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REVIEW ARTICLE

Adopting STOPP/START Criteria Version 3 in Clinical Practice: A Q&A Guide for Healthcare Professionals

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Abstract
The growing complexity of geriatric pharmacotherapy necessitates effective tools for mitigating the risks associated with polypharmacy. The Screening Tool of Older Persons' Potentially Inappropriate Prescriptions (STOPP)/Screening Tool to Alert doctors to Right Treatment (START) criteria have been instrumental in optimizing medication management among older adults. Despite their large adoption for improving the reduction of potentially inappropriate medications (PIM) and patient outcomes, the implementation of STOPP/START criteria faces notable challenges. The extensive number of criteria in the latest version and time constraints in primary care pose practical difficulties, particularly in settings with a high number of older patients. This paper critically evaluates the challenges and evolving implications of applying the third version of the STOPP/START criteria across various clinical settings, focusing on the European healthcare context. Utilizing a "Questions & Answers" format, it examines the criteria's implementation and discusses relevant suitability and potential adaptations to address the diverse needs of different clinical environments. By emphasizing these aspects, this paper aims to contribute to the ongoing discourse on enhancing medication safety and efficacy in the geriatric population, and to promote more person-centred care in an aging society.

1 Introduction

The Screening Tool of Older Person's Prescriptions (STOPP) and Screening Tool to Alert doctors to Right Treatment (START) are explicit criteria developed to assist healthcare providers in identifying potentially inappropriate medications (PIMs) and potentially omitted medications (POMs) in older adults [1]. Although primarily explicit, the criteria include implicit components, particularly for specific PIMs and POMs. The STOPP criteria

Key Points

The third version of the STOPP/START criteria includes significant updates, such as the inclusion of new drugs and expanded evidence, making it more reflective of current clinical practice.

Large randomized controlled trials have not shown significant improvements in major clinical outcomes with the use of STOPP/START criteria. However, they may still offer benefits in terms of reduced drug adverse effects, cost savings and resource optimization.

While the STOPP/START criteria provide a structured framework for medication review, their application must be balanced with clinical judgment and individualized patient needs, recognizing that they are not a one-size-fits-all solution.

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focus on medications that could be harmful or produce adverse effects in older adults and should in general be avoided. Conversely, the START criteria highlight medications that are essential for preventing or managing specific conditions in older adults [1]. Initially developed in 2008 with 65 STOPP and 22 START criteria [2], they underwent subsequent revisions, expanding to 80 STOPP and 34 START criteria in 2015 [3] and most recently to 133 STOPP and 57 START criteria [1], reflecting the evolving and expanding landscape of geriatric medicine (Table 1).

The expert panel that validated the START/STOPP version 3 criteria was composed of 11 academic physicians with recognized expertise in geriatric pharmacotherapy from eight European countries, representing northern, southern, eastern and western Europe. This diverse selection of panel members differs significantly from version 1, where only physicians from academic centres in Ireland and the UK were involved. The inclusion of experts from across Europe in version 3 provides a broader representation of current European clinical therapeutics practice, ensuring that the criteria are more comprehensive and applicable to a wider range of clinical settings.

These criteria have been extensively used in research and various clinical settings, including primary care, hospitals and nursing homes, with the aim of guiding clinicians in optimizing medication regimens for older adults [4–7]. Although their impact on major clinical outcomes is still debated, they offer a structured framework that can aid in optimizing medication regimens. Their extensive use is attributed to the easy consultation of the physiological-system-based list of criteria (e.g. the cardiovascular system, central nervous system) and to their consistency with the comprehensive geriatric assessment (CGA), widely applied in clinical practice to older individuals. The third version includes input from European geriatricians, some of whom have formal qualifications in clinical pharmacology, thus enhancing its international applicability [1]. However, challenges in implementing the STOPP/START criteria in clinical practice are notable.

Different care settings have different challenges when using the STOPP/START criteria. Time constraints in primary care and the extensive number of criteria in the latest version complicate their routine application, particularly in settings where doctors have numerous older patients and only a limited amount of time is spent with each one [8, 9]. In this context, applying 190 criteria in the third version may represent a limit to their applicability.

Moreover, family physicians usually do not have easy access to specialists who prescribe at least some of the patients' medications. Another challenge is access to comprehensive clinical records, which is of utmost importance in assessing the appropriateness of medication for patients [10]. The subjective nature of clinical judgment introduces variability in applying these criteria, and their suitability may vary according to the clinical setting and country-specific healthcare characteristics.

The European origin of the STOPP/START criteria is particularly significant. The development and revisions of the criteria were informed by a panel of geriatricians from across Europe, ensuring that they reflected the unique aspects of drug markets, usage habits and healthcare organizations prevalent in Europe. Nevertheless, there are essential differences in the healthcare systems of the European countries. This variability has led to the development of other criteria, such as the EU(7)-PIM [11], Laroche list [12] and adaptations of the STOPP/START criteria to reflect local or country-level needs. Some STOPP/START criteria adaptations have been proposed [13–15]. Additionally, comparisons with other tools, such as the Beers Criteria [16, 17], highlight differences in identifying PIMs, underscoring the need for contextual application and ongoing evaluation [18–20].

This paper aims to critically evaluate the application, challenges and evolving significance of the STOPP/START criteria in various clinical settings, particularly in the European healthcare context. While the primary focus of this paper is on the adoption and implementation of the third version of the STOPP/START criteria, the principles and strategies discussed are relevant to all versions of the tool and to the general practice of deprescribing in older adults. Utilizing a "Questions & Answers" format, we will explore their implementation, compare them with similar tools and discuss potential adaptations and variations in their use across different clinical settings. The main general recommendations, as well as the recommendations specific to specific settings, are summarized in Fig. 1. The intent is to provide guidance to clinicians and healthcare professionals on how to effectively utilize the STOPP/START criteria in the management of older patients taking a large number of medications.

2 What are the Benefits or Advantages of Using the Updated Version 3 STOPP/START Criteria for Medication Reviews in Older Adults Compared with Previous Versions and/or Other Frequently Used Criteria (i.e. Beers)?

There are several potential advantages of using the STOPP/START criteria in their updated version.

First, the organization of STOPP/START criteria into systems and clinical areas enhances their usability in clinical practice. This systematic approach facilitates a more comprehensive review of a patient's medication regimen, ensuring that all aspects of the treatment are thoroughly evaluated.

The new version of the STOPP/START criteria also reflects the inclusion of new drugs [e.g., sodium–glucose co-transporter-2 (SGLT2) inhibitors] and the expanding

Table 1 Evolution of STOPP/START criteria versions

Version number	Year of publication (first author)	Number of STOPP criteria	Number of START criteria	Key changes/additions	STOPP/START example criteria	Consensus method
STOPP/START Version 1	2008 (Gallagher et al.) [2]	65	22	Initial set-up: Formation of the foundational criteria focusing on common areas of concern in geriatric pharmacotherapy	STOPP: The use for more than one month of long-acting benzodiazepines; PPI at full therapeutic dosage for > 8 weeks START: Warfarin in patients with chronic AF	Delphi process: Panel of 18 experts from different areas of the United Kingdom. First round questionnaire was rated with a Likert scale by each panelist. Two more rounds to reach the consensus
STOPP/START Version 2	2015 (O'Mahony et al.) [3]	80	34	Expansion and refinement: Increase in the number of criteria and improvement in categorization for easier clinical application	STOPP: Simultaneous use of two or more drugs with anticholinergic activities; Aldosterone antagonists with concomitant potassium-sparing drugs START: High-potency opioids in moderate-severe pain, where paracetamol, NSAIDs or low-potency opioids are not/no longer effective or safe; Vaccines section	Delphi process: Panel of 19 experts from 13 different European countries. Eight-phase process from the review of the first version, passing through different drafts of the version 2 and looking for evidence to support the new criteria before reaching the consensus
STOPP/START Version 3	2023 (O'Mahony et al.) [1]	133	57	Comprehensive update: Significant increase in the number and scope of criteria, reflecting newer medications and contemporary clinical practices; removal of obsolete criteria	STOPP: Antiplatelets drugs instead of vitamin K antagonist or NOACs for stroke prevention in patients with AF; Z-drugs for insomnia more than ≥ 2 weeks START: SGLT-2 inhibitors in symptomatic heart failure; Propranolol in patients with essential tremor; Coagulation and renal sections	Delphi process: Panel of 11 expert physicians from eight different European countries. Revision of the previous criteria and evidence to support the new proposed criteria and four rounds to validate each new criteria, rating them with a Likert scale on SurveyMonkey to reach a clear consensus
STOPP-Frail Version 1	2017 (Lavan et al.) [92]	27	N/A	Initial set-up: Developed to assist physicians with deprescribing decisions in older people approaching end-of-life. Focus on reducing drug-related morbidity in the frailest older patients	STOPP: Statins for primary prevention of cardiovascular disease; Selective oestrogen receptor modulators for osteoporosis START: N/A	Delphi process: A panel of 17 experts, comprising geriatricians, clinical pharmacologists and clinical pharmacists, who were all affiliated with Irish university teaching hospitals. The process spanned three rounds, during which the panellists rated the criteria using a 5-point Likert scale

Table 1 (continued)

Version number	Year of publication (first author)	Number of STOPP criteria	Number of START criteria	Key changes/additions	STOPP/START example criteria	Consensus method
STOPP-Frail Version 2	2021 (Curtin et al.) [79]	25	N/A	Refinement: Emphasizes the importance of shared decision-making in deprescribing. Includes updated criteria for identifying older people likely to be approaching end-of-life and guidance on deprescribing certain medications	STOPP: Antihypertensive therapies in patients with SBP persistently <130 mmHg; Drug for benign prostatic hyperplasia in catheterized male patients START: N/A	Delphi process: A panel of eight experts with expertise in various field (i.e. geriatrics, clinical pharmacology and geriatric psychiatry) involved in the validation of the first version. In round 1, seven of the eight new criteria were validated on the basis of their median Likert scores, and consensus was reached on removing all seven potentially obsolete criteria
STOPP-Fall Version 1	2021 (Seppala et al.) [80]	35	N/A	Initial Set-Up: Developed to address medications that increase the risk of falls in older adults. Focus on identifying high-risk medications and suggesting safer alternatives	STOPP: Long-acting benzodiazepines, antipsychotics and medications with a high anticholinergic burden in patients with a history of falls START: N/A	Delphi process: A panel of 15 experts, including geriatricians, clinical pharmacologists and pharmacists. Three rounds to reach consensus

AF atrial fibrillation, *NOACs* non-vitamin K oral anticoagulants, *NSAIDs* nonsteroidal anti-inflammatory drugs, *PPI* proton pump inhibitor, *SBP* systolic blood pressure, *SGLT-2* sodium/glucose cotransporter 2

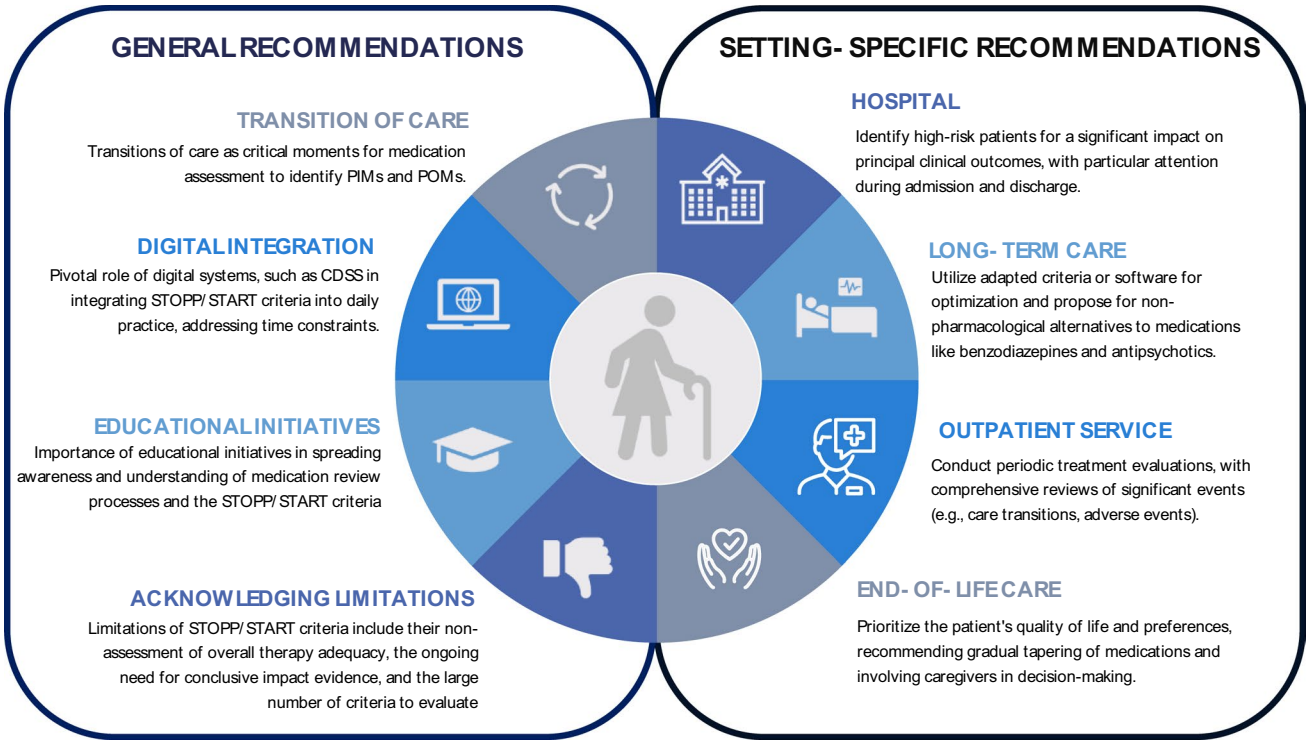

Fig. 1 Graphical representation of the general and setting-specific recommendations for applying the STOPP/START criteria

evidence over the past decade on common chronic disorders such as heart failure, diabetes and chronic obstructive pulmonary disease, thus better capturing the complexity of drug–drug and drug–disease interactions and making it more relevant to current clinical practice. Indeed, compared with the previous version, the number of criteria increased by approximately 67%, from 114 to 190, while three of the version 2 criteria were deemed obsolete or redundant and were therefore removed [1]. This update is critical in geriatric pharmacotherapy, in which new drug development and emerging evidence regarding drug risks and benefits are frequent. For further information regarding the relevant literature that led to changes in the criteria for the third version of the STOPP/START criteria compared with the previous version, please refer to the Electronic Supplementary Material (Supplementary Tables 1 and 2).

The updated STOPP/START criteria boast an enhanced ability to identify PIMs, which is a significant advantage. As previously stated, these criteria are based on the best geriatric pharmacotherapy practices endorsed by a panel of reputed senior academic physicians who participated in the Delphi process [1]. The updated criteria incorporated the latest research findings and clinical guidelines. Some studies have shown that the STOPP criteria may be more effective than the Beers criteria for identifying PIMs, which can lead to improved patient outcomes [7, 20–22]. Furthermore, the START criteria help detect POMs, ensuring that patients receive all the medications they need, a feature not commonly addressed by other criteria, such as Beers [23].

Compared with the Drug Burden Index [24], one of the most common tools to measure anticholinergic treatment burden, the STOPP/START criteria seem to adequately address the indication or benefit for a specific patient. When compared with the other most common criteria such as the Medication Appropriateness Index (MAI) [25] (implicit criteria), the 2015 Beers (explicit criteria) [17], the 2014 Fit for the Aged (FORTA) list [26] (explicit criteria) and the PRISCUS list [27] (explicit criteria), the START/STOPP criteria (particularly version 2) have shown the highest sensitivity and the highest inter-operator agreement [28, 29]. Indeed, as previously stated, these criteria are based on the best geriatric pharmacotherapy practices endorsed by a prestigious panel of senior academic physicians who participated in the Delphi process.

In summary, the updated version 3 of the STOPP/START criteria appears to be an improvement in the medication review process in older adults. Its systematic organization, inclusion of new drugs and evidence and potentially improved detection of PIMs and POMs make it a potentially useful tool in the management of medications in older adults. However, further studies are needed to assess whether the application of these versions of the STOPP/START criteria can reduce PIMs in different settings and improve clinical outcomes in older patients.

3 What are Some Limitations of the STOPP/START Criteria that Clinicians Need to Consider When Applying them?

Clinicians should be aware of several limitations when considering the STOPP/START criteria. While these criteria are widely recognized for their utility in assessing medication appropriateness and POMs in older adults' treatments, they assess 'potential' inappropriate prescribing and potential omissions and do not assess the overall adequacy of a patient's entire treatment plan. The primary responsibility for evaluating the complete treatment regimen and making the final decision regarding medication appropriateness lies with the prescribing physician.

Another critical limitation is the relatively thin layer of evidence supporting their use, particularly for some criteria. Indeed, two large-scale multicentre trials (SENATOR [30] and OPERAM [31]) that intended to investigate the effect of computer-generated STOPP/START criteria on the occurrence of adverse drug reactions (ADRs) and PIMs in hospitalized older patients did not conclusively demonstrate a significant impact. The SENATOR trial, a large randomized clinical trial, failed to achieve a reduction in ADRs using highly sophisticated software aimed at optimizing pharmacotherapy in hospitalized older patients [30]. Similarly, the OPERAM trial, which sought to lower the incidence of PIMs and decrease drug-related hospitalizations, did not find significant differences in PIMs between the intervention and control groups [31]. Similar inconclusive results were found in OPTICA, a cluster-randomized primary-care-based clinical trial [32]. The OPERAM trial indicated that the intervention may have had an impact on readmission and other clinical outcomes, as there was a noticeable trend towards improvement in these areas [31].

Although large randomized controlled trials such as OPERAM and SENATOR have not demonstrated significant improvements in major clinical outcomes, some observational studies, clinical trials and systematic reviews have found a positive association between PIMs identified using the STOPP/START criteria and adverse drug reaction (ADR)-related hospital admissions, functional decline, ADRs and falls in different contexts and countries [33–36]. There is also evidence suggesting that the use of STOPP/START criteria to reduce PIMs can lead to cost savings and reduced use of healthcare resources [37, 38]. The main reasons for these inconsistent results are the number of factors impacting health outcomes in these clinical trials (i.e. multiple possible prescribers for a single patient, adherence and self-medication), the high mortality in the observed population of frail older individuals and the low implementation rates of recommendations.

Another potential limitation of employing the STOPP/START criteria in routine medication evaluation is the extensive length of the third version of the criteria, which may deter their implementation because they can be excessively time-consuming. Although electronic applications could mitigate this issue, other factors, such as the lack of familiarity with these applications, the multitude of available options and ethical concerns regarding patient confidentiality, may impede their widespread use. Moreover, despite their length, they still represent a valuable practical educational tool for medical and other healthcare professional students, helping them learn about safe prescribing practices and the complexities of medication management in older adults [39, 40].

Additionally, the STOPP/START criteria have demonstrated notable variability in their effectiveness across countries. Studies have observed significant heterogeneity in the detection of PIMs and POMs across various geographic locations [13, 41–43]. This variation is likely due to differences in the national treatment guidelines, drug availability and healthcare settings. Consequently, some non-European researchers have suggested the need for geographical revision of the criteria to enhance their applicability in diverse settings.

Moreover, the increasing use of dietary vitamin and mineral supplements among older adults, particularly in polypharmacotherapy regimens, presents a new challenge. The high prevalence of inappropriate supplement use is not adequately addressed in the current version of the STOPP/START criteria despite the potential risks of adverse events or drug interactions associated with these supplements [44].

In summary, while the STOPP/START criteria are valuable tools for assessing medication appropriateness in older adults, clinicians should be mindful of their limitations. Understanding these limitations is crucial for clinicians to effectively apply these criteria and ensure optimal patient care. Moreover, while these criteria are designed to provide a clinical assessment tool, clinicians should consider that the medication review process includes patient and caregiver views.

4 What is the Best Way for Clinicians to Incorporate STOPP/START Criteria into Their Regular Medication Review Process and Workflow?

As mentioned above, the use of the STOPP/START criteria in routine medication reviews may be time-consuming and challenging to implement, with low implementation rates, possibly explaining the inconclusive results of the aforementioned clinical trials. For instance, in the OPTICA trial, only 28% of the STOPP and 14% of the START recommendations

were implemented (24), whereas the SENATOR trial saw approximately 15% of the recommendations implemented [30].

To address time constraints, healthcare providers may choose to concentrate on particular patients, including those who are at a heightened risk, such as individuals taking a large number of medications (i.e. polypharmacy [45]), or those taking specific medication classes, such as benzodiazepines, opioids or anticholinergics. Furthermore, the integration of STOPP/START criteria into Clinical Decision Support Systems (CDSS) equipped with algorithms can facilitate prompt and effective identification and resolution of drug-related issues in daily clinical practice [46]. Despite the findings of Sallevelt et al. demonstrating the importance of an expert team in effectively using CDSS, in their study in a hospital setting, half of the CDSS signals for PIMs, underuse, or misuse were deemed inappropriate [5].

Therefore, it is crucial to understand physicians' attitudes and behaviours towards these tools to ensure their successful implementation and integration into routine clinical practice. A study conducted among general practitioners revealed that they perceived educational initiatives and interdisciplinary cooperation as essential components for integrating STOPP/START criteria into CDSS daily practice [47]. Nevertheless, the integration of the STOPP/START criteria into CDSS must consider the potential for alert fatigue. Alert fatigue can occur when clinicians are overwhelmed by frequent alerts, leading to desensitization and potential disregard of important warnings [48]. Implementing these strategies, along with a multidisciplinary approach to medication review, can enhance the effectiveness of CDSS and support better clinical outcomes.

Another approach that could lead to improved outcomes is to facilitate clear communication between patients, physicians and family/caregivers. This is of paramount importance in achieving the goal of decreasing the use of unnecessary medications. Moreover, each care setting has distinct requirements and patient profiles, with specific characteristics. Patients in nursing homes differ from those in hospitals and community-dwelling older adults seeking primary care for their chronic conditions. Opportunities to perform medication reconciliation and/or review may arise during transitions of care, as this is an ideal time to revise a patient's medication regimen and discontinue inappropriate drugs.

Another area of exploration is the employment of STOPP/START criteria in patients exhibiting low therapy adherence. While polypharmacy can be a surrogate measure of multimorbidity, it is also associated with an increased risk of medication errors [49] and reduced adherence through the complexity of treatment regimens, a heavy pill burden, medication side effects and the risk of drug–drug interactions [50–52]. Patients with polypharmacy often struggle to adhere to their medication regimens despite understanding its importance [53]. Furthermore, poor adherence increases the risk of hospital readmission and is linked to decreased survival rates [54]. Nonetheless, a recent systematic review on deprescribing interventions and their impact on medication adherence could not establish a definitive association due to insufficient evidence. However, it is noteworthy that all four included studies that reported a decrease in medications also observed improved adherence [55]. Thus, it is reasonable to suggest that, in cases of poor therapeutic adherence, the first approach should be to minimize the number of prescribed medications. In this regard, the STOPP/START criteria can be useful. Further investigation is necessary to fully understand the extent to which medication reduction may enhance therapeutic outcomes.

An essential component of effectively implementing the STOPP/START criteria is engaging in shared decision-making with patients and their caregivers. This approach ensures that treatment decisions align with the patient's preferences, values, and care goals, thereby enhancing adherence and outcomes. Involving patients and caregivers in the medication review process fosters a collaborative environment where their insights and concerns are taken into account, leading to more informed and personalized care. This patient-centred approach is particularly important in managing complex medication regimens and ensuring the appropriateness of prescribed treatments.

In summary, incorporating the STOPP/START criteria into clinical practice requires strategic planning and engagement across the healthcare team. A team-based approach involving physicians, pharmacists, nurses and other healthcare professionals can facilitate the accurate and comprehensive application of these criteria. Studies, such as the Team Approach to Polypharmacy Evaluation and Reduction (TAPER) trial, have demonstrated the feasibility of this approach, highlighting its benefits in terms of process management, resource allocation and overall patient care [56]. The integration of pharmacists in particular, due to their expertise in pharmacotherapy, is already an integral part of the current medication review practices and has been shown to enhance medication safety and effectiveness [57–59]. The challenges in the implementation of STOPP/START criteria underscore the need for enhanced communication and tailored approaches to medication management. Leveraging technology through CDSS and focusing on high-risk patient groups (such as those on polypharmacy or with low adherence rates) can optimize the use of STOPP/START criteria.

Table 2 Summary of the main points for each question and answer

Question	Main points
Question 1: Benefits and advantages of Version 3 for medication review	Enhanced usability through system-based organization Inclusion of new drugs and evidence Improved detection of PIMs and POMs
Question 2: Limitations of STOPP/START criteria	Limited evidence for some criteria Extensive length of criteria list Heterogeneity in detecting PIMs and POMs across different regions
Question 3: Incorporation into regular medication review process and workflow	Focus on high-risk patients Integration into Clinical Decision Support Systems (CDSS) Importance of communication and interdisciplinary cooperation
Question 4: Use in medication reconciliation or review in older hospitalized patients	Focus on pre-transition medication reviews Use STOPP/START criteria to optimize medication regimens and reduce discrepancies. Ensure effective communication among healthcare professionals
Question 5: Application for helping deprescribing in long-term care and nursing homes	Use of STOPP/START to manage and deprescribe psychiatric medications Emphasis on person-centred care and multidisciplinary teams Engaging patients and caregivers in shared decision-making
Question 6: Special considerations for nursing homes	Prioritization of STOPP criteria, considering patient's health conditions and care goals Engaging patients and caregivers in shared decision-making
Question 7: When to review and update medications in outpatient settings	Regular reviews during routine visits After any significant clinical change or hospital discharge Annual comprehensive reviews for stable patients

5 What is the Best Way to Use the STOPP/START Criteria for Medication Reconciliation or Review in Older Hospitalized Patients?

As mentioned previously, implementing the STOPP/START criteria in clinical practice necessitates careful planning and collaboration within the healthcare team. While the primary application of these criteria is in conducting medication reviews to identify and deprescribe PIMs, they can indirectly support medication reconciliation processes. Polypharmacy increases the complexity of medication regimens and the likelihood of discrepancies during care transitions. Therefore, conducting a thorough medication review using STOPP/START criteria before transitions can simplify subsequent reconciliation efforts by ensuring that the medication list is optimized, reducing the risk of unintentional omissions or additions. This proactive approach may ensure that medication regimens are optimized before care transitions, facilitating a smoother and more accurate reconciliation process and reducing unintentional medication discrepancies and errors across transitions of care [60]. This can potentially reduce hospital readmissions, costs and other health-related adverse outcomes [61].

A recent randomized clinical trial emphasized the role of medication reconciliation in improving patient outcomes, particularly in terms of reducing readmissions within 30 days after discharge from the hospital [62]. Although there is limited evidence to suggest that medication reconciliation and medication review processes may contribute to the identification of medication-related discrepancies and errors [63], it remains unclear whether these processes significantly improve clinical outcomes such as a reduction in hospital readmissions in real-world settings [64–66]. The selection of patients at a higher risk of receiving PIMs could increase the likelihood of demonstrating an impact on outcomes such as hospitalization, mortality or reduced costs [63]. Independent of the healthcare professionals who perform medication reviews and reconciliations, effective communication between healthcare professionals is crucial for successful implementation, as demonstrated by the improvement in medication appropriateness when STOPP/START recommendations are communicated to attending physicians upon hospital admission compared with usual pharmaceutical care [67].

6 Which Effective Ways Exist to Help the Deprescribing Process of Potentially Inappropriate Medications (PIMs) Among Older Adults in Nursing Homes or Long-Term Care Settings?

Nursing homes and long-term care facilities represent unique environments where generally older and/or frailer individuals are admitted. In these settings, healthcare professionals

typically maintain a higher degree of oversight and control over all pharmacological treatments. PIMs are frequently prescribed to these patients [68–70]. Compared with other older adults, those in nursing homes and long-term facilities are most often prescribed psychiatric PIMs, such as benzodiazepines, antidepressants and antipsychotics [71, 72], to manage behavioural symptoms in dementia and for sedation [73]. Concerns arise owing to their association with an increased risk of falls, cognitive impairment and other adverse effects in older adults [74, 75]. Particularly in the population of patients with dementia and behavioural disturbances, it is crucial to apply the suggestions of the STOPP/START criteria, which involve linking the prescription to a specific indication and a defined time frame. These disturbances are characterized by frequent fluctuations rather than persistence. Consequently, pharmacological therapy should be restricted to periods of heightened intensity and unmanageability using non-pharmacological approaches [76].

The STOPP/START criteria recommend the reduction of psychotropic medications [1]. Research on the variations in benzodiazepine use among older individuals, both community-dwelling and nursing-home residents, has highlighted a decline in prescription rates of such medications in recent years [77, 78]. This trend may reflect stricter adherence to clinical guidelines and criteria, such as the STOPP/START tool or specific criteria, such as the STOPP-Frail, which was developed for deprescribing among frail older adults transitioning to nursing home care [79], or the STOPP-Fall, which were developed for older persons who have experienced falls and focuses on identifying medications that may increase the risk of falls [80]. All these criteria identified benzodiazepines as PIMs for this population and the development of deprescribing algorithms [81, 82]. Nevertheless, in a study conducted among long-term residents in the USA from 2013 to 2018, the use of long-acting benzodiazepines did not decrease, emphasizing the need for continued intervention to reduce the use of such medications [78]. Especially for older adults in nursing homes or long-term care settings, it is crucial to engage in a planned and supervised process of reducing or deprescribing medications that may cause harm or are no longer beneficial.

Deprescribing is vital for improving these individuals' quality of life and health outcomes [83]. This aspect is particularly delicate in deprescribing because medications are prescribed not only for the patient's benefit, but also to enable their care in the facility. Often, patients cannot communicate if anxiolytics or antidepressants no longer benefit them. Therefore, regular reviews and maximal reduction of such prescriptions are fully justified, necessitating frequent medication reviews to ensure optimal care and health outcomes for these individuals. Implementing a multidisciplinary team approach involving physicians, pharmacists, nurses and other healthcare professionals can facilitate the accurate and comprehensive application of the STOPP/START criteria. Additionally, behaviour charts could be a useful tool in this process, as they help document and monitor behavioural symptoms, providing essential data to guide decisions on deprescribing psychiatric medications and other PIMs, following specific deprescribing algorithms (i.e. deprescribing.org).

Ensuring effective deprescribing of psychotropics in older individuals, particularly in nursing homes or long-term care settings, necessitates recognizing and embracing non-pharmacological alternatives to these medications. Although non-pharmacological therapies, which are commonly recommended as first-line treatments for managing insomnia, delirium or dementia-related agitation [84–87], may entail additional costs and time, some of them might be cost-effective in certain contexts, especially in the long term [88, 89]. Implementing deprescribing criteria, such as STOPP/START, is essential, but also requires facilities to have feasible alternatives, which can be challenging due to organizational and financial constraints.

7 In Cases Where Older Adults have Limited Life Expectancy or are Receiving End-of-Life Care, How Should Clinicians Prioritize Reviewing STOPP/START Criteria?

In cases where older adults have limited life expectancy or are receiving end-of-life care, the prioritization of reviewing the STOPP over the START criteria becomes crucial. End-of-life care requires a nuanced approach. Research indicates that a significant proportion of older adults with life-limiting diseases are prescribed drugs with questionable clinical benefits, such as statins, vitamin D and bisphosphonates, during their last months of life [90, 91]. In this context, clinicians should prioritize deprescribing, with a focus on an individual's overall health status, life expectancy and quality of life. The primary goal should be to minimize the burden of polypharmacy and avoid medications that may no longer provide a benefit or could potentially cause harm, given the short life expectancy of these patients. This involves a careful evaluation of the risks and benefits of each medication, considering the patient's current health conditions, preferences and care goals. As mentioned previously, applying the STOPP-Frail criteria specifically designed for frail older individuals can significantly reduce the number of regular medications compared with routine pharmaceutical care [79, 92].

Indeed, certain medications such as antipsychotics, benzodiazepines and medications with anticholinergic activity (e.g., first-generation antihistamines and muscle relaxants) have been associated with an increased risk of falls or delirium in older adults [74, 93–95]. Others may induce

significant side effects that are particularly challenging for this patient group to tolerate. To mitigate these risks, abrupt discontinuation of such medications should be avoided because of potential withdrawal effects or the exacerbation of the underlying condition. Instead, a gradual tapering process closely monitored by healthcare professionals is recommended.

Moreover, involving patients and their caregivers in treatment decisions is crucial, as it ensures that the therapeutic approach aligns with the patient's preferences and overall care goals, ultimately enhancing treatment adherence and outcomes. An adapted person-centred prescription model focusing on the individual needs and prognosis of the patient has been shown to effectively reduce the number of regular medications, improve pharmacotherapeutic indicators and reduce associated costs [96]. Balancing the principles of palliative care with the need for appropriate medication can guide clinicians in optimizing the treatment and comfort of older adults during the final stages of life.

8 When Should Clinicians Review and Update Older Patients' Medications Using the STOPP/START Criteria in Outpatient Settings?

In outpatient settings, clinicians may find it beneficial for their older patients to conduct regular medication reviews using the STOPP/START criteria. These reviews should be conducted at different points in time. When a new older patient is seen during their initial assessment at an outpatient clinic or healthcare facility, clinicians should carry out a thorough medication review as part of the initial assessment to ensure that any PIMs are detected immediately from the beginning. Periodic medication reviews, possibly supported by telemedicine and digital tools and typically conducted at least once a year or more frequently in response to changes in their health or medication list following a specialist visit, are vital to ensure that older individuals continue to receive safe and appropriate medications. Furthermore, clinicians should use the STOPP/START criteria after hospital discharge, because medication management during care transitions can be complex. Finally, when older patients experience adverse effects or raise concerns about their medications, prompt reviews using these criteria can help identify and resolve any potential issues, ultimately possibly contributing to improved healthcare outcomes for this vulnerable population.

Another crucial aspect to be considered is interprofessional collaboration among healthcare professionals, which is essential for successful deprescribing initiatives, and this also applies in the outpatient setting [57]. While prescribing is primarily the responsibility of medical doctors in many countries, building strong interpersonal and interprofessional collaboration with older adults, their caregivers and all other involved healthcare professionals is indeed critical, as evidenced by studies emphasizing the need for teamwork among healthcare professionals [97]. Nurses are well-positioned to offer insightful perspectives on patient care, thanks to their comprehensive understanding of the patient and their greater accessibility. Pharmacists play a crucial role in optimizing medication regimens, as they are knowledgeable about the formulation of medications, compatibility issues and dispensing. They can also help identify potential drug interactions, advise on the appropriate use of medications, assist in developing adherence strategies and contribute to efforts to deprescribe medications. In addition, both nurses and pharmacists can also prescribe medications for non-complicated patients.

Collaboration among a multidisciplinary team can lead to a more comprehensive and individualized approach to medication management, which can improve patient outcomes. Moreover, integrating deprescribing competencies, for example, into nursing curricula and healthcare education programs, can significantly improve interprofessional collaboration and optimize medication use for older adults. This approach can enhance the quality of care provided to older adults population, reduce the risk of ADRs and align with the principles of high-quality healthcare [98, 99].

9 Conclusions

In summary, in this paper, we explored the clinical implications of utilizing the updated version of the STOPP/START criteria, highlighting its potential role in supporting the safety and well-being of older adults (Table 2). This exploration includes their significance and application in various clinical settings to safeguard the well-being and safety of older adults. The process aligns with the World Health Organization (WHO) Guide to Good Prescribing, which outlines a six-step model for the prescribing process. This model begins with defining the patient's problem, specifying therapeutic objectives and selecting appropriate treatment. Physicians, nurses or pharmacists apply these criteria cyclically to evaluate and adjust the medication regimen. This is followed by prescribing the chosen treatment, providing adequate information and instructions, and monitoring the patient's progress with ongoing feedback. This approach emphasizes the patient's central role in achieving improved outcomes through medication regimen adjustments and ongoing monitoring.

Reflecting on the clinical application of the STOPP/START criteria, it is important to recognize that, although comprehensive, they cannot cover all possible omitted therapies. They were designed to identify the most frequently

overlooked treatments that have a significant clinical impact. This means that, while the STOPP criteria help address gaps in the guidelines by identifying medications that may be harmful or unnecessary for older adults, the START criteria aim to support guidelines by ensuring that essential medications are not omitted.

The complexity of drug treatment in older people, often due to multimorbidity, presents a significant challenge in constructing explicit criteria that function effectively as a 'one-size-fits-all' solution. While the STOPP/START criteria provide a structured approach to identifying PIMs and POMs, they should be viewed as initial screening tools. Moreover, the inclusion of implicit criteria in the STOPP/START criteria set, introduced from version 2 onwards, requires a higher degree of medical judgment, which suggests caution in their broad implementation without adequate training and standardization [100]. The comprehensive evaluation of the entire patient situation, including clinical judgment and individualized care, is thus essential for optimal medication management. This distinction highlights the criteria's role in supporting a nuanced approach to medication management, emphasizing the importance of continuous review to help ensure the most effective and safe treatment plans for older adults.

For the proper application in routine clinical practice, it thus becomes evident that prioritizing certain patient groups for medication review is essential. These groups include patients at risk of poor therapeutic adherence due to factors such as socioeconomic challenges, cognitive decline without adequate caregiver support, those on polypharmacy and those nearing the end of life. Moreover, depending on the goal and specific environmental features, a list of priority criteria should be considered to facilitate the initial local implementation. This targeted approach, coupled with the understanding that these criteria should not overly focus on "high-risk" or "low-risk" medications, aims to enhance the applicability and effectiveness of the criteria in real-world settings, ultimately fostering a more individualized and person-centred approach to medication management in older adults.

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Declarations

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Author contributions CL drafted the manuscript and, along with ER, EP and FDP, conceived the study's idea and structure. GO, MD and SV substantially contributed to the manuscript with clinical insight and data presentation. All authors contributed to the manuscript revision, gave final approval for publication and agreed to be accountable for all aspects of the work.

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