

**POTENTIALLY INAPPROPRIATE MEDICATIONS IN GERIATRICS ACCORDING TO  
AGS BEERS' CRITERIA 2023 AT 4TH FLOOR OPD PHARMACY-HAMAD HOSPITAL-  
QATAR**

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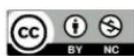


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### ABSTRACT

The largest category of patients to whom we see inappropriate medication being prescribed is the elderly, who also tend to suffer the most from it. Additionally, because the body changes with age, that age group is more likely to be taking multiple medications at once, some of which may not be suitable for them. The American Geriatrics Society released the Beers Criteria in an effort to address this problem, and it is a widely used tool for identifying and steering clear of medications that could be harmful to elderly people. This study aims to assess the prevalence of potentially inappropriate medications (PIMs) prescribed to elderly patients at the 4th floor OPD Pharmacy-Hamad General Hospital in Qatar, in accordance with the 2023 AGS Beers Criteria, and to examine the clinical implications of these prescriptions. 10,072 prescriptions in total were examined. The 2023 Beers Criteria categorized medications as potentially unsuitable. The data was analyzed using both descriptive and inferential statistical methods. According to the study, geriatric prescribing guidelines are well implemented, as evidenced by the high compliance rate of 92.76% with the Beers Criteria. However, 7.24% of prescriptions included potentially inappropriate medications, with common drugs including aspirin, amitriptyline, and anticoagulants such as warfarin and rivaroxaban. Cardiovascular issues, central nervous system toxicity, and risks of bleeding were the main causes of non-compliance. The study demonstrates the effectiveness of current practices in adhering to the Beers Criteria.

**KEYWORDS:** Potentially Inappropriate Medications, Beers Criteria, Geriatric, Elderly

### INTRODUCTION

The optimization of prescribed medications for elderly individuals is a global concern for healthcare providers and researchers. Standardizing the selection of medications for older persons to improve safety is one of the main topics of pharmaceutical research. Some pharmaceuticals have no known contraindications, but when used under particular circumstances, they can have negative health effects.<sup>[1]</sup>

Therefore, geriatric experts, researchers, and healthcare professionals are collaborating to reduce the negative effects of potentially inappropriate medications (PIMs) in this population.<sup>[1]</sup>

"PIM" describes drugs that may be extremely dangerous when side effects outweigh advantages, particularly when there are safer substitutes. The prevalence of PIMs globally ranges between 6% and 41%, leading to negative clinical and economic consequences.<sup>[2]</sup>

Age-related physiological changes have a significant impact on how well medications function and how safe they are for elderly patients. People's body systems alter as they age, which affects how medications function and how they are absorbed. This may increase the likelihood of adverse effects from medications that are typically safe for younger users.<sup>[3]</sup>

Because they have more chronic illnesses as they age, older people frequently take five or more medications at once. PIMs are so prevalent because, although polypharmacy can be beneficial, it also increases the risk of drug-drug and drug-disease interactions. Research shows that the more medications are given, the significantly higher the chance of adverse drug interactions.<sup>[4-6]</sup>

### Consequences of PIMs

Adverse Drug Reactions (ADEs): Orthostatic hypotension, cognitive decline, falls, and fractures are just a few of the negative side effects that might result from taking PIMs. PIM users are more likely to fall, particularly if they are taking anticholinergic medications, psychotropics, or long-acting benzodiazepines. PIMs have been linked to functional deterioration, increased hospital visits, and even death, according to research. Moreover, PIM use directly contributes to the rise in healthcare services utilization caused by ADEs.<sup>[7-9]</sup>

Health Care Costs: Additionally, using PIMs increases health care costs. Research indicates that PIM-related medication issues account for a significant portion of older adults' healthcare expenses. At least one potentially inappropriate medication (PIM) was used by one-third of older adults, accounting for a significant proportion of their pharmaceutical expenses.<sup>[10]</sup>

### Assessment Tools for Identifying PIMs

Several evaluation tools have been developed to address the PIMs problem. To determine if a medication is right for you, these tools employ both explicit and ambiguous guidelines. The Beers Criteria is one of the most widely utilized tools. It identifies medications that are unsafe for elderly individuals.<sup>[10]</sup>

The Beers Criteria were last updated by the American Geriatrics Society in 2023. It classifies medications into classes, such as those that should be avoided, those that should be taken cautiously, and those whose dosages should be adjusted based on the condition of the kidneys. The Beers Criteria, the Medication Appropriateness Index (MAI), as well as implicit criteria based on clinician opinion, are all used to help doctors decide what to prescribe.<sup>[11]</sup>

## METHODOLOGY

### Study Design

According to the 2023 AGS Beers Criteria, this study examines how well doctors prescribe what we consider inappropriate medications to patients aged 50 and above using a retrospective cross-sectional approach. We opted for this strategy because it enables a thorough examination of current medication prescription data, which we do not directly collect from patients, as well as a thorough investigation of patterns in a sizable patient population.

### Study Setting

In our study, we examined the outpatients' pharmacy, which is on the 4th floor of Hamad General Hospital in Qatar. It is a nationally recognized hospital with numerous departments that serve a diverse patient population. We looked at data from the seven departments that are in charge of the care of the elderly: General Medicine, Neurology, Nephrology, Pulmonary Medicine, Cardiology, Psychiatry, and the Warfarin clinic, which in turn gave us a wide range of prescriptive practices to evaluate.

### Study Population

This research was performed in the outpatient pharmacy on the 4th floor of Hamad General Hospital in Qatar, a prominent healthcare institution with numerous departments addressing diverse patient requirements. To ensure an accurate assessment of prescribing practices across different specialties, the data analyzed for this study came from the abovementioned seven departments responsible for caring for elderly patients.

### Data Collection

The hospital's electronic medical records (EMR) system was closely examined in order to gather the data. The research team had access to a sizable database containing prescription data for individuals whose age exceeded 50. A patient's age, medical history, and other health concerns are all recorded by the EMR system. Additionally, it records prescription data, including the medication's name, dosage, method, frequency, duration, and specialization of the physician. Lastly, it gathers clinical diagnoses. Furthermore, we categorized the medications using the 2023 AGS Beers Criteria to see whether they could be unsafe for elderly patients to consume. A group of qualified researchers, comprising physicians and chemists, thoroughly examined the prescriptions using the AGS Beers' 2023 criteria and identified the potentially inappropriate medications (PIMs).

### Data Analysis

The data were examined using descriptive and inferential statistical methods. According to the Beers Criteria, descriptive statistics were used to summarize the research population's characteristics, including the kinds and quantities of potentially inappropriate medications given.

### Ethical Considerations

Following ethical guidelines, this study maintained strict patient confidentiality. Prior to analysis, the data were anonymised, and no personally identifiable information was gathered. Following the Declaration of Helsinki's guidelines, the study ensured that all data were utilized only for research and that patient privacy was maintained.

## RESULTS

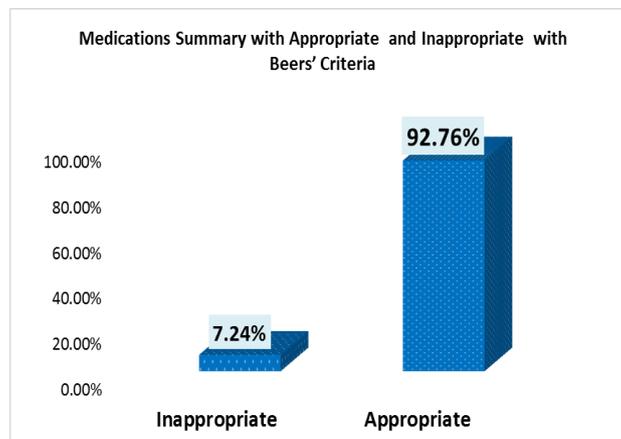
Table 1: Most frequently used inappropriate medications in older adults according to the Beers (2023) criteria.

Category and medications	Frequency	Percentage
<b>Central Nervous System Drugs</b>		
Amitriptyline 10 mg TAB	77	0.10%
Amitriptyline 25 mg TAB	41	0.05%
Baclofen 10 mg TAB	29	0.04%
Metoclopramide 10 mg TAB	22	0.03%
Promethazine Hydrochloride 10 mg TAB	6	0.01%
Promethazine Theoclate 25 mg TAB	3	0.00%
<b>Pain Medications (NSAIDs/Analgesics)</b>		
Aspirin	2733	3.45%
Celecoxib 200mg CAP	170	0.21%
Ibuprofen 400 mg TAB	50	0.06%
Naproxen 500mg TAB	36	0.05%
Ibuprofen 200 mg TAB	8	0.01%
Naproxen 250 mg TAB	11	0.01%
Acetaminophen	0	0.00%
Dipyridamole	0	0.00%
<b>Cardiovascular Drugs</b>		
Warfarin	700	0.88%
Rivaroxaban (all strengths)	503	0.64%
Rivaroxaban 20 mg TAB	349	0.44%
Spirolactone	267	0.34%
Rivaroxaban 10 mg TAB	116	0.15%
Rivaroxaban 15 mg TAB	38	0.05%
Prazosin 1 mg TAB	37	0.05%
Digoxin 0.125 mg TAB	20	0.03%
Digoxin 0.25 mg TAB	8	0.01%
<b>Antibiotics</b>		
Nitrofurantoin 100mg TAB	38	0.05%
Nitrofurantoin (sustained release) 100mg CAP	27	0.03%
Itraconazole	3	0.00%

Table 2: Inappropriate Medications in Older Adults According to The Beers (2023) Criteria with Reason for Non-Compliance.

Drug	Reason for Non-compliance
Aspirin	Increased risk of bleeding when used for the primary prevention of cardiovascular diseases. It is recommended to avoid starting it for this purpose.
Warfarin	Increased risk of bleeding compared to other direct oral anticoagulants (DOACs). It should be avoided as first-line therapy for non-valvular atrial fibrillation or venous thromboembolism (VTE).
Rivaroxaban	Increased risk of bleeding compared to other DOACs like apixaban. Avoid for long-term treatment of non-valvular atrial fibrillation or VTE.
Spirolactone	Increased risk of hyperkalemia. Avoid or monitor closely in patients with kidney dysfunction.
Celecoxib	Increased risk of cardiovascular events and GI bleeding. Should be avoided or used with caution in older adults.
Dipyridamole	May cause hypotension, particularly in older adults.
Rivaroxaban	Increased risk of bleeding compared with other DOACs like apixaban. Avoid for long-term treatment of nonvalvular atrial fibrillation or VTE.
Celecoxib	Increased risk of cardiovascular events and GI bleeding. Should be avoided or used with caution in older adults.
Amitriptyline	Highly anticholinergic; risk of confusion, falls, and dementia.
Ibuprofen	Increased risk of GI bleeding and kidney damage, particularly in older adults with pre-existing conditions.
Amitriptyline	Highly anticholinergic; risk of confusion, falls, and dementia.
Nitrofurantoin	Risk of pulmonary toxicity, hepatotoxicity, and peripheral neuropathy, especially with long-term use.
Rivaroxaban	Increased risk of bleeding compared with other DOACs like apixaban. Avoid for long-term

	treatment of nonvalvular atrial fibrillation or VTE.
<b>Prazosin</b>	Increased risk of orthostatic hypotension and falls in older adults.
<b>Naproxen</b>	Increased risk of GI bleeding and kidney injury, especially in high-risk groups like older adults.
<b>Baclofen</b>	Increased risk of encephalopathy and CNS toxicity in older adults, especially those with kidney impairment.
<b>Metoclopramide</b>	Increased risk of extrapyramidal effects and tardive dyskinesia, particularly in older adults.
<b>Digoxin</b>	Not recommended as a first-line therapy for atrial fibrillation or heart failure. Increased risk of toxicity, especially in older adults with reduced kidney function.



**Figure 3.1: Appropriate and Inappropriate with Beers' Criteria.**

## DISCUSSION

Our findings, which indicate a very high medication compliance rate of 92.76% with the Beers Criteria, reveal how effectively the study group implemented the principles of geriatric prescribing. Strong systemic safeguards, including clinical chemists actively monitoring prescriptions, electronic health record alerts that identify potentially inappropriate medications (PIMs), and a high degree of prescriber awareness, are indicated by this level of adherence (American Geriatrics Society Beers Criteria® Update Expert Panel, 2019).<sup>[12]</sup>

However, it is important to consider the remaining 7.24% non-compliance rate. This suggests that there is always room for improvement in deprescribing actions. When considering this compliance rate in the context of the broader literature, it is a positive exception. PIMs are more common, according to numerous systematic reviews. 40.5% of senior patients in the Middle East were given at least one potentially inappropriate medication (PIM), according to a meta-analysis conducted by Alhmod et al.<sup>[13]</sup>

In a related study of outpatient settings in the United States, Davidoff et al. (2015) discovered that 34.5% of older adults used a PIM. Instead of showing the more common percentage of patients who have been exposed to one or more PIMs, which typically shows a higher non-compliance rate, the significant difference could indicate that the data comes from a very well-run location, such as a geriatric specialty clinic, or it could show the percentage of medications that are compliant.<sup>[14]</sup>

However, our results were lower than those of comparable studies carried out in several nations, such as New Zealand ((42.72%),<sup>[15]</sup> and Indonesia (52.21%).<sup>[16]</sup>

The results of our study show that older people are more likely to take potentially inappropriate medications (PIMs), a problem that has been well-documented in international studies. The most significant conclusion is that many patients (3.45%) use aspirin as their main cardiovascular preventive measure, which is strongly discouraged by the Beers Criteria (American Geriatrics Society [AGS], 2023<sup>[17]</sup> since the danger of serious bleeding is far greater than any potential benefit.

This finding aligns with the significant ASPREE study conducted by McNeil et al. (2018)<sup>[18]</sup>, which demonstrated the inaccuracy of this technique. Moreover, the persistent use of amitriptyline despite its known high anticholinergic load exemplifies the patterns found in systematic reviews, such as that conducted by Price et al.,<sup>[19]</sup> thereby confirming that these CNS medications persist as a common yet avoidable risk in geriatric care.

Additionally, the study addresses issues with prescribed anticoagulants. For non-valvular atrial fibrillation, the frequent use of rivaroxaban and warfarin rather than potentially safer options indicates that people are not adhering to the revised recommendations. This outcome is consistent with the American Heart Association's guidelines (2019),<sup>[12]</sup> which endorse alternative DOACs, and represent a prevalent pattern found in empirical research. Giving spironolactone to a group of people who are prone to hyperkalemia highlights a persistent difficulty in treating heart failure in the elderly while

preventing negative drug effects, which is a key focus of geriatric pharmacovigilance research.

## CONCLUSION

Our study results revealed a 92.76% medication adherence rate, which is extraordinarily high according to the Beers Criteria. This indicates that the implementation of geriatric prescription principles is being aided by systemic safeguards such as electronic warnings and expert pharmacist reviews.

However, the fact that 7.24% of people continued to disregard the guidelines indicates that potential risks remain. The frequency of several potentially inappropriate medications (PIMs), such as higher-risk anticoagulants, anticholinergic drugs like amitriptyline, and aspirin as preventive medications, is consistent with worldwide trends and underscores continuous difficulties in prescribing practices. These results demonstrate how important it is to implement focused deprescribing programs that are informed by current research and guidelines to reduce adverse drug events and improve medication safety for senior citizens.

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