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Assessment Of Geriatric Prescriptions Using Stopp\ Start Criteria: A Cross-Sectional Observational Study

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ABSTRACT:

Objective : The present study was to assess the prevalence of PIMs and PPOs among geriatric patients using STOPP/START criteria Version 3 (2023) in a hospital setting, evaluate the extent of polypharmacy, and identify medications commonly over prescribed or omitted in elderly patients.

Methodology: A prospective cross-sectional study was conducted over six months at The Oxford Medical College, Hospital and Research centre, Bangalore. A total of 105 geriatric patients were included. Patient data, including demographics and medications, were reviewed using STOPP/START criteria. Descriptive statistics were used to analyze the prevalence of PIMs, PPO's and polypharmacy.

Results: From the study majority of the drugs prescribed were appropriate i.e., 728 medications out of 814 medications prescribed (89.43%) appropriateness and 86 out of 814 prescribed medications were found to be potentially inappropriate as per STOPP/START criteria 2023 which accounted for only 10.56%.

Conclusion: We concluded that the most frequently prescribed PIMs were Glimepiride, Prednisolone and Tramadol. Reconsidering these medications in the geriatric prescription will increase the appropriateness and minimizing the chances of prescribing the PIMs. We also conclude that as per our study, Gender and age have no significant association with the PIMs. The logistic regression revealed that both the factors, presence of comorbidities and number of drugs given were found to be associated with the chances of prescribing the PIM.

Keywords: STOPP/START criteria, polypharmacy, potentially inappropriate medications, potentially prescribing omissions, geriatrics.

INTRODUCTION

The aging population is experiencing a significant rise globally, leading to an increased prevalence of chronic diseases and associated polypharmacy among older adult. [1] Geriatrics refers to medical care for older adults, an age group that is not easy to define precisely but mostly ≥ 65 is the age is often used. Geriatrics represents the most vulnerable section of our society and tends to be largest consumers of prescriber drugs. Treating this population is most challenging part to the physician and it can be sorted only through holistic multidisciplinary approach. [2]

It is commonly observed that geriatrics suffer from co-morbid conditions and is also hospitalized several times, so there is an increased occurrence of polypharmacy and drug related issues which need to be addressed. [3] Geriatric patients are more likely to have multiple chronic diseases than younger generations; therefore, they need more medications. Taking a higher number of medications is considered to be a risk factor because of more side effects, non-adherence, financial costs, drug–drug interactions, and morbidity outcomes. as the world population is aging, with the expectance of people over 65 years old to reach 71 million by 2030, compared with 35 million in 2000; by 2050, the world average life expectancy is predicted to increase by 10 years compared with that in the 2000s. These statistics shows that there will be more medications to be used per person. [4]

Potentially inappropriate medication [PIM] is defined as a "drug in which the risk of an adverse event out weights its clinical benefits, particularly when there is a safer or more effective alternative therapy for the same condition". PIM may cause ADRs and lead to ADE resulting in increased hospitalizations, mortality and health care cost. [5] Potentially prescribing omission [PPO] is defined as "not prescribing a beneficial medication for which there is a a clear clinical indication."[6] Polypharmacy, defined as the concurrent use of multiple medications, is associated with a higher risk of potentially inappropriate prescriptions (PIPs), adverse drug reactions (ADRs), and medication non-adherence [7] This underscores the need for effective tools to optimize drug therapy in geriatric populations.

STOPP/START (Screening Tool of Older Person's Prescriptions / Screening Tool to Alert to Right Treatment) criteria are evidence-based tools designed to identify PIPs and potential prescribing omissions (PPOs) in older adults [8]. These criteria provide a structured approach for evaluating medication appropriateness and have shown efficacy in improving prescribing practices, reducing ADRs, and lowering healthcare costs. The third version of STOPP/START, introduced in 2023, incorporates updated evidence to address evolving clinical needs [9].
Despite their demonstrated benefits, the practical implementation of STOPP/START criteria faces challenges, including the need for clinician training and integration into electronic health records [10] [11].

MATERIALS AND METHODOLOGY

Study type: A prospective cross-sectional observational study to evaluate the prescribing pattern, chances of prescribing potentially inappropriate medications [PIMs] and potentially prescribing omissions [PPOs] in geriatric patients using STOPP\START criteria version 3.

Study location: This study was conducted at The oxford medical college hospital and research centre, Attibelle, Banglore.

Duration of clinical study: this study was conducted for duration of minimum 6 months from MAY 2023 to OCTOBER 2023.

Study source:

- Patient case records
- STOPP\START criteria version 3, [2023].
- Prescription analysis to identify PIMs and PPOs.

Study Population:
The study included geriatric patients aged 65 years and older who were admitted to the hospital during the study period.
Inclusion criteria**:** Patients of either gender above 65 years of age admitted in the General Medicine department.
Patients with single/ multiple comorbidities, and prescribed at least one daily medication, were included in the study
Exclusion criteria**:** Patients admitted to the emergency department, Patients with incomplete medical records and Patients undergoing palliative care.

Sample Size Determination:
The sample size for this study was determined using Cochran's formula to ensure statistical accuracy. Based on a 61% prevalence of Potentially Inappropriate Prescriptions (PIPs) from previous studies, a 95% confidence interval (Z=1.96), and a 5% margin of error, the initial sample size was calculated as 91. To adjust for a finite population of 150, the sample size was further corrected using the finite population formula, resulting in 57. To account for potential dropouts or incomplete data, a 10% buffer was added, yielding a final sample size of 105 patients. This ensures adequate representation of the target population and reliable results.

Ethical approval:
This study was approved by Institutional Ethics Committee of The Oxford Medical College Hospital and Research Centre , Attibele, Banglore (IEC reference no: IEC/TOMCHRC/61/2023-2024).

DATA COLLECTION PROCEDURE

Data were collected systematically from the medical records of eligible patients. A structured data collection form was used to record demographic details (age, gender, and comorbidities), prescription details (drug names, doses, frequency, and duration), and clinical parameters. STOPP Criteria were applied to identify Potentially Inappropriate Medications (PIMs), which are drugs with a risk of adverse outcomes outweighing their benefits. For example, benzodiazepines in elderly patients with a history of falls were flagged as inappropriate. START Criteria were used to detect Potential Prescribing Omissions (PPOs), highlighting cases where clinically indicated medications were not prescribed, such as the omission of a statins for a patient with a history of myocardial infarction.

Assessment and Categorization:
Each prescription was independently reviewed by a clinical pharmacist and a physician trained in applying the STOPP/START criteria. Discrepancies in evaluations were resolved through consensus discussions.

Outcome Measures:
The primary outcome was the prevalence of Potentially Inappropriate Prescriptions (PIPs), including PIMs and PPOs.
Secondary outcomes included the prevalence of polypharmacy (≥5 medications).

Data Analysis:
Data were entered into Microsoft Excel and analyzed using SPSS software (version 25.0). Descriptive statistics were used to summarize demographic and prescription data. Chi-square tests were used to evaluate associations between categorical variables, and a p-value of <0.05 was considered statistically significant. This methodology provides a comprehensive approach to identifying and addressing inappropriate prescribing practices in geriatrics, ensuring improved clinical outcomes through evidence-based interventions.

RESULTS:

This research study was conducted on 105 patients who met the inclusion and exclusion criteria. The prescriptions of these elderly patients were analysed using the STOPP and START criteria 2023, to identify Potentially Inappropriate Medications (PIMs) and Potential Prescribing Omissions (PPOs). These findings are reported with detailed analysis of demographic and clinical characteristics.

STOPP Criteria: Identification of PIMs

This study found that for total of **105** patients who were included in study, a total of **814** medications were prescribed to them out of which **86** potentially inappropriate medications [PIMs] were identified using STOPP criteria which accounts for **10.56%** of total medications prescribed.
In this research study of 105 patients, **72** of them are male patients which accounts for **(68.5%)** of the total study population and **33** of them are female which accounts for (**31.42%)** of the study population.

A total of **552** medications were prescribed to **72** male patients in which **55** PIMs was identified using STOPP criteria which accounts for **9.97%** of total medications prescribed to male patients.
Similarly in this study for **33** female patients a total of **262** medications were prescribed to them out of which **31** PIMs were identified according to STOPP criteria which accounts for **11.84%** of total medications prescribed to them. Despite the smaller number of medications for females, the higher proportional prevalence of PIMs in this group suggests that their prescriptions may warrant closer scrutiny. These findings highlight potential gender-related differences in prescribing practices and medication appropriateness.

Age-based analysis of PIMs revealed notable trends. The 65–69 years age group had the highest number of 50 patients to whom 343 drugs were prescribed out of which 38 PIMs were identified according to STOPP criteria which accounts for 11.07% of total drugs prescribed to them ,
Similarly the 70-74 years age group include 30 patients for which 239 drugs was prescribed out of which 29 PIMs were identified according to STOPP criteria which accounts for 12.13% of total drugs prescribed to them.
In the 75-79 years age group includes 13 patients for which 137 drugs were prescribed out of which 10 PIMs were identified according to STOPP criteria which accounts for 7.29% of total drugs prescribed to them and the final age group of 80-84 years includes a total of 12 patients to whom 95 drugs were prescribed from which 9 PIMs were identified according to STOPP criteria which accounts for 9.47% of total drugs prescribed to them.

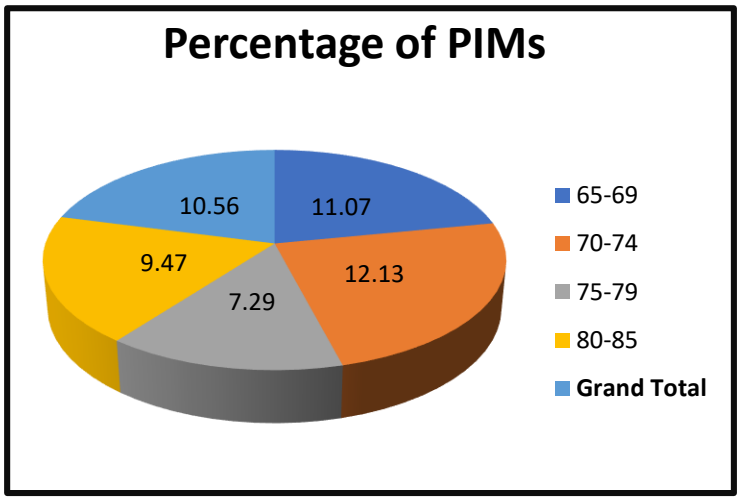

Figure 1. Age-wise distribution of PIMs percentage.

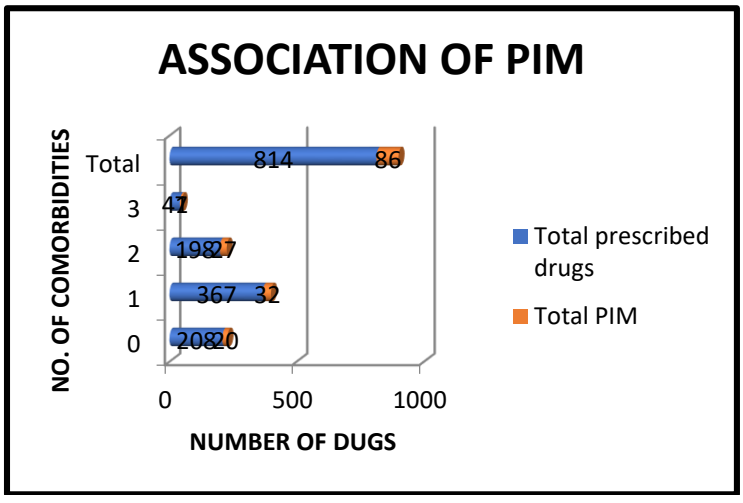

Figure 2. Association of PIMs with co-morbidities.

Association of PIMs with comorbidities suggest that the greatest number of PIMs were found in patients who had 3 comorbidities , a total of 41 drugs were prescribed them of which 7 PIMs were identified which accounts for 17.03% of total drugs prescribed to them & 8.16% of total 86 PIMs . A total of 198 drugs were prescribed to the patients with 2 comorbidities out of which 27 PIMs were identified which accounts for 13.64% of total drugs prescribed to them & 31.
39% of total 86 PIMs. To the patients with 1 single comorbidity 367 drugs were prescribed out of which 32 PIMs were found which accounts for 8.71% of total drugs prescribed to them & 37.20% of total 86 PIMs. And the patients with no comorbidities were prescribed with 208 medications out of which 20 PIMs were identified according to STOPP criteria which accounts for 9.61% of total drugs prescribed to them & 23.25% of total 86 PIMs

This trend suggests that younger elderly patients may be more vulnerable to inappropriate prescribing due to differences in clinical characteristics, comorbidities, or prescribing behaviors. The most frequently flagged PIMs under the STOPP criteria included: Prolonged use of benzodiazepines, particularly in patients with anxiety or insomnia, despite the risk of dependence and cognitive impairment, Non-steroidal anti-inflammatory drugs (NSAIDs) prescribed in patients with gastrointestinal risks or concomitant anticoagulants, increasing the likelihood of adverse gastrointestinal effects, First-generation antihistamines, flagged due to their anticholinergic side effects, which can impair cognition and exacerbate frailty in older patients.

Table 1: The demographic details of the elderly patients

VARIABLE	NUMBEROF PATIENTS (%) (N=105)	MEAN (SD)	TOTALDRUGS PRESCRIBED (n=814)	TOTALPIMOUT OF TOTAL DRUGS PRESCRIBED (%)	p-value
GENDER					
• **MALE**	**73(69.52%)**		**552(67.82%)**	**55(63.95%)**	0.324
• **FEMALE**	**32(30.48%)**		**262(32.18%)**	**31(36.05%)**	
AGE(YEARS)					
• **65-69**	**50(47.62%)**	**70.52**	**343(42.13%)**	**38(44.18%)**	0.397
• **70-74**	**30(28.58%)**		**239(79.37%)**	**29(33.72%)**	
• **75-79**	**13(12.38%))**		**137(16.83%)**	**10(11.62%)**	
• **80-85**	**12(11.42%)**		**95(11.67%)**	**9 (10.48%)**	
PRESENCE OF COMORBIDITIES:					
0	**36(34.28%)**	**2.52 (±1.480)**	**208(25.55%)**	**20(23.25%)**	**0.049***
1-2	**65(61.92%)**		**565(69.42%)**	**59(68.60%)**	
≥3	**4 (3.80%)**		**41(5.03%)**	**7 (8.15%)**	
NUMBER OF DRUGSGIVEN					**0.027***

• 1-4	20(19.04%)	7.75	68(8.35%)	2 (2.32%)	
• 5-10	63 (60%)		472(57.99%)	52(60.45%)	
• ≥11	22(20.96%)		274(33.665%)	32(37.23%)	

Association of number of drugs given and PIM in our study results when the number of drugs prescribed to each patient was between 1-5 drugs a total of 105 medications were prescribed to them among them 5 PIMs were identified similarly when the number of drugs prescribed to each patient was between 6-10 drugs a total of 432 medications were prescribed to them among them 49 PIMs were identified and when the drug range is greater than or equal to 11 a total of 274 drugs were prescribed to them in which 32 drugs were identified as PIMs.
In our research study frequency of most observed PIMs were Glimepride (25 times) , prednisolone (15 times), tramadol (10 times), furosemide-torsemide (7 times), aspirin-clopidogrel (6 times) and so on.

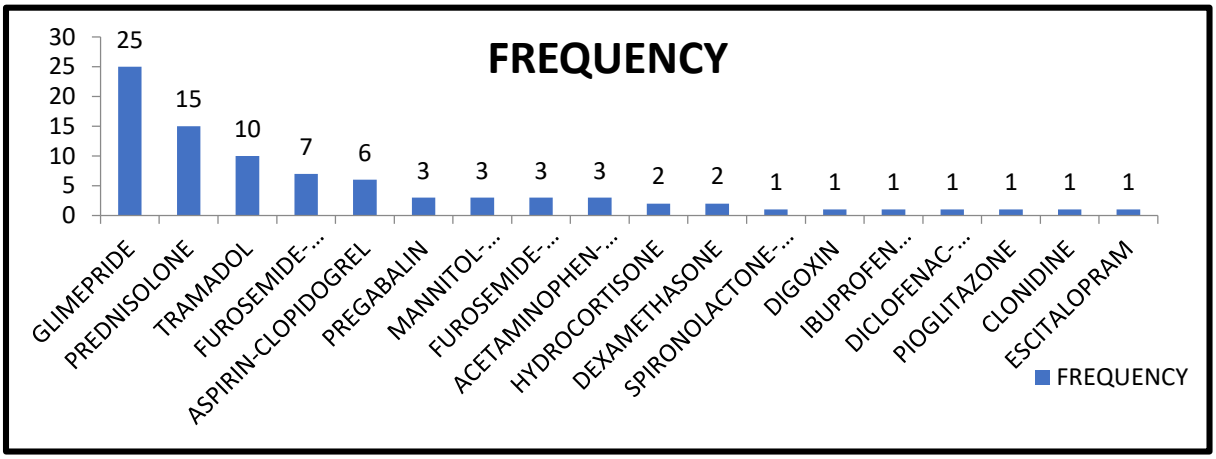

Figure 3. Frequency of observed PIMs

START Criteria: Identification of PPOs

Using the START criteria, 06 medications (0.73%) were identified as having potentially prescribing omissions [PPOs]. These omissions reflect instances where clinically indicated medications were not prescribed, potentially compromising patient outcomes. The majority of PPOs were observed in the 70–79 years age group, a population at higher risk for comorbidities and requiring preventive pharmacotherapy.
The most frequently identified omissions included: Statins, omitted in patients with a history of cardiovascular disease or high cardiovascular risk, despite their proven efficacy in reducing morbidity and mortality, Calcium and Vitamin D supplementation, which was frequently under-prescribed in patients with osteoporosis or a high risk of fractures, potentially leading to preventable complications, Antiplatelet agents, missed in patients requiring secondary prevention of ischemic cardiovascular events, leaving them at an increased risk of recurrent events.
These findings emphasize the importance of incorporating evidence-based guidelines to address under-prescription in elderly patients.

Combined STOPP and START Criteria

When combining the findings from both the STOPP and START criteria, 728 prescriptions (89.44%) were classified as appropriate, 86 prescriptions (10.56%) were flagged as PIMs, and 20 prescriptions (2.45%) were identified as PPOs. This demonstrates that while the majority of prescriptions adhered to recommended guidelines, a notable percentage required intervention to optimize prescribing practices. The combined use of STOPP and START criteria offers a comprehensive approach to evaluating prescribing quality in elderly populations.

Polypharmacy and Its Impact

Polypharmacy was observed in 68% of the study population and emerged as a key factor influencing prescribing appropriateness. Among patients with polypharmacy, the prevalence of PIMs was 15.3%, compared to a significantly lower prevalence in patients taking fewer than five medications. Similarly, 8.9% of prescriptions in polypharmacy patients contained PPOs, compared to negligible rates in non-polypharmacy patients. The association between polypharmacy and inappropriate prescribing highlights the complexity of managing elderly patients with multiple comorbidities. Polypharmacy often increases the risk of drug-drug interactions, adverse drug reactions, and prescribing cascades, further complicating medication regimens. This underscores the need for routine medication reviews and the integration of STOPP and START criteria into clinical workflows.

DISCUSSION

This is a study performed to evaluate the chances of potentially inappropriate medications and potentially prescribing omissions in geriatrics prescriptions as per STOPP / START criteria.

Also, to determine the pattern of polypharmacy in geriatric prescriptions. Most of the similar studies expressed their results as the prevalence of PIM out of total prescriptions, whereas this study expresses the results in terms percentage of PIMs compared to a total number of drugs prescribed to the study sample, in order to calculate the overall chance of prescribing PIMs rather than at individual prescribing level along with the pattern of polypharmacy.

In this study sample size was calculated and the value is 105 patients which was consistent to the study conducted by **Johanna O Conner et al** in which the sample size was found to be 111.

In this study, results were evaluated, among them 73(69.52%) were male patients and 32(30.47%) were female patients. Similar findings were found in the study conducted by **Mangala B Murthy** in which 75 (54.34%) were male patients and 63 (46.65%) were female patients. In our study a total of 814 medications were prescribed. Among those 86(10.56%) were identified as PIMs, Similar findings were found in the study conducted by Mangala B Murthy et al in which 21.01% medications was found to be PIMs.

In our study in the drugs prescribed 5-10 medications range a total of 472 medications were prescribed out of 814 medications which accounted for 57.98% the results were similar to the findings of the study conducted by **Abdulla Damin Abukhalil et al** which the 5-9 medications range accounts for 52.10% in hospitalized patients.

Our study revealed that out of 105 patients 60(57.14%) of patients are having at least 1 PIM and 45(42.86%) patients are having appropriate prescription (without any PIM). The results were similar to the findings of the study conducted by **Birgit A Damouiseaux-Volman et al** in which 56% of the patients had at least 1 PIM and 46% of the patients were without any PIM consistent with our study

Our study revealed that out of 105 patients. Among them 6(5.71%) of the patients had at least 1 PPOs which were in approximation in the study conducted by Abdulla **Damin Abukhalil et al** which also accounts for 12.14% of the patients with at least 1 PPOs.

CONCLUSION

This study highlights the importance of using STOPP/START criteria to optimize medication prescribing in elderly patients. The high prevalence of Potentially Inappropriate Medications (PIMs) and Potential Prescribing Omissions (PPOs) underscores the need for regular medication reviews. With 58% of patients prescribed PIMs and 42% experiencing treatment omissions, there is significant potential for improving prescribing practices and patient safety.

Polypharmacy was prevalent in 74% of patients, increasing the risk of adverse drug reactions and interactions. While necessary for managing multiple conditions, polypharmacy should be approached cautiously, with a focus on deprescribing unnecessary medications where possible.

The study also revealed key omissions, such as statins, vitamin D, and anticoagulants, which are critical for reducing the risk of cardiovascular events and fractures. Ensuring these medications are prescribed in line with guidelines is essential for preventing preventable complications in older adults.

Incorporating STOPP/START criteria into routine practice, along with clinician education and electronic health record integration, can improve prescribing safety and efficiency. By addressing both PIMs and PPOs, healthcare providers can enhance medication safety, improve patient outcomes, and reduce healthcare costs in geriatric care.

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