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# A CRITICAL ANALYSIS OF VARIOUS METHODS USED TO IDENTIFY POTENTIALLY INAPPROPRIATE MEDICATIONS IN ELDERLY PATIENTS: A REVIEW

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## Abstract

The term "potentially inappropriate medications" (PIM) refers to drugs that are used among elderly patients and should be avoided due to a significant risk of adverse reactions. Due to its high prevalence and related adverse effects including ADRs, morbidity, usage of healthcare services, and increased expenditures, the prescribing of inappropriate medication has become a major public health solicitude. Several PIM screening tools are anticipated to lower adverse drug reactions and promote rational drug use. The American Geriatrics Society (AGS) beers criteria, a Screening tool to alert to the right treatment (START), and a Screening tool for older people's prescription (STOPP) are the criteria implemented to detect the PIMs. This study primarily focuses on the tools used in evaluating the PIM and the detailed information regarding the criteria.

**Keywords:** Potentially inappropriate medications, older adults, Screening tools, Explicit criteria, Adverse drug reactions

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## **Introduction**

The quality of life for elderly people the age of 65 and above irrespective of their gender is significantly impacted by potentially inappropriate medication.<sup>[1]</sup> Elderly patients are more vulnerable to PIM usage, due to the increased possibility of comorbid conditions therefore necessitating the prescription of multiple medicines.<sup>[2]</sup> It is a worldwide health issue that affects all care settings and is anticipated to get worse as the world population ages.<sup>[3]</sup> Therefore, screening techniques with specified criteria have been utilized to enhance prescription that enlists the American geriatrics society beers criteria and the European – based tools namely the screening tool to alert to the right treatment (START), the screening tool for older people's prescription (STOPP) and other explicit-based criteria.<sup>[4]</sup>

## **Major prescribed PIMs among geriatric patients**

The study conducted in Saudi Arabia shows that the majority of the patient was diabetic, hypertensive, and also with lipid profile abnormalities and almost all were similar with decreased hemoglobin levels, so the most common PIM was a high dose of ferrous sulfate (>325 mg/day) and analgesics and opioids were the second most prescribed medications.<sup>[5]</sup> The most commonly encountered PIMs according to beers criteria (2015) which should be avoided are anticholinergics, antispasmodic, and cardiovascular drugs.<sup>[6]</sup> Benzodiazepines, analgesics, and NSAIDs were also highly and most commonly used PIMs.<sup>[7]</sup> Diuretics, androgens, and sulfonylureas are also mentioned based on the prevalence of usage.<sup>[8]</sup>

## **Most Commonly used explicit criteria-based tools**

Several explicit PIM criteria-based tools have been developed to help physicians manage medication in clinically complex multi-morbid older people. Very few of

these PIM criteria sets have been evaluated as interventions versus standard pharmaceutical care in well-designed clinical trials.<sup>[13]</sup> Physicians most commonly use the Screening Tool of Older People's Prescriptions (STOPP), Screening Tool to Alert to Right Treatment (START) criteria, and American Geriatrics Society (AGS) Beers Criteria (AGS Beers criteria) to detect potentially inappropriate medications (PIMs).<sup>[4]</sup> Various explicit country-specific criteria have been developed to assess the appropriateness of prescribing globally. These tools are broadly classified as explicit (criterion-based) or implicit (judgment-based).<sup>[9]</sup> Explicit tools are firm standards derived from published literature, expert opinions, and consensus techniques.<sup>[10]</sup> They are typically drug or disease-oriented and can be applied to large populations to assess the appropriateness of prescribing at the population level.<sup>[11]</sup>

## **Beers criteria an update**

Beers criteria are most commonly used to assess potentially inappropriate medication in older people<sup>[12]</sup>. The criteria, which was first published in 1991, have been updated five times. Physicians, research scholars, healthcare executives, and supervisors in the healthcare industry all rely heavily on the American Geriatrics Society (AGS) Beers Criteria for Potentially Inappropriate Medication (PIM) Use in Older Adults (AGS Beers criteria). AGS has been a steward of the criteria since 2012, updating it every three years. The most recent revision of the AGS beers criteria was made in 2019<sup>[13]</sup>. The evidence was analysed by a multi-disciplinary expert panel and reviewed the evidence published since the last update (2015). The AGS Beers Criteria expert update panel included 13 clinicians from the 2015 update, including physicians, pharmacists, and nurses. The panellists had worked in a variety of practise settings, including ambulatory care, home care, acute hospital care, skilled nursing facilities, and long-

term care. Ex-officio members of the panel included the Centers for Medicare and Medicaid Services, the National Committee for Quality Assurance, and the Pharmacy Quality Alliance<sup>[13]</sup>. The 2019 update has fewer changes than the 2015 update but more than the 2012 update. The PIMs were classified into five different genre;

- i. Potentially Inappropriate Medication Use in people over the age 65.
- ii. Medication Use in Older Adults That May Be Inappropriate Due to Drug-Disease or Drug-Syndrome Interactions
- iii. Potentially Inappropriate Medications: to Be Used with Caution in elderly people
- iv. Potentially Clinically Important Drug-Drug Interactions to be Avoided in elderly people
- v. Medications to Avoid or Have Dosage Reduced in elderly Adults with Varying Levels of renal Function.

According to *Lina Tao et al.*, a high prevalence of PIM use in elderly patients was observed in their study using AGS beers criteria<sup>[14]</sup>. *Hunsur Nagendra Vishwas et al.*, study was the first in India to compare Beers criteria and STOPP to evaluate PIM use in hospitalised elderly patients. Furthermore, it was concluded that the Beers criteria were more sensitive and specific in detecting PIM in elderly patients<sup>[15]</sup>. According to studies, Beers criteria has been the most frequently cited tool for assessing PIM use in the elderly since 2003<sup>[17,18]</sup>.

### START criteria

It is also called as screening tool to alert to right treatment criteria. The START criteria was intended to recognize the potential prescribing omissions (PPOS). The intervention utilize of these tool significantly better medication appropriateness and then decrease the occurrence of adverse drug reactions in elderly patients. These instruments were initially created in Ireland, Where they

were first released in 2008. The specific physiological systems effected by various medications (or) medication types was analyzed to characteristic the criteria<sup>[4]</sup>. The *Denis O' Mahony et al.*, at 2014 was re-evaluate the 2008 criteria and substantiation of new criteria that have been proposed. The new European countries experts re-evaluate anew gust of START criteria and include proposed new criteria. The re-evaluate list of criteria was sub-sequently verified using the Delphi consensus technique. After 2 Delphi validation rounds, the expert panel decided on a final set of 114 criteria, Which include 34 START criteria. In comparison to version I, This indicates an overall 31% increase in START criteria. In that several new START categories was characterized in version II, That is categories included vaccines, analgesic and then urogenital system drugs. Thatwise the updated and expandable criteria is reduce the inappropriate prescribing in elderly patients.<sup>[18]</sup> *Amalia Ubeda et al.*, in 2012 was said in The START criteria identified clinical circumstances which there may have been inappropriate omissions.<sup>[19]</sup> Explanations of the START criteria encompass beginning an antidepressant for treated patients three months of depressive symptoms, contributing ACE inhibitors or ARB after a heart attack or sudden cardiac death in patients with a cardiovascular disorder, and considering starting a bisphosphonate in patients on chronic steroids in patients with endocrine disorders.<sup>[20]</sup>

### STOPP criteria

STOPP is also known as screening tool to older people's prescriptions. Contrary to Beers 2003 criteria drugs, STOPP criteria pharmaceuticals are directly correlated with adverse drug events (ADEs) by *Denis O'Mahony et al.*, at 2014<sup>[18]</sup>. To detect PIMs, the STOPP criterion was constructed. It's presented in venisehanna et.al at 2022<sup>[8]</sup>. Elderly Chinese cancer outpatients who's met the 2014 STOPP

criteria. These criteria are most typically utilised older Chinese patients, even though that they were formulated for various organizations and needs. Because elderly cancer patients frequently have additional comorbidities, a method that targets cancer outpatients should be put in place to notify clinicians of a probable PIM prescription. In contrast to prior study on Chinese elderly inpatients, our investigation has found that the 2017 Chinese and the 2014 STOPP criteria suggested weak coherence, while the 2019 AGS/Beers criteria showed intermediate concordance with the other two criteria (Ma et al., 2018). The exhaustive medication history, the patient's clinical description, and diagnostic tests must all be known in order to apply the STOPP criteria (O'Mahony et al., 2015; O'Mahony, 2020; Perpétuo et al., 2021)<sup>[21]</sup>. STOPP criterion explanations include providing long-acting sulfonyleureas and exercising caution when aspirin and warfarin are taken in patients who are not obtaining an acid-suppressing substance. Benzodiazepines raise the risk of collapsing in patients with central nervous system diseases who have a history of collapsing during the previous three months. PIMs include medications with a high risk of falling, analgesic and antimuscarinic compounds, cardiovascular system antiplatelet/anticoagulant drugs, CNS and antidepressants, nephro, GI, bronchial, neuromuscular, urinary tracts, and endocrinology drugs, as per STOPP criteria<sup>[20]</sup>.

### Others tools used to assess PIMs

As per studies, the methods medication appropriateness index (MAI) and assess, review, minimise, optimise, reassess (ARMOR) are the most regularly used to analyse drug administration practises. Another reliable approach in the literature is called TIMER, and it evaluates four areas of probable inappropriate pharmaceutical use in the geriatric population. The treatment of problems,

therapeutic objectives, safety, adherence, and costs are some of these domains. There were several benefits cited for the TIMER as well. The assessment of underutilization (AOU) tool, which was developed and validated by the same people who created the pharmaceutical appropriateness index, is another instrument that has been mentioned in the literature (MAI). According to reports, the AOU tool was primarily created to assess which pharmaceuticals should have been administered for the elderly in clinical settings and which ones shouldn't have. According to studies, the ARMOR as well as MAI tools have been used to analyse drug administration methods the most frequently.<sup>[22]</sup>

### Conclusion

The PIMs usage are quite common in older individual, so in order to amend this proactive intervention are made to ameliorate this scenario. The implementation of various methods will be helpful in promoting the therapeutic use, to improve rational drug use, minimize the risk of ADRs, reduce the polypharmacy, provides the medication appropriateness and lower the risk of complication in geriatric patients. The developing explicit tools will provide a clear view on usage of medications and their clinical benefits, which will be helpful in precise prescribing patterns among the physicians and the pharmacist has a significant advantage in the counselling process and in developing knowledge of the medications used by elderly patients. Beneficial of this study ensures the reduction in the mortality rate and will increase the life expectancy in rapidly growing global population of multi-morbid older patients.

### Conflict of interest

No conflict of interest

## References

- [1] Alshammari H, Al-Saeed E, Ahmed Z, Aslanpour Z. Reviewing Potentially Inappropriate Medication in Hospitalized Patients Over 65 Using Explicit Criteria: A Systematic Literature Review. *Drug, Healthcare and Patient Safety* 2021;Volume 13:183–210. <https://doi.org/10.2147/dhps.s303101>.
- [2] Zhang H, Wong EL, Wong SY, Chau PY, Yip BH, Chung RY, Lee EK, Lai FT, Yeoh EK. Prevalence and determinants of potentially inappropriate medication use in Hong Kong older patients: a cross-sectional study. *BMJ open*. 2021 Jul 1;11(7):e051527.
- [3] Brkic J, Fialova D, Okuyan B, Kummer I, Sesto S, Capiu A, Hadziabdic MO, Tachkov K, Bobrova V. Prevalence of potentially inappropriate prescribing in older adults in Central and Eastern Europe: a systematic review and synthesis without meta-analysis. *Scientific Reports*. 2022 Oct 6;12(1):1-5.
- [4] Candeias C, Gama J, Rodrigues M, Falcão A, Alves G. Potentially Inappropriate Medications and Potential Prescribing Omissions in Elderly Patients Receiving Post-Acute and Long-Term Care: Application of Screening Tool of Older People's Prescriptions/Screening Tool to Alert to Right Treatment Criteria. *Frontiers in Pharmacology* 2021;12. <https://doi.org/10.3389/fphar.2021.747523>.
- [5] Al Odhayani A, Tourkmani A, Alshehri M, Alqahtani H, Mishriky A. Potentially inappropriate medications prescribed for elderly patients through family physicians. *Saudi Journal of Biological Sciences*. 2017 Jan 1;24(1):200-7.
- [6] Zhang X, Zhou S, Pan K, Li X, Zhao X, Zhou Y, Cui Y, Liu X. Potentially inappropriate medications in hospitalized older patients: a cross-sectional study using the Beers 2015 criteria versus the 2012 criteria. *Clinical interventions in aging*. 2017;12:1697.
- [7] Malakouti SK, Javan-Noughabi J, Yousefzadeh N, Rezapour A, Mortazavi SS, Jahangiri R, Moghri J. A Systematic Review of Potentially Inappropriate Medications Use and Related Costs Among the Elderly. *Value in Health Regional Issues*. 2021 Sep 1;25:172-9.
- [8] Zhang Q, Cai Y, Lu L, Yao K, Chen J, Yang Y, Wang K, Zheng J, Guo P. Prevalence of potentially inappropriate medications and association with comorbidities in older adults with diabetes in an outpatient visitation setting. *Frontiers in Public Health*. 2022 Sep 20:3235.
- [9] Zhang H, Wong EL, Yeoh E, Ma BH. Development of an explicit tool assessing potentially inappropriate medication use in Hong Kong elder patients. *BMC Geriatrics* 2021;21. <https://doi.org/10.1186/s12877-021-02024-0>.
- [10] Kaufmann CP, Tremp R, Hersberger KE, Lampert ML. Inappropriate prescribing: a systematic overview of published assessment tools. *European Journal of Clinical Pharmacology* 2013;70:1–11. <https://doi.org/10.1007/s00228-013-1575-8>.
- [11] Dimitrow MS, Airaksinen MSA, Kivelä S-L, Lyles A, Leikola SNS. Comparison of Prescribing Criteria to Evaluate the Appropriateness of Drug Treatment in Individuals Aged 65 and Older: A Systematic Review. *Journal of the American Geriatrics Society* 2011;59:1521–30. <https://doi.org/10.1111/j.1532-5415.2011.03497.x>.
- [12] Curtin D, Gallagher PF, O'Mahony D. Explicit criteria as clinical tools to minimize inappropriate medication use and its consequences. *Therapeutic Advances in Drug Safety* 2019;10:204209861982943.

- <https://doi.org/10.1177/2042098619829431>.
- [13] American Geriatrics Society 2019 Updated AGS Beers Criteria® for Potentially Inappropriate Medication Use in Older Adults. *Journal of the American Geriatrics Society* 2019;67:674–94. <https://doi.org/10.1111/jgs.15767>.
- [14] Tao L, Qu X, Gao H, Zhai J, Zhang Y, Song Y. Polypharmacy and potentially inappropriate medications among elderly patients in the geriatric department at a single-center in China. *Medicine* 2021;100:e27494. <https://doi.org/10.1097/md.00000000000027494>.
- [15] Nagendra Vishwas H, Harugeri A, Parthasarathi G, Ramesh M. Potentially inappropriate medication use in Indian elderly: Comparison of Beers' criteria and Screening Tool of Older Persons' potentially inappropriate Prescriptions. *Geriatrics & Gerontology International* 2012;12:506–14. <https://doi.org/10.1111/j.1447-0594.2011.00806.x>.
- [16] 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 and Ageing* 2008;37:673–9. <https://doi.org/10.1093/ageing/afn197>.
- [17] Levy HB, Marcus E-L, Christen C. Adverse Reactions/Medication Safety: Beyond the Beers Criteria: A Comparative Overview of Explicit Criteria. *Annals of Pharmacotherapy* 2010;44:1968–75. <https://doi.org/10.1345/aph.1p426>.
- [18] O'Mahony D, O'Sullivan D, Byrne S, O'Connor MN, Ryan C, Gallagher P. STOPP/START criteria for potentially inappropriate prescribing in older people: version 2. *Age Ageing*. 2015 Mar;44(2):213-8. doi: 10.1093/ageing/afu145. Epub 2014 Oct 16. Erratum in: *Age Ageing*. 2018 May 1;47(3):489. PMID: 25324330; PMCID: PMC4339726.
- [19] Ubeda A, Ferrándiz L, Maicas N, Gómez C, Bonet M, Peris JE. Potentially inappropriate prescribing in institutionalised older patients in Spain: the STOPP-START criteria compared with the Beers criteria. *Pharmacy practice*. 2012 Apr;10(2):83.
- [20] Hill-Taylor B, Sketris I, Hayden J, Byrne S, O'sullivan D, Christie R. Application of the STOPP/START criteria: a systematic review of the prevalence of potentially inappropriate prescribing in older adults, and evidence of clinical, humanistic and economic impact. *Journal of clinical pharmacy and therapeutics*. 2013 Oct;38(5):360-72.
- [21] Tian F, Zhao M, Chen Z, Yang R. Prescription of Potentially Inappropriate Medication Use in Older Cancer Outpatients With Multimorbidity: Concordance Among the Chinese, AGS/Beers, and STOPP Criteria. *Frontiers in Pharmacology*. 2022:1163.
- [22] Abdullah, Marwah&Alomari, Majed&AlNihab, Ali &Alshaikh, Maha&Alzahrani, Maryam & Al-Shehab, Ali &Alghafli, Munthir&Shaban, Ayat&Bajaba, Majed&Yateem, Samia&Alseraihi, Ahmad. (2022). Types of screening tools used to identify potential inappropriate medication in the geriatric. *International Journal Of Community Medicine And Public Health*. 9. 10.18203/2394-6040.ijcmph20220005.