

Application of STOPP Criteria and Beers Criteria in an inpatient psychiatric facility and impact on utilization of potentially inappropriate medications and adverse outcomes

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ABSTRACT

Background: The Beers Criteria and STOPP Criteria were developed to identify potentially inappropriate medications (PIMs) in the geriatric population. Utilization of STOPP Criteria PIMs have shown a significant association with presence of avoidable adverse drug events (ADEs) as compared to utilization of Beers Criteria PIMs.

Objectives: The purpose of this study was to utilize STOPP and Beers Criteria to identify PIMs in geriatric patients at an inpatient psychiatric facility, with the goal of implementing a formal process for assessing medication regimens. This process would be expected to decrease adverse outcomes.

Methods: Both criteria were used by the pharmacist to identify PIMs and recommendations were made to address the PIMs. A retrospective chart review evaluated whether utilization of the two criteria led to a significant change in number of PIMs and associated adverse outcomes. The primary outcome was the change in number of PIMs for the Beers Criteria versus the STOPP Criteria. Secondary outcomes included the change in number of PIMs, falls, required referrals/transfers, and medication-specific ADEs for each set of criteria assessed separately.

Results: Twenty-nine patients met inclusion criteria, and 76 treatment recommendations were made. More PIMs per patient were identified at baseline utilizing STOPP (mean±SD, 3.9±2.3) versus Beers Criteria (mean±SD, 2.2±1.3) ($p < 0.001$). The number of PIMs decreased using STOPP (from 112 to 66; mean decrease per patient -1.6 ± 1.5 , $p < 0.0001$) and Beers Criteria (from 63 to 23; mean decrease per patient -1.4 ± 1.1 , $p < 0.0001$), although the change was not significant for STOPP vs. Beers ($p = 0.375$). All secondary outcomes decreased using both criteria.

Conclusions: Utilization of each set of criteria by the pharmacist led to a significant decrease in PIMs and adverse outcomes decreased at follow-up using both criteria. Implementation of a process for assessing medication regimens of geriatric patients utilizing the Beers and/or STOPP Criteria would likely be beneficial to this institution.

KEYWORDS

STOPP Criteria, Beers Criteria

BACKGROUND

Inappropriate medication use is prevalent among older people and polypharmacy is common. An average skilled nursing facility patient (defined as a patient residing in a nursing home or intermediate care facility) is prescribed over eight concurrent medications, which is nearly twice the prescription rate of older adults who are not institutionalized.^{1,2} Polypharmacy increases the risk of adverse drug events (ADEs), drug-drug interactions and drug-disease interactions.³ Varying definitions of ADEs exist, with one study using a definition of "any noxious, unintended, and undesired effect of a drug, excluding therapeutic failures, intentional or accidental poisoning, and drug abuse".⁴ These events can be linked to preventable consequences including falls, hip fractures, depression, constipation, immobility, confusion, and hospitalization.² One study reported that 4.4% of hospitalizations were related to ADEs that were possibly or definitely avoidable, and one-fifth of these patients had received an inappropriate medication or a drug not indicated for the diagnosed disease.⁵ In addition, a recent study by Hamilton and colleagues detected ADEs in 26.3% of 600 geriatric patients, with 66.6% considered causal or contributory to admission and 68.9% of causal/contributory ADEs considered to be avoidable or potentially avoidable.⁴ In addition to polypharmacy, certain individual medications are also considered inappropriate in older age based on adverse drug properties or drug-disease interactions which can increase the risk of ADEs.

These observations form the basis for the development of criteria for potentially inappropriate medication in older people. The most commonly referenced are the Beers Criteria, which were developed in 1991 and updated in 1997, 2003, and 2012.^{1,2,6,7} The Beers Criteria consists of lists of potentially inappropriate medications (PIMs) to be avoided in older people. However, there are conflicting data regarding the association between Beers Criteria PIMs and patient outcomes. Several studies have shown no significant association between Beers Criteria PIMs and the incidence of ADEs.⁸⁻¹⁰ Other studies have demonstrated a link between Beers Criteria PIMs and poor patient outcomes including ADEs, hospitalization, and mortality.¹¹⁻¹³ A new set of PIM criteria in older people was developed in 2008 called the STOPP Criteria (Screening Tool of Older Persons' potentially inappropriate Prescriptions).³ STOPP is comprised of 65 clinically significant criteria which have several distinct differences from the Beers Criteria.³ Cited advantages over the 2003 Beers Criteria include organization

according to physiological systems; inclusion of medications that are currently in widespread use; emphasis on potential adverse drug-drug interactions and duplicate drug class prescription; and inclusion of several criteria that are not included in the Beers Criteria.⁴ In addition, the STOPP Criteria have shown a significant association with avoidable ADEs in older people that cause or contribute to urgent hospitalization when compared to the 2003 version of the Beers Criteria.⁴ In other words, the likelihood of avoidable ADEs increased significantly when STOPP PIMs were prescribed; this was not the case for Beers PIMs.⁴ Using PIM criteria to assess medication regimens of geriatric patients is considered a standard of care. A need was identified for implementation of a formal process for routinely screening medication regimens for PIMs for all patients on the geriatric unit of an inpatient psychiatric facility as a part of quality assurance for the organization.

The purpose of this study was to utilize STOPP Criteria and Beers Criteria to identify PIMs and make recommendations regarding the use of PIMs, with the goal of implementing a formal process for assessing medication regimens for all geriatric patients at this institution. Implementation of this practice would be expected to decrease inappropriate medication use, adverse drug events, drug-drug interactions, and drug-disease interactions in the geriatric population at this institution. Ultimately, this would be expected to lead to a decrease in morbidity and health resource utilization.

METHODS

A retrospective chart review was performed by an individual pharmacist to evaluate whether utilization of the two different criteria led to a significant decrease from baseline to follow-up in number of PIMs and associated adverse outcomes, including ADEs (as outlined in each set of criteria), falls, and required transfer to an acute medical facility or referral to the psychiatric facility's medical clinic. Identifying potential drug therapy problems and making recommendations to the geriatric psychiatry team was considered a routine responsibility of the clinical pharmacist rotating through the geriatrics unit at an inpatient state psychiatric facility over a six week time period. Currently, a clinical pharmacist is not permanently present on this unit. Therefore, a standard process is not in place for assessing medication regimens by a clinical pharmacist on this unit. This facility has an average daily patient census of 292, with a total of 35 beds on the geriatric unit. The average length of stay at the hospital is around 18 days, although this is likely longer on the geriatric unit with some patients being

admitted for many years. Prior to the retrospective study, PIMs were identified by the same pharmacist who performed the retrospective chart review using both the STOPP Criteria and the 2003 version of the Beers Criteria for all patients on the geriatrics unit meeting inclusion criteria. All interventions were discussed with the pharmacy clinical coordinator, and associated recommendations (as deemed clinically appropriate) were made to the physician. Ultimately, it was the physician's decision whether to implement the recommendations.

Patients were included if they were greater than or equal to 60 years of age and less than or equal to 89 years of age, and were inpatients on the geriatric unit during the 6 week study period from August to September 2011. A minimum age of 60 years was chosen in an effort to include an adequate number of subjects, with the consideration that the definition of "older adults" varies in the literature. A maximum of 89 years of age was a requirement of the IRB at this institution due to the potential for subjects above this age to be considered identifiable. Patients were excluded if no medications from either set of criteria were identified on the patient's medication profile.

The primary outcome was the change in number of PIMs from baseline to follow-up for the Beers Criteria versus the STOPP Criteria. Baseline was assessed through evaluation of the patient's medication regimen on the first day of the geriatric rotation (and before any recommendations were made) or the date of admission if admitted after this date. Follow-up was assessed on the last day of the geriatrics rotation (and after all recommendations were made) or the date of discharge if discharged before this date.

Secondary outcomes included the change from baseline to follow-up in number of PIMs for each set of criteria assessed separately, using the same time period as the primary outcome. Other secondary outcomes included the change from baseline to follow-up in adverse patient outcomes including number of falls, number of required transfers to an acute medical facility or referrals to the medical clinic, and number of medication-specific ADEs for each set of criteria assessed separately. The baseline time period for adverse patient outcomes began eight weeks prior to each recommendation or beginning with the date of admission if admitted after this date, and ending on the date of each recommendation. The follow-up time period for adverse patient outcomes began on the date of the recommendation and extended eight weeks after each recommendation or the date of discharge if discharged prior to this date. An equal

amount of time was assessed prior to and after each recommendation.

All data elements were extracted from patients' electronic medical records and appropriate procedures were followed to maintain patient confidentiality. Paired t-tests were used to analyze the primary outcome and to analyze the change in number of PIMs from baseline to follow-up for each set of criteria separately. Fisher's exact tests were used to analyze adverse patient outcomes. The project was approved by The University of Texas at Austin Institutional Review Board as well as the Texas Department of State Health Services Institutional Review Board.

RESULTS

A total of 34 patients were initially screened, and 29 patients met inclusion criteria (five patients were excluded due to age less than 60 years). Baseline characteristics are presented in Table 1. Significantly more PIMs were identified at baseline utilizing STOPP Criteria (total 112; mean per patient \pm SD, 3.9 \pm 2.3) versus Beers Criteria (total 63; mean per patient \pm SD, 2.2 \pm 1.3) ($t=-4.29$, $p<0.001$). A total of 76 recommendations were made on 23 patients (72 pertained to STOPP Criteria and 48 to Beers Criteria with a significant amount of overlap between the two criteria). Of the recommendations made, 84% were accepted ($n=64$).

Table 1. Baseline Characteristics

Age- years (mean \pm SD)	67.6 \pm 6.0
Gender- n (%)	
Male	8 (27.6)
Female	21 (72.4)
Race- n (%)	
White	20 (69.0)
Hispanic	3 (10.3)
African American	4 (13.8)
Other	2 (6.9)
Length of Stay- median (range)	270 days (2 days - 25.7 years)

Primary outcome

There was no significant difference in the change in number of PIMs per patient from baseline to follow-up for STOPP Criteria versus Beers Criteria ($t=0.90$; $p=0.3750$) (Figure 1).

Secondary Outcomes

PIMs decreased 41% using STOPP Criteria from baseline ($n=112$) to follow-up ($n=66$) (mean change per patient \pm SD -1.6 \pm 1.5; $p<0.0001$), and 63% using Beers Criteria from baseline ($n=63$) to follow-up ($n=23$) (mean change per patient \pm SD -1.4 \pm 1.1; $p<0.0001$) (Figure 1). Applying both the STOPP Criteria and Beers Criteria, the total

Figure 1. Change in Number of PIMs

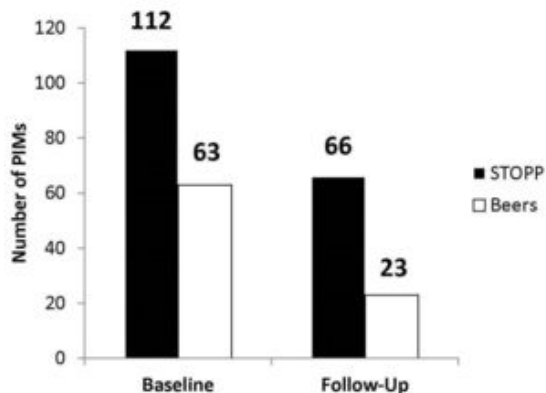


Figure 2. Change in Number of Falls

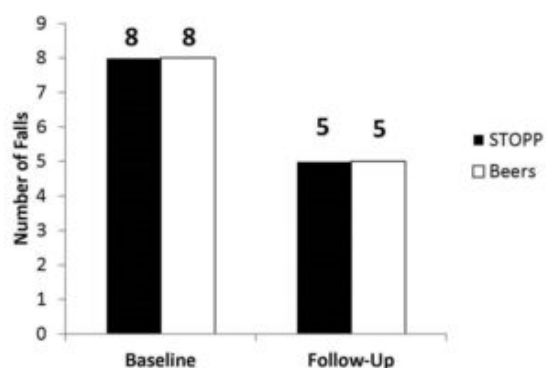


Figure 3. Change in Number of Transfers/Referrals

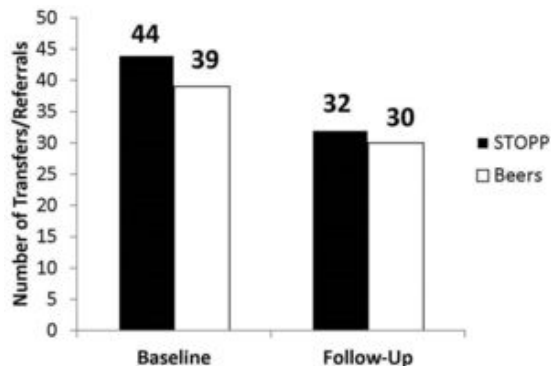
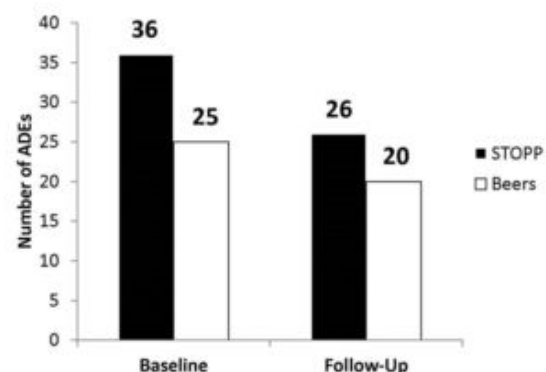


Figure 4. Change in Number of ADEs



number of falls decreased by 37.5% (from 8 pre-recommendation to 5 post-recommendation). However, there was no statistically significant difference in the change in mean number of falls per patient from baseline to follow-up for STOPP ($p=0.54$) or Beers Criteria ($p=1.00$) (Figure 2).

Applying the STOPP Criteria, the total number of referrals to the medical clinic or required transfers to an acute medical facility decreased by 27.2% (44 pre-recommendation and 32 post-recommendation). The total number of falls decreased by 23.1% (39 pre-recommendation and 30 post-recommendation) with Beers Criteria. However, there was no significant difference in the change in mean number of referrals/transfers per patient from baseline to follow-up for either criteria ($p=1.00$ for both criteria) (Figure 3). Five transfers to an acute medical facility occurred in the pre-recommendation period due to: chest pain ($n=2$); suspected myocardial infarction ($n=1$); abnormal EKG ($n=1$); and congestive heart failure ($n=1$). Three transfers occurred post-recommendation due to: dehydration/somnolence/UTI ($n=1$); abnormal EKG ($n=1$); and pneumonia ($n=1$).

Applying the STOPP Criteria, the total number of ADEs decreased by 27.8% (36 pre-recommendation and 26 post-recommendation). Total number of ADEs decreased by 20.0% (25 pre-recommendation and 20 post-recommendation) with Beers Criteria. A statistically significant decrease from baseline in mean number of ADEs per patient was detected whether applying the STOPP ($p=0.0013$) or Beers ($p<0.001$) Criteria (Figure 4). Common ADEs included constipation, sedation, confusion, weight gain, headache, orthostatic hypotension, and urinary retention (Table 2). Serious ADEs included extrapyramidal symptoms (EPS), unsteady gait, QT prolongation, and vaginal bleeding (Table 3).

DISCUSSION

Utilization of two criteria, STOPP and Beers, for identifying PIMs in geriatric patients led to significant decreases in number of PIMs from baseline to follow-up when assessed separately. However, there was no significant difference between the two criteria in the change in number of PIMs identified per patient. Of note, nearly double the number of PIMs were identified at baseline utilizing STOPP Criteria.

At the time of completion of the current research the most recent publication of the Beers Criteria was the 2003 version.² An updated version was published in February 2012 with several significant changes from the 2003

Table 2. Common Adverse Drug Events*

ADE	Medications	Patients Pre (n)	Patients Post (n)
Constipation	Iron	3	3
	Dicyclomine	1	1
	Hydroxyzine	1	0
	Verapamil	2	2
	Benzotropine	2	2
	Chlorpheniramine	2	2
	Oxybutynin	1	1
	Quetiapine	2	2
Sedation	Clonazepam	1	1
	Benzotropine	1	0
Confusion	Clonazepam	1	1
	Lorazepam	1	1
	Alprazolam	1	0
	Hydroxyzine	1	1
	Tolterodine	1	1
	Quetiapine	1	1
	Benzotropine	1	0
Weight Gain	Olanzapine	1	0
Headache	Estrogen	1	0
Orthostatic	Benzotropine	1	1
Hypotension	Chlorpromazine	1	1
Urinary Retention	Oxybutynin	1	1
	Chlorpheniramine	1	1
Total		29	23

*Data for number of ADEs are merged for STOPP & Beers Criteria as a significant amount of overlap occurred

Table 3. Serious Adverse Drug Events*

ADE	Medications	Patients Pre (n)	Patients Post (n)
Extrapyramidal Symptoms (EPS)	Olanzapine	1	1
	Aripiprazole	1	1
	Risperidone	3	1
	Ziprasidone	1	1
	Quetiapine	1	0
	Chlorpromazine	1	1
Unsteady Gait	Quetiapine	1	1
QT Prolongation	Ziprasidone	1	0
Vaginal Bleeding	Ibuprofen	1	0
Total		11	6

*Data for number of ADEs are merged for STOPP & Beers Criteria as a significant amount of overlap occurred

version, including organization according to physiological systems or therapeutic category, and an update to reflect medications that are currently in widespread use.⁷ For example, the criteria were updated to include glyburide as a PIM due to higher risk of severe prolonged hypoglycemia in older adults, with a strong recommendation to avoid this medication.⁷ Therefore, although the results of this study showed that more PIMs were identified using the STOPP Criteria, it is possible

that more PIMs would have been identified with the 2012 Beers Criteria as compared to the 2003 version. Based on this consideration, it is likely that either set of criteria would be beneficial in identifying PIMs. Furthermore, the American Geriatrics Society recommends that criteria such as the STOPP Criteria (among others) should be used in a “complementary manner with the 2012 AGS Beers Criteria to guide clinicians in making decisions about safe medication use in older adults”.⁷

In terms of adverse patient outcomes, ADEs significantly decreased from baseline (pre-recommendation period) to follow-up (post-recommendation period) using both criteria. No statistically significant changes from baseline to follow-up were found for either set of criteria in number of falls or required transfers to an acute medical facility or referrals to the medical clinic. However, there was a decrease post-recommendation in all individual adverse patient outcomes which may be considered clinically significant from a health care perspective, particularly given the short intervention duration (6 weeks) as well as the small number of patients included in this study.

This study had several limitations including the small patient population, the short intervention duration, and the retrospective study design. In addition, only one pharmacist was involved in evaluation of medication profiles and assessment of adverse outcomes. The study was not powered to detect a difference between the two criteria; however, a statistically significant decrease in number of PIMs was found using both Beers and STOPP Criteria when evaluated separately. A significant amount of clinical judgment was required to determine appropriateness of medications and whether to make recommendations regarding PIMs. Moreover, although the two criteria provide guidance in identifying PIMs, the risks and the benefits of each medication must be weighed when determining whether the medication is appropriate. For example, benzodiazepines were frequently identified on patients’ medication profiles but were not considered inappropriate in every situation. Another limitation was the variability in reasoning for adverse outcomes. For example, referrals to the medical clinic may not have been medication-related, and many factors often contribute to falls. Likewise, many factors may have contributed to ADEs (e.g., medication doses, other contributing medications, mobility issues). It is not possible to attribute these ADEs solely to the specific medication as listed in Tables 2 and 3. In addition, adverse patient outcomes were assessed for a set time period without consideration for when the medication was

initiated or discontinued. For example, a patient may not have been on a medication for the full 8-week pre-recommendation period or may have been discharged prior to the full 8-week post-recommendation period. Finally, there was the potential for missed PIMs when assessing the primary outcome. In other words, changes may have been made between the baseline date and follow-up date which were not reflected in the primary outcome. Likewise changes may have been implemented by the physician without pharmacist recommendations and these changes may have influenced the results of the study.

As previously stated, clinical judgment weighed heavily in assessing PIMs for appropriateness and determining appropriate recommendations to address the use of PIMs. Therefore, although it may be possible to implement tools or screening processes to identify PIMs, a healthcare provider with specialized training in treating this patient population is necessary to appropriately apply the criteria. A clinical pharmacist is an optimal member of the healthcare team to provide this service due to specialized training in assessing medication regimens. Of note, several of the medications included in the criteria are psychotropic medications, making this a potentially beneficial service in a psychiatric facility in particular.

A change to the admission order set through removal of PRN chlorpheniramine has already occurred as a result of the findings of this study. Chlorpheniramine is a first generation antihistamine which can be harmful in the geriatric population due to anticholinergic effects. Although the majority of patients were not receiving this medication on a routine basis, the decision was made to remove it from the admission order set in order to decrease potential anticholinergic burden.

CONCLUSIONS

Utilization of both STOPP and Beers Criteria led to a significant decrease in number of PIMs in a geriatric population at an inpatient psychiatric facility, although there was not a significant difference between the two criteria. A decrease in adverse outcomes including falls, required transfer to an acute medical facility or referral to the medical clinic, and adverse drug events was shown using either set of criteria. Implementation of a process for assessing medication regimens of geriatric patients utilizing the Beers and/or STOPP Criteria would likely be beneficial to this institution. It is our hope that implementing this process would further influence prescribing patterns and decrease utilization of potentially inappropriate medications and associated adverse outcomes in this population.

REFERENCES

1. Beers MH, Ouslander JG, Rollingher I, Reuben DB, Brooks J, Beck JC. Explicit criteria for determining inappropriate medication use in nursing home residents. UCLA Division of Geriatric Medicine. Arch Intern Med. 1991;151(9):1825-32. PubMed PMID: [1888249](#).
2. Fick DM, Cooper JW, Wade WE, Waller JL, Maclean JR, Beers MH. Updating the Beers criteria for potentially inappropriate medication use in older adults: results of a US consensus panel of experts. Arch Intern Med. 2003;163(22):2716-24. DOI: [10.1001/archinte.163.22.2716](#). PubMed PMID: [14662625](#).
3. Gallagher P, Ryan C, Byrne S, Kennedy J, O'Mahony D. STOPP (Screening Tool of Older Person's Prescriptions) and START (Screening Tool to Alert doctors to Right Treatment). Consensus validation. Int J Clin Pharmacol Ther. 2008;46(2):72-83. PubMed PMID: [18218287](#).
4. Hamilton H, Gallagher P, Ryan C, Byrne S, O'Mahony D. Potentially inappropriate medications defined by STOPP criteria and the risk of adverse drug events in older hospitalized patients. Arch Intern Med. 2011;171(11):1013-9. DOI: [10.1001/archinternmed.2011.215](#). PubMed PMID: [21670370](#).
5. Franceschi M, Scarcelli C, Niro V, Seripa D, Paziienza AM, Pepe G, et al. Prevalence, clinical features and avoidability of adverse drug reactions as cause of admission to a geriatric unit: a prospective study of 1756 patients. Drug Saf. 2008;31(6):545-56. PubMed PMID: [18484788](#).
6. Beers MH. Explicit criteria for determining potentially inappropriate medication use by the elderly. An update. Arch Intern Med. 1997;157(14):1531-6. PubMed PMID: [9236554](#).
7. American Geriatrics Society updated Beers Criteria for potentially inappropriate medication use in older adults. J Am Geriatr Soc. 2012;60(4):616-31. DOI: [10.1111/j.1532-5415.2012.03923.x](#). PubMed PMID: [22376048](#).
8. Onder G, Landi F, Liperoti R, Fialova D, Gambassi G, Bernabei R. Impact of inappropriate drug use among hospitalized older adults. Eur J Clin Pharmacol. 2005;61(5-6):453-9. DOI: [10.1007/s00228-005-0928-3](#). PubMed PMID: [15912391](#).
9. Gallagher P, O'Mahony D. STOPP (Screening Tool of Older Persons' potentially inappropriate Prescriptions): application to acutely ill elderly patients and comparison with Beers' criteria. Age Ageing. 2008;37(6):673-9. DOI: [10.1093/ageing/afn197](#). PubMed PMID: [18829684](#).
10. Budnitz DS, Shehab N, Kegler SR, Richards CL. Medication use leading to emergency department visits for adverse drug events in older adults. Ann Intern Med. 2007;147(11):755-65. PubMed PMID: [18056659](#).
11. Jano E, Aparasu RR. Healthcare outcomes associated with beers' criteria: a systematic review. Ann Pharmacother. 2007;41(3):438-47. DOI: [10.1345/aph.1H473](#). PubMed PMID: [17311835](#).
12. Chrischilles EA, VanGilder R, Wright K, Kelly M, Wallace RB. Inappropriate medication use as a risk factor for self-reported adverse drug effects in older adults. J Am Geriatr Soc. 2009;57(6):1000-6. PubMed PMID: [19507293](#).
13. Passarelli MCG, Jacob-Filho W, Figueras A. Adverse drug reactions in an elderly hospitalised population: inappropriate prescription is a leading cause. Drugs Aging. 2005;22(9):767-77. PubMed PMID: [16156680](#).

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