazolam	3
	Depression	Long term Benzodiazepine: Clonazepam	1
	Parkinson disease	Conventional antipsychotics eg: Chlorpromazine	1
	Gastric or duodenal ulcers	NSAIDs	4
	Total		15

STOPP criteria detected 8.5% of potentially inappropriate prescriptions. The most common potentially inappropriate prescriptions according to STOPP were the use of calcium channel blockers for hypertensive patients with chronic constipation, prescribing benzodiazepines for insomnia in patients with history of fall and the use of beta blockers in patients with diabetes and hypertension. Table 4 shows the potentially inappropriate prescriptions identified by using STOPP criteria.

DISCUSSION

Special care and attention while prescribing drugs to geriatric population is required because many medications can pose a greater health risk as regards to the available pharmacologic and non-pharmacologic alternatives. Prescribing potentially inappropriate

medications in elderly is associated with increased risk of adverse drug reactions leading to recurrent hospital admissions resulting in morbidity and mortality⁸. The present study was carried out to find the safe use of drugs in the elderly population by using Beers and STOPP criteria.

Table 4: Potential inappropriate prescriptions identified by STOPP criteria.

Criteria	Drugs	
Drugs that adversely affect fallers	Benzodiazepines	5
Cardiovascular system	Loop diuretics as first line monotherapy for hypertension	2
	Calcium channel blockers with chronic constipation	5
Central nervous system and psychotropic drugs	Long term use of long acting benzodiazepines	1
	Long term neuroleptics in those with parkinsonism	1
Gastrointestinal system	Loperamide for unknown cause of diarrhea.	1
Endocrine system	Beta blockers with diabetes mellitus and episode of hypoglycemia.	3
	Total	18

In the present study gender wise distribution of study populations shows male predominance noted over females. This association has not been reported in all studies as some studies reported that women are more likelihood of having potentially inappropriate medications prescribed than men^{9, 10, 11}. Considering age wise distribution of study populations, most of the prescriptions reviewed were in the age between 65-74 years of age. But in contrast to this result study conducted in other countries were comprised mainly of patients aged more than 80 years of age^{12, 13}. This observation may be related to the lower life expectancy in developing countries like India. The study revealed hypertension as the most common cardiovascular disorder among the study populations followed by diabetes mellitus. This might be due to the fact that hypertension and diabetes mellitus is more likely to be associated with complications resulting frequent hospital visits among our study population. Examining the number of drugs received per prescription, most of the patients received at an average of 4-6 drugs per prescription. This result is well supported by a systematic review on polypharmacy and inappropriate drug use among older people which showed that polypharmacy defined as patients receiving more than four drugs per prescription was predictive of the risk for inappropriate drug use among elderly¹⁴.

The study proves the high prevalence of potentially inappropriate medications among elderly populations. In



this study, approximately 20-25% of the elderly population who visited the medicine outpatient department has at least one potentially inappropriate medication. Comparing the result with other studies, the prevalence ranged from 16.3% to 62.5%^{15, 16}. This variation can be explained by the diversity in the severity of the disease in the study subjects as more severe cases are admitted to the hospital and the number of drugs prescribed will be more than primary care and occurrence of PIM is very high. Of the total potentially inappropriate medications identified during the study, it was found that using beers criteria has a greater number of potentially inappropriate medications than the STOPP criteria. This finding was supportive to the previous studies in nursing homes of Malaysia by Karandikar et al which showed that beers criteria identified more residents being prescribed on PIMs than STOPP criteria^{17, 18}. The common identified PIMs by beers criteria included amitriptyline, alprazolam, nitrofurantoin and prazosin. The study identified a high prevalence of benzodiazepines usage in patients with PIM by using STOPP criteria. However benzodiazepines can increase the likelihood of cognitive deterioration, delirium, falls, fractures and even death in elderly people. Hence we suggest that prescribing benzodiazepines to elderly with caution and preferably for short durations when no alternatives are available. Considering PIMs using beers criteria, anticholinergic in particular tricyclic antidepressants, benzodiazepines and calcium channel blockers showed a high proportion. As compared to other studies the common medications related to PIMs were diverse according to the study settings, study populations and the criteria checklist list used. Nevertheless, benzodiazepines and tricyclic antidepressants associated with PIMs in this study is as the same as to other prior studies^{19, 20, 21}. Few cases of use of calcium channel blockers for hypertensive a patient with chronic constipations has been identified as PIMs in our study. As the older age group usually has isolated systolic hypertension, diabetes and dyslipidemia, channel blockers were the majority of prescriptions for hypertensive treatment. Another example is the use of amitriptyline prescription for neuralgia which is also being considered as PIMs. Physician do not have many choices for prescription as a safer alternative to amitriptyline or having an adverse effect from this medication. Difference in availability of certain drugs and prescribing habits also may make up the major share differences.

Though it is not a rule that the prescription of PIMs will cause adverse events in older adults and there exist no universally accepted criteria for the evaluation of prescription, individual assessment remains the key factor in the consideration of prescription in the elderly. However, use of an explicit criterion by physicians and pharmacist as a screening tool for assessment of PIMs in geriatric may be worthwhile. This may help in minimizing medication related adverse effects, reduction of drug related cost, overall healthcare costs and adverse drug

event –related hospitalizations thereby improving quality of care for the elderly people.

CONCLUSION

The study shows that Beers and STOPP criteria help in identifying inappropriate prescriptions and thereby improving the current prescribing practices in the elderly patients. The incidence of potentially inappropriate medication in our study was found to be high, special care and attention should be given to elderly patients receiving poly pharmacy or multiple medications with comorbidities and who are at increased risk of potentially inappropriate medication. The study suggests that the clinical pharmacist can play a key role in identifying, resolving and preventing the Potentially Inappropriate Medication in elderly patients and thereby optimizing the patient care.

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REFERENCES

1. Wooten JM. Pharmacotherapy considerations in elderly adults. *South Med J.* 105 (8), 2012, 437-445.
2. Spinewine A, Schmader KE, barber N, Hughes C, Lapane KL, Swine C, et.al. Appropriate prescribing in elderly people: how well can it be measured and optimized? *The Lancet*, 370(9582), 2007, 173-184.
3. Reich O, Rosemann T, Rapold R, Blozik E, Senn O. Potentially Inappropriate medication use in older patients in Swiss managed care plans: Prevalence, Determinants and Association with hospitalization. *PLoS ONE* 9 (8), 2014, e105425.
4. Primejdie DP, Bojita MT, Popa A. Potentially inappropriate medications in elderly ambulatory and institutionalized patients: an observational study. *BMC Pharmacology and Toxicology*, 17, 2016, 38-40.
5. Galli TB, Reis WC, Andrzejewski VM. Potentially inappropriate prescribing and the risk of adverse drug reactions in critical ill older adults. *Pharmacy Practice*, 14(4), 2016, 818- 21.
6. Pradhan S, Panda A, Mohanty M, Behera JP, Ramani YR, Pradhan PK. A study of the prevalence of potentially inappropriate medication in elderly in a tertiary care teaching hospital in the state of Odisha. *Int J Med Public Health* 5, 2015, 344-8.
7. Shah KN, Joshi HM, Christian RP, Patel KP, Malhotra SD. Prevalence of potentially inappropriate medications and prescription cost analysis among older cardiac patients in an outpatient department of a tertiary care hospital in India. *J Basic Clin Pharma* 7, 2016, 110-5.
8. Morgan SG, Jordan HMA, Rioux J, Proulx J, Deirdre WMA, Cara TMD. Frequency and cost of potentially inappropriate



- prescribing for older adults: a cross-sectional study. *CMAJ Open* 4(2), 2016, E346-E351.
9. Faustino CG, Passarelli MCG, Filho WJ. Potentially inappropriate medications among elderly Brazilian outpatients. *Sao Paulo Med J* 131(1), 2013, 19-26.
 10. Martins VS, Moreira Mori ALP, Dorea EL, Pinto GA, Hirata MH et al. Exposure to potentially inappropriate medications in Brazilian elderly outpatients with metabolic diseases. *Braz. J Pharm Sci*, 52(4), 2016, 699-707.
 11. Raghuvver P. To assess the prescription quality in a comprehensive geriatric clinic and to determine frequency of inappropriate medication and polypharmacy. *IJPS*, 8, 2016, 975-993.
 12. Gallagher P, O'Mahony D. STOPP (Screening Tool of Older person's potentially inappropriate prescriptions) application to acutely ill elderly patients and comparison with Beer's criteria. *Age Ageing* 37, 2008, 673-9.
 13. Liu CL, Peng LN, Chen Y, Lin MH, Liu LK, Chen LK. Potentially inappropriate prescribing for elderly medical inpatients in Taiwan: a hospital based study. *Arch Gerontol Geriatr*. 55, 2011, 148-51.
 14. Elmstahl S, Linder H. polypharmacy and inappropriate drug use among older people- a systematic review. *Healthy Aging & Clinical care in the Elderly* 5, 2013, 1-8.
 15. Vali L, Pourreza A, Foroushani AR, Sari AA, Honarmand DH. An investigation on inappropriate medication Applied among Elderly Patients. *World Appl Sci J*. 16(6), 2012, 819-25.
 16. Bradley MC, Motterlini N, Padmanabhan S, Cahir C, Williams T, Fahey et al. Potentially inappropriate prescribing among older people in the United Kingdom. *BMC Geriatrics*, 14, 2014, 72.
 17. Karandikar YS, Chaudhari SR, Dalal NP, Sharma M, Pandit VA. Inappropriate prescribing in the elderly: A comparison of two validated screening tools. *Journal of Clinical Gerontology & Geriatrics* 4, 2013, 109-114.
 18. Chen LL, Tangiisuran B, Shafie AA, Hassali MA. Evaluation of potentially inappropriate medications among older residents of Malaysian nursing homes. *Int J Clin Pharm* 34, 2012, 596-603.
 19. Ubeda A, Ferrandiz ML, Maicas N, Gomez C, Bonet M, Peris JE. Potentially inappropriate prescribing in institutionalized older patients in Spain: the STOPP-START criteria compared with the Beers criteria. *Pharmacy Practice* 10(2), 2012, 83-91.
 20. Limpawattana P, Kamolchai N, Theeranut A, Pimporm J. Potentially inappropriate prescribing of Thai older adults in an internal medicine clinic. *Afr J Pharm Pharmacol* 7(34), 2013, 2417-2422.
 21. Yang PJ, Lee YT, Tzeng SL, Lee HC, Tsai CF, Chen CC et.al. Potentially inappropriate prescribing in disabled older patients with chronic diseases: *Med Princ Pract* 24, 2015, 565-570.

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