

Analysis of medication prescription of the elderly persons in a geriatric outpatient

Análise da prescrição medicamentosa dos idosos atendidos em um ambulatório de geriatria

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ABSTRACT | OBJECTIVE: To evaluate the medication prescriptions of the elderly who are assisted in a geriatric outpatient clinic based on the Brazilian Consensus of Potentially Inappropriate Medications (PIM) for the Elderly. **METHODOLOGY:** This is a descriptive research with retrospective analysis of the electronic medical records of patients aged equal to or older than 60 years old, who attended the geriatric outpatient clinic of a hospital in Bahia from January to June 2018. The research includes 291 medical records and documentation of the medications that the elderly people already used at home and the prescription in force after the consultation records were collected. **RESULTS:** The median age was 73 years old. It was identified that before the consultation, 89 elderly people (30.6%) used inappropriate medications. After the consultation with a geriatrician, 110 elderly people (37.6%) began to use them, with no statistical difference. The median number of medications after the outpatient consultation was higher than before the consultation, with statistical significance ($p < 0.001$). It was found that of the elderly who did not use polypharmacy, 20.4% began to use it after the consultation. **CONCLUSION:** Even after consultation with the geriatrician, there are still inadequacies in the prescriptions, with a relevant number of elderly people using five or more medications and using PIM.

KEYWORDS: Aging. Polypharmacy. Potentially Inappropriate Medications. Beers.

RESUMO | OBJETIVO: Avaliar a prescrição medicamentosa dos idosos atendidos em um ambulatório geriátrico baseado Consenso Brasileiro de Medicamentos Potencialmente Inapropriados para Idosos (MPI). **METODOLOGIA:** Trata-se de uma pesquisa descritiva com análise retrospectiva do prontuário eletrônico de pacientes com idade igual ou superior a 60 anos, atendidos no ambulatório geriátrico de um hospital baiano no período de janeiro a junho de 2018. Foram incluídos 291 prontuários e coletados os medicamentos que o idoso já fazia uso em seu domicílio e a prescrição vigente após a consulta. **RESULTADOS:** A idade mediana foi de 73 anos. Foi identificado que antes da consulta 89 idosos (30,6%) faziam uso de MPI e que após a consulta com geriatra 110 idosos (37,6%) passaram a utilizá-los, sem diferença estatística. A mediana de números de medicamentos posteriores à consulta ambulatorial foi maior do que anterior à consulta, com significância estatística ($p < 0,001$). Constatou-se que dos idosos que não recorriam à polifarmácia, 20,4% começaram a utilizá-la após a consulta. **CONCLUSÃO:** Mesmo após a consulta com o geriatra ainda existem inadequações nas prescrições, com um número relevante de idosos utilizando cinco ou mais medicamentos e em uso de MPI.

PALAVRAS-CHAVE: Envelhecimento. Polifarmácia. Medicamentos Potencialmente Inapropriados. Beers.

Introduction

The world population has undergone a period of demographic transition in recent decades. According to data from the Instituto Brasileiro de Geografia e Estatística - IBGE (Brazilian Institute of Geography and Statistics), the Brazilian population has continued the aging trend of recent years, and it is predicted that by 2060 a quarter of the population (25.5%) will be over 65 years old.¹ This represents a major challenge for the Brazilian public health system, requiring the development and implementation of policies, strategies, and actions that meet the specific needs of this population. These adaptations will need to occur not only in our country but worldwide as well.²

Human aging has a significant impact on the safety of elderly patients when combined with epidemiological transition, contributing to the increased prevalence of chronic diseases, functional limitations, increased use of healthcare services, higher medication consumption, as well as polypharmacy, which is largely responsible for adverse reactions and drug interactions^{3,4}, additionally, the aging process alters the pharmacokinetics and pharmacodynamics of drugs, making the elderly more vulnerable to toxicity.⁵

The increase in life expectancy has brought about a greater need for care and caution among healthcare professionals regarding the prescription of medications for the elderly, as they constitute up to 50% of medication users. It is common to find inappropriate dosages and indications as well as unfavorable drug interactions in their prescriptions.⁶ Medication can be considered inappropriate when the risks outweigh the benefits, when there is a significant risk of adverse events, when there is evidence of an equally or more effective alternative with less risk to the patient for treating the same condition.^{7,8}

In Brazil, although there is no legislation regulating the use of potentially inappropriate medications (PIMs), they should be avoided due to their high risk of serious adverse events, falls, cognitive function decline, and hospitalization.⁸ The inadequacy of prescriptions for this population constitutes a public health problem, and therefore, the evaluation of prescriptions should be appropriate to the clinical conditions of the elderly in order to promote medication safety. This evaluation can be performed using implicit methods based on clinical judgment or explicit methods based on predetermined standards.⁹⁻¹¹

Since the 1990s, studies on the elderly population and medications have become relevant. With the aim of listing inappropriate medications for institutionalized elderly individuals, the Beers Criteria was created in 1991 by the American geriatrician Mark Beers. In 2012, the Beers Criteria was updated through a joint effort of the American Geriatrics Society (AGS) and experts in geriatric care and pharmacotherapy. These criteria are regularly updated by the AGS, using robust methodology with a high degree of reliability.⁹

Another important criterion for detecting inappropriate medications is the STOPP/START criteria (Screening Tool of Older Person's Prescriptions/ Screening Tool to Alert doctors to Right Treatment), consisting of two methods used together, created in 2003 in Ireland by physicians and pharmacists and first published in 2008. More recently, in 2019, new versions of the criteria were published.⁹⁻¹²

Although the Beers and STOPP criteria have similarities, it is recommended to use them in a complementary and combined manner to make the best decision regarding medication prescription for the elderly. However, due to differences in drug availability and different prescribing practices, these criteria have been adapted in many countries. In Brazil, the content of the Beers Criteria 2012 and STOPP 2006 was validated in 2016 to obtain national criteria for the classification of PIMs, leading to the creation of the Brazilian Consensus on Inappropriate Medications for the Elderly.⁷

The objective of this study was to evaluate medication prescribing for elderly patients treated at a geriatric outpatient clinic based on the Brazilian Consensus on Potentially Inappropriate Medications for the Elderly.

Methodology

This was a cross-sectional study with a retrospective analysis of electronic medical records. The population consisted of patients aged 60 years or older who had their first geriatric consultation between January and June 2017.

The research was conducted at the geriatric outpatient clinic of a reference hospital for the elderly in Salvador, Bahia. This institution is a philanthropic entity that houses one of the largest 100% Sistema

Único de Saúde - SUS (Unified Health System) healthcare complexes in the country.

Data collection was performed by filling out a form where the age and medications the elderly patients were already taking at home prior to the consultation were recorded, along with the current prescription after the consultation, for subsequent comparison between the two variables.

The inclusion criteria for the study were the age of 60 years or older and the first geriatric consultation, while the exclusion criteria were electronic medical records with incomplete or nonexistent data. In the computerized system, 428 patients were identified as scheduled for their first consultation with the geriatrician. Of these, 137 were excluded because 121 were incorrectly scheduled in the system as first geriatric consultations, but they were patients for review and/or follow-up appointments, 7 had incomplete data (no prescription or did not know the medication they were taking), and 9 had nonexistent data (referred to another outpatient clinic, hospitalization, did not wait for the consultation, or did not show up). This resulted in a total of 291 medical records for investigation.

For the analysis of medication prescribing, the Brazilian Consensus on Potentially Inappropriate Medications, which contains the national criteria for the classification of PIMs for the elderly, was used. In this study, considering that no clinical data of the patients were collected, it was decided to use the 43 criteria divided into six classes, which are independent of the clinical condition: Central Nervous System (CNS) and psychotropic medications; Cardiovascular system; Endocrine system; Gastrointestinal system; Musculoskeletal system; miscellaneous.

The R 3.5.0 software (R Development Core Team, Vienna, Austria) was used for data analysis. Categorical variables were expressed as absolute and relative frequencies, while continuous variables were expressed as median and quartiles. The normality of data distribution was checked using the Shapiro-Wilk test. The McNemar test was used to verify significant differences between the two evaluation moments for categorical variables, and the non-parametric Wilcoxon test was used for quantitative variables according to the study group. The significance level adopted for this study was 5%.

The research project was approved by the Research Ethics Committee of Hospital Santo Antônio/ Obras Sociais Irmã Dulce, under opinion number CAAE 74923417.3.0000.0047, in accordance with the ethical aspects contained in resolution 466/12, which provides guidelines for research involving human subjects, ensuring harm reduction or damage prevention.

Results

The medication prescriptions of 291 elderly patients who had their first geriatric consultation at an outpatient clinic in Salvador-Bahia, between January and June 2017 were analyzed. The study did not differentiate between men and women. The median age was 73 years (q1=68; q3=79), with a minimum of 61 years and a maximum of 100 years.

Regarding medication use, it was found that 85.9% of the elderly (n=250) were using one or more medications before the geriatric consultation, and 93.1% of the elderly (n=271) continued and/or started taking one or more medications after the consultation with the geriatrician. The median number of medications used by the elderly before the consultation was 3.00 (q1=1.00 and q3=5), and after the appointment was 4.00 (q1=2.00 and q3=5.00).

Regarding the number of medications used, it ranged from 0 to 10 before the appointment and from 0 to 12 medications after the appointment. The median number of medications after the outpatient consultation was higher than before the consultation, with statistical significance ($p < 0.001$).

The prevalence of polypharmacy (use of five or more medications) before and after the appointment were 25.8% (n= 75/291) and 38.8% (n= 113/291), respectively. When analyzing the cross-tabulated data of polypharmacy users to explore the relationship between two variables (before and after the appointment), it was found that among the elderly who were not using polypharmacy, 20.4% started to belong to the polypharmacy group after the appointment, and among the elderly who were already using it, 8.0% stopped using it after the geriatric consultation, with statistical significance ($p < 0.001$) (Table 1).

Table 1. Patients using polypharmacy before and after geriatric consultation, Salvador, Bahia, Brazil – 2017

Polypharmacy Before the consultation	After consultation		p-value
	No n (%)	Yes n (%)	
No	172 (79,6)	44 (20,4)	<0,001
Yes	6 (8,0)	69 (92,0)	

Source: the authors (2023).

When analyzing the prescription using the Brazilian Consensus of Inappropriate Medications for the Elderly, it was identified that before the consultation, 89 elderly individuals (30.6%) were using one or more PIMs (Potentially Inappropriate Medications), and after the geriatric consultation, 110 (37.6%) elderly individuals continued to use and/or started to use one or more IMs. The data analysis showed that the use of IMs before and after the geriatric consultation did not present statistical significance ($p=0.096$).

The median number of PIMs used by the elderly before and after the consultation was 0.00 ($q1=0.00$ and $q3=1.00$). However, upon investigating the cross-tabulated data on the use of PIMs between two variables (before and after), it was found that among the elderly who were not using PIMs, 19.8% started using them after the consultation, and among those who were already using them, 21.3% stopped using some PIMs after the geriatric consultation, with statistical significance ($p=0.009$) (Table 2).

Table 2. Use of potentially inappropriate medications for the elderly (PIMs) before and after the medical consultation. Salvador, Bahia, Brazil – 2017

MPI Before the consultation	After consultation		p-value 0,009
	No n (%)	Yes n (%)	
No	162 (80,2)	40(19,8)	
Yes	19(21,3)	70(78,7)	

Source: the authors (2023).

Table 3 presents the description of medication classes that should be avoided in the elderly, regardless of clinical condition, according to the Brazilian Consensus on PIMs. Following the consultation, there was a decrease in the number of elderly individuals using cardiovascular and endocrine classes of medications and an increase in the use of CNS, psychotropic, and gastrointestinal classes. There was no difference in the musculoskeletal class before and after the consultation, and no occurrence of elderly individuals using medications from the miscellaneous class. Data analysis showed that concerning medication classes before and after the consultation, only the gastrointestinal class showed statistical significance ($p=0.003$).

Tabela 3. Distribuição de idosos em uso de MPI conforme classe terapêutica. Salvador, Bahia, Brasil – 2017

Drug class	Before the geriatric consultation%	After the geriatric consultation%	P value
CNS and Psychotropics	10,7%	13,1%	0,230
Cardiovascular	8,6%	7,2%	0,188
Endocrine	5,5%	4,8%	0,531
Gastrointestinal	11,7%	17,5%	0,003
Skeletal muscle	3,4%	3,4%	0,703
Several	0,0%	0,0%	-

Source: the authors (2023).

Table 4 describes the most frequent PIMs among the elderly. Prior to the consultation, the most prevalent medication in the prescriptions was omeprazole (10.3%), followed by glibenclamide (5.5%), furosemide (3.4%), and clonazepam (2.7%). After the consultation, the most prevalent medications were omeprazole (11.7%), zolpidem (5.2%), glibenclamide (4.8%), codeine (3.4%), and quetiapine (3.4%).

Among the most prevalent medications in the study, only quetiapine, zolpidem, and codeine showed statistical significance in the cross-tabulations ($p=0.008$, $p=0.03$, $p<0.001$, respectively). The cross-tabulations between the two variables (before and after the consultation) revealed that among the elderly who were not using quetiapine, 2.7% started using it after the consultation, and for codeine, 3.1% started using it after the geriatric consultation. Among those who were already using these medications, none of the elderly individuals stopped using them after the geriatric consultation. Regarding the use of zolpidem, there was an increase of 4.2% after the consultation, but among the elderly who were already using zolpidem before the consultation, 0.4% stopped using it after the geriatric consultation.

Tabela 4. Medicamentos inapropriados mais utilizados pelos idosos antes e depois da 1ª consulta geriátrica. Salvador, Bahia, Brasil – 2017

Consensus drug	Therapeutic category	Before the consultation		After the geriatric consultation		p-value
		n	%	n	%	
Omeprazol	Gastrointestinal	30	10,3%	34	11,7%	0,481
Glibenclâmida	Endocrine	16	5,5%	14	4,8%	0,687
Clonidina	Cardiovascular	11	3,8%	07	2,4%	0,125
Furosemida	Cardiovascular	10	3,4%	09	3,1%	1,000
Clonazepam	CNS and Psychotropics	08	2,7%	05	1,7%	0,453
Amitríptilina	CNS and Psychotropics	07	2,4%	03	1,0%	0,219
Zolpidem	CNS and Psychotropics	04	1,4%	15	5,2%	0,003
Quetiapina	CNS and Psychotropics	02	0,7%	10	3,4%	0,008
Ibuprofeno	Skeletal muscle	02	0,7%	04	1,4%	0,625
Codeína	Gastrointestinal	01	0,3%	10	3,4%	0,004

Source: the authors (2023).

Discussion

The evaluation of medication prescriptions for elderly patients attending a geriatric outpatient clinic, using the Brazilian Consensus of Potentially Inappropriate Medications for the Elderly, showed that 85.9% of the elderly were using some type of medication before the consultation and that after the consultation with the geriatrician, 93.11% of the elderly either started or continued using at least one medication, indicating the addition of medications to the prescriptions of the elderly after the consultation. It is known that an increase in medication use, especially PIMs, can lead to the risk of adverse events and drug interactions.¹³

When analyzing the prescription using the Brazilian Consensus of Inappropriate Medications for the Elderly, it was identified that before the consultation, 89 elderly individuals (30.6%) were using one or more PIMs, and after the geriatric consultation, 110 elderly individuals (37.6%) continued or started using one or more PIMs, but this difference was not statistically significant ($p=0.096$). Similar to our findings, studies conducted with elderly individuals in China identified the routine presence of PIMs in medical prescriptions.¹⁴

Therefore, it becomes imperative to evaluate the risks and benefits of each prescribed medication, as the prescription for geriatric patients poses a challenge for prescribers, requiring careful individual assessment to strike a balance between the risks of unnecessary prescription and the negative consequences of underprescribing.¹⁵

We also observed an increase in the number of elderly individuals using five or more medications (25.8% to 38.8%) and polypharmacy, which was statistically significant. Similar findings were reported in an outpatient study conducted in Belém, Pará, where 30.3% of the surveyed patients were using polypharmacy.⁷ This clinical practice is common among the elderly, either due to medical prescription or self-medication, and it can be associated with the presence of chronic diseases and clinical manifestations of aging^{15,16}. Therefore, it is up to the prescriber to maintain the necessary medications and carefully monitor adverse effects.⁴

When analyzing the most prescribed medication within the class of PIMs, omeprazole had the highest prevalence in our study, although without statistically significant difference ($p=0.481$) between before and after the consultation, findings similar to those described by Praxedes et al.⁸ Omeprazole is a proton pump inhibitor (PPI) and is the most prescribed medication for gastroesophageal reflux disease.

In Brazil, omeprazole has been used as a self-medication due to not requiring a prescription, which may explain its higher prevalence. Prolonged use for more than eight weeks is associated with the development of osteoporosis, osteopenia, bone fractures, dementia, renal insufficiency, anemia, pneumonia, enteric infections, as well as decreased absorption of important vitamins and minerals, such as vitamin B12, iron, calcium, and magnesium. When used for more than one year, it can lead to decreased magnesium absorption, increasing the risk of arrhythmias, strokes, seizures, bone weakening, and muscle spasms.^{17,18} A possible recommendation to be followed is the use of omeprazole by medical prescription for less than eight weeks or reducing the dose for the treatment and prophylaxis of peptic ulcer, esophagitis, or gastroesophageal reflux disease, or opting for other cytoprotective medications available in the market.

Among the medications that showed statistically significant differences before and after the geriatric consultation, we identified codeine (in the gastrointestinal class), zolpidem, and quetiapine (in the central nervous system and psychotropic class). These medications are associated with controlled sales, inhibiting self-medication when compared to other medications that do not require a prescription.

However, codeine was classified as a PIM due to its strong association with constipation inherent to opioids, but it is a highly used analgesic and considered by the AGS as an effective and indispensable option for pain treatment in the elderly.^{19,20} Zolpidem and quetiapine, in the central nervous system and psychotropic class, are inappropriate when prescribed to elderly individuals with dementia or Alzheimer's, cognitive deficit, and/or for treating behavioral changes, as they increase the risk of stroke, potentially worsening the condition of chronic constipation and have the potential to cause gait ataxia, parkinsonism, hypotension, and falls were highlighted.⁷

Analyzing the other classes of PIMs, even without statistical differences between before and after, it is important to understand the risks involved in the use of these medications by the elderly when they become part of daily use.

Within the class of medications that act on the central nervous system, benzodiazepines (BDZs) stand out. They have been described by other researchers as PIMs prescribed for both outpatients and hospitalized patients²⁰ due to their prolonged elimination half-life, which is associated with the risk of cognitive impairment, delirium, drowsiness, falls, and fractures.^{20,21} Older adults are more sensitive to BDZs, so treatment attempts with behavioral measures such as sleep hygiene are recommended.^{17,19} However, if the prescription is truly necessary, the use of safer therapeutic alternatives with short to intermediate half-lives is preferred.

When analyzing medications that act on the endocrine system, the oral hypoglycemic agent glibenclamide was identified as the most prescribed. In contrast to our findings, glibenclamide has been described as a medication with reduced prescription due to being a long-acting sulfonylurea, which is generally associated with a higher risk of severe hypoglycemia in the elderly.⁴

In the cardiovascular system, furosemide (a diuretic) was identified as the most prescribed medication. Similarly, studies conducted by Farias et al.⁸ also listed this PIM within this class. It is important to note that this drug can lead to or contribute to the development of hypovolemia and dehydration in the elderly. The presence of this medication reflects the high prevalence of cardiovascular diseases among the elderly, especially hypertension.³ Regarding the use of nonsteroidal anti-inflammatory drugs (NSAIDs), although relatively low, it draws attention due to its close association with gastric irritation, gastric ulcers, nephrotoxicity, and increased probability of gastrointestinal bleeding and renal injury and impairment.⁷

When evaluating the total number of medications used before and after the consultation, as well as the use of polypharmacy, we observed a significant increase in both parameters ($p < 0.001$). However, for potentially inappropriate medications, an increase in the number of elderly individuals using

PIMs was found, but without statistical significance ($p = 0.098$) between before and after. Clearly, our research observed the presence of PIMs in current prescriptions (37.6%), which corroborates the data described by Praxedes et al.⁴, in which the prevalence of PIMs in prescriptions in Brazil, Japan, and Italy was reported as 47.3%, 56.1%, and 31.1%, respectively, as well as the findings by Farias et al.⁸, in which PIMs were present in 19.3% (279) of prescriptions.

The elderly population is the most vulnerable group, often experiencing problems associated with medications and their interactions. Most medication interactions occur through processes involving the pharmacokinetics and/or pharmacodynamics of the drug. When inappropriate medications are used, the risk of an adverse reaction doubles, which can impact the quality of life of the elderly.^{13,22}

Adverse reactions often go unnoticed by healthcare professionals and are mistaken for the consequences of aging. It is important for nursing professionals to be vigilant in investigating and correlating these clinical findings with the possibility of PIM use. In cases where the prescription of a PIM is unavoidable, strategies for monitoring should be implemented to identify undesired effects and/or drug interactions as early as possible. According to the Política Nacional de Saúde da Pessoa Idosa - PNSPI (National Health Policy for the Elderly), care should be viewed in an integral manner, and all involved parties, including nurses and other professionals, should monitor the Elderly Health Book, as it allows for an initial assessment of inappropriate medications and possible adverse reactions.²³

The results presented serve as a basis for reflection on the need for updates and the use of the Brazilian Consensus on PIMs as a guide for prescribing medications for the elderly since it is the only instrument adapted to the Brazilian reality capable of assessing the appropriateness of PIM use in these patients.⁷ Constant training of nursing professionals in gerontogeriatric care is also necessary.

This study had limitations. The analysis of prescriptions did not allow for correlating the current diseases or comorbidities of the elderly that justified the prescription of the identified medications in the research. Unlike the studies conducted by Zhang et al.¹⁴, in which they observed that the prevalence of

PIMs was associated with age, the number of diseases, and the number of medications, and that PIMs were more common in patients with more than two types of diseases and more than four types of medications.

Conclusion

The research data shows that even after consultation with a geriatric professional, there are still inadequacies in prescriptions, such as a significant number of elderly individuals using inappropriate medications. There was also an increase in the number of elderly individuals using five or more medications after the geriatric consultation. Since the Brazilian Consensus on Inappropriate Medications for the Elderly is not a law but a recommendation in Brazil, the prescriber remains free to decide whether or not to prescribe them.

Authors' contributions

Vaz LKM participated in the conception of the research project, methodological design, data search and statistical analysis, interpretation of the results, and initial drafting of the scientific article. Ramos MESP participated as the research advisor, contributing to the conception of the research project, methodological design, analysis of the results, and final revision of the article. Ramos TC contributed as a critical reviewer of the intellectual content and final version of the article. Goulart JL and Ramos ASP conducted the research and literature review, and organized the references in the scientific article. All authors reviewed and approved the final version and agreed to its publication.

Conflicts of interest

No financial, legal, or political conflicts involving third parties (government, companies, private foundations, etc.) have been declared for any aspect of the submitted work (including but not limited to grants and funding, participation in advisory boards, study design, manuscript preparation, statistical analysis, etc.).

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