

DOI: <https://dx.doi.org/10.18203/2319-2003.ijbcp20243831>

Original Research Article

Evaluation of rationality of geriatric patients prescription based on STOPP/START criteria in a tertiary care hospital

Nischal Agrawal¹, Srimadhurmayi Poluri^{1*}, Lomash Timsina¹, Beulah Milton²

¹Krupanidhi College of Pharmacy, Bangalore, Karnataka, India

²Department of Pharmacy Practice, Krupanidhi College of Pharmacy, Bangalore, Karnataka, India

Received: 04 October 2024

Revised: 07 November 2024

Accepted: 11 November 2024

*Correspondence:

Dr. Srimadhurmayi Poluri,

Email: madhurmayi2000@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: The geriatric population (65 years and above) is a challenge to treat for the medical fraternity, exposing them to the risk of potentially inappropriate prescription (PIP) and thus, increasing the risk of adverse drug reactions (ADR). The over-use of drugs and irrational choice lead to the prescription of a potentially inappropriate medication (PIM) and the underuse of appropriate drugs leading to potential prescribing omission (PPO). Screening Tool of Older Persons' Potentially Inappropriate Prescriptions (STOPP) and Screening Tool to Alert doctors to the Right Treatment (START) criteria is one of the most effective tools to check the rationality of the prescribed drugs.

Methods: The study was a six-month (March 2023 to August 2023) prospective observational design. A total of 193 patients were enrolled in the study. Case report forms were used to confirm the diagnosis and medications. Geriatric patients who fulfilled the study inclusion criteria were assessed using the STOPP/START toolkit version 2.

Results: The majority of the study participants belonged to age group 65 to 70 years. Out of these 40.4% of the study participants had Potentially Inappropriate Medications based on STOPP criteria and 31.1% had Potential Prescription Omissions based on START criteria.

Conclusions: Potentially Inappropriate Prescriptions were assessed using STOPP/START criteria in version 2. A high prevalence of PIM and PPO was found. Co-morbidity and polypharmacy were linked to a higher chance of PIM. Thus, this criterion can be used to generate rational prescriptions for the elderly population.

Keywords: Potentially inappropriate prescription, Potentially inappropriate medication, Potential prescription omission

INTRODUCTION

The term "geriatric population" refers to individuals who are 65 years old or older. This demographic presents a unique challenge for the medical field to manage effectively, due to their increasing age and the related changes in physiology, pharmacokinetics, pharmacodynamics, multiple chronic comorbid conditions and polypharmacy, exposing the geriatric patients to the risk of potentially inappropriate prescription (PIP) and thus increasing the risk of adverse drug reactions (ADR).¹ When a medication has clear evidence-based indications, it is generally well tolerated and is said to be appropriate

for the geriatric population. In addition to considering each patient's life expectancy, appropriate prescribing for older patients involves promoting medications with favourable risk-benefit ratios and avoiding preventative medicines in patients with a poor prognosis for survival.²

Challenges arise from factors such as, the large size of the demographic, increased sensitivity to drug effects, which can be caused by changes in body composition.³ Decreased ability to eliminate drugs, malnutrition and cachexia, which can be the result of the aging process.^{4,5} The increased likelihood and effects of polypharmacy, numerous diseases and comorbidities.⁶ A lack of relevant

evidence about treatment effectiveness and safety in elderly and frail patients, as well as limited access to it.^{1,7,8}

When the dangers of prescribing a medication outweigh its potential benefits for a certain patient, it is considered inappropriate prescribing. IP includes both potentially inappropriate medications (PIMs) and potential prescription omissions (PPOs). IP, for instance, may happen when drugs are prescribed. Even when there is no clear evidence-based indication. In higher doses or for longer than necessary. With medications from the same class. With medications that could result in drug-drug or drug-disease interactions. For patients who are vulnerable to certain ADEs, such as benzodiazepines in patients with a history of fall. In place of an equally therapeutically effective drug, which is more affordable.⁹

A range of criteria and tools, like BEER'S criteria, STOPP/START in various versions, Phadke's criteria, etc., are available to evaluate the rationality of a prescription.^{10,13} STOPP (Screening Tool of Older Persons' Prescriptions) and START (Screening Tool to Alert to Right) criteria are a physiological systems-based explicit set of criteria that attempts to define the clinically important prescribing problems relating to potentially inappropriate medications (PIMs-STOPP criteria) and potential prescription omissions (PPO-START criteria) in older adults.

STOPP/START criteria acknowledge the dual nature of IP by presenting a list of PIMs (STOPP criteria) and PPOs (START criteria) for potential IP in older patients. Researchers and healthcare professionals have systematically identified potentially inappropriate drugs (PIMs) using 80 criteria in STOPP and potential prescribing omissions (PPOs) using the START system, which consists of 34 criteria. Contrary to beer's criteria, STOPP criteria drugs are significantly related to adverse drug effects (ADE). The usability of the stop-start criteria is improved by the way they are arranged in relation to the physiological system to which one is related.¹¹

Additionally, STOPP and START criteria refer to classes of drugs rather than specific medications, which results in easier transferability to different countries with different formularies.¹² The criteria being used in this study are STOPP/START criteria Version 2.

METHODS

Study type

A prospective observational study.

Study place

The study was conducted in the Departments of General Medicine, Orthopedics and General Surgery at MVJ Medical College and Research Hospital, Bangalore, India.

Study duration

The study was conducted for a duration of six months (March 2023 to August 2023).

Sample size

The data of 193 geriatric patients was collected during the study period an institutional ethics committee approved the study.

Inclusion criteria

In our study, the inclusion criteria considered were, Patients aged 65 years and above, of either sex, having complete medical record data, including age, sex, drug use and laboratory data. Prescriptions administered to hospitalized patients in the fields of general medicine, general surgery and orthopedics.

Exclusion criteria

The exclusion criteria considered were, Patients in casualty and on ventilators. Patients who are unwilling to take part in the study. Patients scheduled for short duration of hospitalization (less than 24 hours) or ambulatory care

Procedure

A total of 193 patients who met the inclusion criteria were included in the study, from the departments of General Medicine, General Surgery and Orthopedics of MVJ Medical College and Research Hospital. An institutional ethics committee approved the study. The required data was collected using the patient case file data collection form, which includes information such as age, gender, weight, social status, food habits along with diagnosis, laboratory values, concomitant diseases, drugs prescribed, dose of each drug, route of drug administration, frequency of administration of each drug and duration for which the drug was prescribed, associated complications and treatment chart.

The STOPP criteria were applied to each medication listed in the prescription individually and each drug was identified as a Potentially Inappropriate Medication (PIM) if it met the criteria. Likewise, the START criteria were utilized for each prescription to identify any omission errors.

Statistical analysis

The patient data was collected and compiled in MS Excel. Descriptive statistics has been used to present the data. To analyse the data, SPSS (Version 26.0) was used. A fixed significance level of five percent ($\alpha=0.05$) was used. Frequency and percentages are used to express qualitative variables, while mean and standard deviation are used to express quantitative variables. The Chi-square test was

used to compare the association between categorical variables.

RESULTS

Patient characteristics

The prospective observational study was conducted on 193 subjects to assess the prevalence of Potentially Inappropriate Medications (PIMs) and the prevalence of Potential Prescription Omissions (PPOs) according to STOPP/START criteria. The mean age of the study participants was found to be 72.44±6.552 years. Most of the participants in the study were in the age group of 65-70 years (49.2%). Most of the study participants were male (N=125, 64.8%), whereas female participants constituted a smaller portion of the sample (N=68, 35.2%). The study participants were diagnosed with various major disease conditions. Most of the participants had a diagnosis of either Acute Exacerbation of COPD or Diabetes Mellitus (N=17, 8.8%), followed by a diagnosis of Acute Gastroenteritis (N=10, 5.2%).

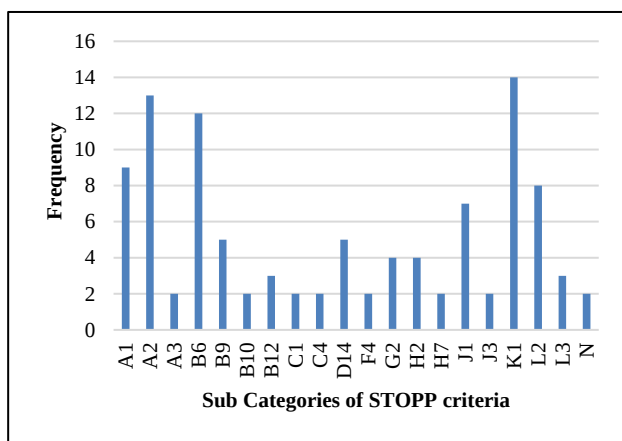


Figure 1: Distribution of the study participants according to major potentially inappropriate medication (According to STOPP criteria).

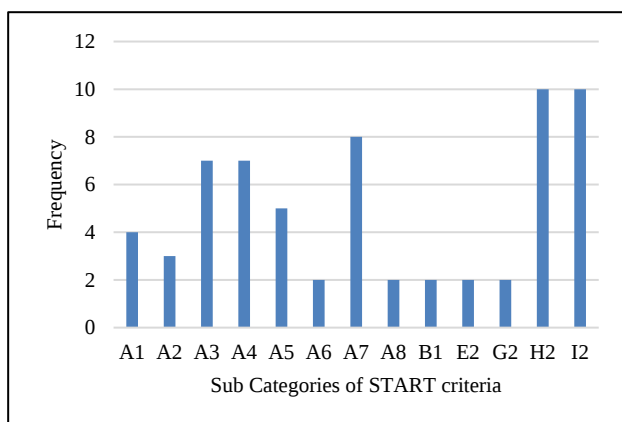


Figure 2: Distribution of the study participants according to major potential prescription omissions (According to START criteria).

Potential inappropriate medications

Based on the STOPP criteria, 40.4% of participants in the study (N=78) were identified as having received prescriptions for potentially inappropriate medications. (Table 1). Most of the potentially inappropriate medications (PIMs) belonged to the category of Benzodiazepines (7.2%), followed by any duplicate drug class prescription (6.7%).

Loop diuretic as first-line treatment for hypertension (6.3%) and any drug prescribed without an evidence-based clinical indication (4.6%) (Table 2). Categorization of the prevalence of different sections of PIMs according to STOPP Criteria is graphically represented in Figure 1.

Potential prescription omissions

Potential prescription omissions, as identified by the START criteria, were observed in 31.1% (N=60) of the study participants (Table 3). The majority of the potential prescription omissions (PIMs) belonged to the category of omission of either laxative in patients receiving opioids regularly (5.2%) or pneumococcal vaccines (5.2%), followed by omission of beta blocker for ischemic heart disease (4.1%) and omission of either antiplatelet therapy with a documented history of coronary, cerebral or peripheral vascular disease (3.6%) or antihypertension therapy (3.6%) (Table 4).

Categorization of the prevalence of different sections of PPOs according to START criteria is graphically represented in Figure 2.

Polypharmacy

The majority (N=177, 91.7%) of the study participants were found to be taking more than or equal to 5 drugs, as compared to study participants taking less than 5 drugs (N=16, 8.3%) (Table 5). 42.9% of the study participants with >5 drugs have potentially inappropriate medication and only 12.5% of the study participants with <5 drugs have potentially inappropriate medication. The association was found to be statistically significant between polypharmacy and potentially inappropriate medication (Table 6).

Comorbidity

The majority (N=161, 83.4%) of the study participants were found to have more than or equal to 2 co-morbidities, as compared to study participants taking less than 2 co-morbidities (N=32, 16.6%) (Table 7). 40.4% of the study participants with >2 comorbidities have potentially inappropriate medication and 40.6% of the study participants with 1 comorbidity have potentially inappropriate medication. The association was not found to be statistically significant between comorbidity and potentially inappropriate medication (Table 8).

Table 1: Distribution of the study participants according to their potentially inappropriate medication (According to STOPP criteria).

Potentially inappropriate medication	N	%
Yes	78	40.4
No	115	59.6

Table 2: Major Potentially Inappropriate Medications based on STOPP criteria.

Potentially inappropriate medication category	N	%	
Indication of medication	A1: Any drug prescribed without an evidence-based clinical indication	9	4.6
	A2: Any drug prescribed beyond the recommended duration, where treatment duration is well defined	13	6.7
	A3: Any duplicate drug class prescription	2	1
Cardiovascular system	B6: Loop diuretic as first-line treatment for hypertension	12	6.3
	B9: Loop diuretic for treatment of hypertension with concurrent urinary incontinence	5	2.6
	B10: Centrally-acting antihypertensives, unless clear intolerance of or lack of efficacy with, other classes of antihypertensives	2	1
	B12: Aldosterone antagonists with concurrent potassium-conserving drugs without monitoring of serum potassium	3	1.5
Antiplatelet	C1: Long-term aspirin at doses greater than 160mg per day	2	1
Anticoagulant drugs	C4: Aspirin plus clopidogrel as secondary stroke prevention, unless the patient has a coronary stent(s) inserted in the previous 12 months or concurrent acute coronary syndrome or has a high grade symptomatic carotid arterial stenosis	2	1
CNS and psychotropic drugs	D14: First-generation antihistamines	5	2.6
Gastrointestinal system	F4: Oral elemental iron doses greater than 200 mg daily	2	1
Respiratory system	G2: Systemic corticosteroids instead of inhaled corticosteroids for maintenance therapy in moderate-severe COPD	4	2
Musculoskeletal system	H2: NSAID with severe hypertension or severe heart failure	4	2.1
	H7: COX-2 selective NSAIDs with concurrent cardiovascular disease	2	1
Endocrine system	J1: Sulphonylureas with a long duration of action with type 2 diabetes mellitus	7	3.7
	J3: Beta-blockers in diabetes mellitus with frequent hypoglycemic episodes	2	1
Drugs that predictably increase the risk of falls in older people	K1: Benzodiazepines	14	7.2
Analgesic drugs	L2: Use of regular opioids without concomitant laxative	8	4.2
	L3: Long-acting opioids without short-acting opioids for break-through pain	3	1.6
Antimuscarinic/anticholinergic drug burden	N: Concomitant use of two or more drugs with antimuscarinic/anticholinergic properties	2	1

Table 3: Distribution of the study participants according to their potential prescription omissions (According to START criteria).

Potentially Inappropriate Medication	N	%
Yes	60	31.1
No	133	68.9

Table 4: Major potential prescription omissions based on START criteria.

Potential prescription omissions category		N	%
Cardiovascular system	A1: Vitamin K antagonists or direct thrombin inhibitors or factor Xa inhibitors in the presence of chronic atrial fibrillation.	4	2.1
	A2: Aspirin in the presence of chronic atrial fibrillation, where Vitamin K antagonists or direct thrombin inhibitors or factor Xa inhibitors are contraindicated.	3	1.5
	A3: Antiplatelet therapy with a documented history of coronary, cerebral or peripheral vascular disease	7	3.6
	A4: Antihypertensive therapy where systolic blood pressure consistently >160 mmHg and/or diastolic blood pressure consistently >90 mmHg, if systolic blood pressure > 140 mmHg and/or diastolic blood pressure >90 mmHg, if diabetic.	7	3.6
	A5: Statin therapy with a documented history of coronary, cerebral or peripheral vascular disease, unless the patient's status is end-of-life or age is >85 years	5	2.6
	A6: Angiotensin converting enzyme (ACE) inhibitor with systolic heart failure and/or documented coronary artery disease.	2	1
	A7: Beta-blocker with ischaemic heart disease.	8	4.1
	A8: Appropriate beta-blocker with stable systolic heart failure.	2	1
Respiratory system	B1: Regular inhaled β_2 agonist or antimuscarinic bronchodilator	2	1
Musculoskeletal system	E2: Bisphosphonates and vitamin D and calcium in patients taking long term systemic corticosteroid therapy.	2	1
Urogenital system	G2: 5-alpha reductase inhibitor with symptomatic prostatism, where prostatectomy is not considered necessary.	2	1
Analgesics	H2: Laxatives in patients receiving opioids regularly.	10	5.2
Vaccines	I2: Pneumococcal vaccine at least once after age 65 according to national guidelines.	10	5.2

Table 5: Distribution of the study participants according to their polypharmacy.

Polypharmacy	N	%
<5	16	8.3
≥ 5	177	91.7

Table 6: Association of polypharmacy with potentially inappropriate medication.

Polypharmacy		Potentially inappropriate medication		Total	P value
		Yes	No		
<5	Count	2	14	16	0.014
	%	12.5%	87.5%	100.0%	
≥ 5	Count	76	101	177	
	%	42.9%	57.1%	100.0%	
Total	Count	78	115	193	
	%	40.4%	59.6%	100.0%	

Table 7: Distribution of the study participants according to their co-morbidity.

Co-morbidity	Frequency N	%
1	32	16.6
≥ 2	161	83.4

Table 8: Association of co-morbidity with Potentially Inappropriate Medication.

Co-morbidity		Potentially inappropriate medication		Total	P value
		Yes	No		
1	Count	13	19	32	0.564
	%	40.6%	59.4%	100.0%	
≥2	Count	65	96	161	
	%	40.4%	59.6%	100.0%	
Total	Count	78	115	193	
	%	40.4%	59.6%	100.0%	

DISCUSSION

A prospective observational study was conducted in the Departments of General Medicine, Orthopedics and General Surgery of MVJ Medical College and Research Hospital, to find out the prevalence of Potentially Inappropriate Medications (PIMs), prevalence of Potential Prescription Omissions (PPOs) and the prevalence of Irrational Prescription in geriatric patients. In this study, most of the study participants belonged to the age group 65-70 years (49.2%) of age. The mean age of the study participants was found to be 72.44 $\pm$ 6.552 years.

In this study, 40.4% of the study participants had Potentially Inappropriate Medication prescriptions based on STOPP criteria. Among them, the majority (6.7%) belonged to the category of Duplication of drug class and 4.7% had Loop diuretics prescribed as the first line of treatment for hypertension. In a study by Kara et al, 41.2 % presented with at least one PIM as per STOPP criteria which was similar to our study.¹ The prevalence of PIM found in this study was lower compared to a study by Bo M et al, in which the prevalence of PIM was found to be 54.4%.¹⁴

In our study, 31.1% of the study participants had Potential Prescription Omissions based on START criteria. Among them, the majority (5.2%) weren't prescribed Laxatives in patients receiving opioids and 4.7% belonged to the category who didn't receive the Pneumococcal vaccine at least once after the age of 65 years. In a study by Murthy et al, proportion of patients subjected to at least one potential prescribing omission (PPO) as per START criteria was 33.33% which was similar to this study.¹³ The prevalence of PPO found in this study was lower compared to a study by Bo M et al, in which the prevalence of PPO was found to be 44.5%.¹⁴ In this study, 91.7% of the study participants were found to be taking more than or equal to 5 drugs and 83.4% of the study participants were found to have more than or equal to 2 co-morbidities.

In the study, 42.9% of the study participants with >5 drugs have Potentially Inappropriate Medication and only 12.5% of the study participants with <5 drugs have Potentially Inappropriate Medication. The association was found to be statistically significant between polypharmacy and

Potentially Inappropriate Medication. In a study by Kara et al, PIM was independently associated with number of medications.¹ In a study by Patel et al, significant increased association was found between polypharmacy and the occurrence of PIMs.¹⁰ In this study, 40.4% of the study participants with >2 comorbidities have potentially inappropriate medication and 40.6% of the study participants with 1 comorbidity have potentially inappropriate medication. The association was not found to be statistically significant between co-morbidity and potentially inappropriate medication.

CONCLUSION

The present study demonstrates the prevalence of PIMs and PPOs among geriatric patients using the modified STOPP/START criteria. PIMs and PPOs were detected in 40.4% and 31.1% of the study participants. These were common in the age group 65-70 years old, in males and in those diagnosed with COPD and DM-II. STOPP/START criteria played an important role in detecting PIMs and PPOs in the present study. This is an effective criterion that can help reduce Potential Inappropriate Prescriptions in the Geriatric population. There is a need to increase awareness about appropriate prescribing and the adverse events that may result in its absence

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Kara Ö, Arık G, Kızılarıslanoglu MC, Kılıç MK, Varan HD, Sümer F, et al. Potentially inappropriate prescribing according to the STOPP/START criteria for older adults. *Aging Clin Exper Res.* 2016;28:761-8.
2. O'Mahony D, Gallagher PF. Inappropriate prescribing in the older population: need for new criteria. *Age and ageing.* 2008;37(2):138-41.
3. Nations U. Department of economic and social affairs, population division. *World population prospects: the 2017 revision, key findings and advance tables.* in Working Paper No ESA/P/WP/248. 2017: 46.

4. Cruz-Jentoft AJ, Boland B, Rexach L. Drug therapy optimization at the end of life. *Drugs Aging.* 2012;1;29(6):511-21.
5. Hanlon JT, Schmader KE, Ruby CM, Weinberger M. Suboptimal prescribing in older inpatients and outpatients. *J Am Geriatr Soc.* 2001;49(2):200-9.
6. Reason B, Turner M, Moses McKeag A, Tipper B, Webster G. The impact of polypharmacy on the health of Canadian seniors. *Fam Pract.* 2012;29(4):427-32.
7. 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 optimised? *Lancet.* 2007;14:173-84
8. Konrat C, Boutron I, Trinquart L, Auleley GR, Ricordeau P, Ravaud P. Underrepresentation of elderly people in randomised controlled trials. The example of trials of 4 widely prescribed drugs. *PLoS One.* 2012;7(3):33559.
9. O'Connor MN, Gallagher P, O'Mahony D. Inappropriate prescribing: criteria, detection and prevention. *Drugs Aging.* 2012;29(6):437-52.
10. Patel MM, Mark AS, Shah NA. Assessment of appropriateness of prescribing among Indian geriatric outpatients using STOPP and START criteria version 2 at a tertiary care teaching hospital. *Natl J Physiol Pharm Pharmacol.* 2022;12(10):1746-50.
11. Barry PJ, Gallagher P, Ryan C, O'mahony D. START (screening tool to alert doctors to the right treatment) - an evidence-based screening tool to detect prescribing omissions in elderly patients. *Age Ageing.* 2007;36(6):632-8.
12. Hill-Taylor B, Sketris I, Hayden J, Byrne S, O'Sullivan D, Christie R. Application of the STOPP/START criteria: a systematic review of the prevalence of potentially inappropriate prescribing in older adults and evidence of clinical, humanistic and economic impact. *J Clin Pharm Ther.* 2013;38(5):360-72.
13. Murthy MB, Jagtap K, Burute SR, Ramanand SJ, Pore SM, Patil PT. Geriatric prescription analysis with respect to "STOPP" and "START" criteria: a descriptive study in the Indian scenario. *Int J Basic Clin Pharmacol.* 2017;6(12):2864-70
14. Bo M, Gibello M, Brunetti E, Boietti E, Sappa M, Falcone Y, et al. Prevalence and predictors of inappropriate prescribing according to the Screening Tool of Older People's Prescriptions and Screening Tool to Alert to Right Treatment version 2 criteria in older patients discharged from geriatric and internal medicine wards: A prospective observational multicenter study. *Geriatr Gerontol Int.* 2019;19(1):5-11.

Cite this article as: Agrawal N, Poluri S, Timsina L, Milton B. Evaluation of rationality of geriatric patients prescription based on STOPP/START criteria in a tertiary care hospital. *Int J Basic Clin Pharmacol* 2025;14:22-8.