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American Geriatrics Society 2023 updated AGS Beers Criteria® for potentially inappropriate medication use in older adults

By the 2023 American Geriatrics Society Beers Criteria® Update Expert Panel

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Abstract

The American Geriatrics Society (AGS) Beers Criteria® (AGS Beers Criteria®) for Potentially Inappropriate Medication (PIM) Use in Older Adults is widely used by clinicians, educators, researchers, healthcare administrators, and regulators. Since 2011, the AGS has been the steward of the criteria and has produced updates on a regular cycle. The AGS Beers Criteria® is an explicit list of PIMs that are typically best avoided by older adults in most circumstances or under specific situations, such as in certain diseases or conditions. For the 2023 update, an interprofessional expert panel reviewed the evidence published since the last update (2019) and based on a structured assessment process approved a number of important changes including the addition of new criteria, modification of existing criteria, and formatting changes to enhance usability. The criteria are intended to be applied to adults 65 years old and older in all ambulatory, acute, and institutionalized settings of care, except hospice and end-of-life care settings. Although the AGS Beers Criteria® may be used internationally, it is specifically designed for use in the United States and there may be additional considerations for certain drugs in specific countries. Whenever and wherever used, the AGS Beers Criteria® should be applied thoughtfully and in a manner that supports, rather than replaces, shared clinical decision-making.

KEYWORDS

Beers criteria, Beers list, inappropriate prescribing, medications and drugs, older adults

INTRODUCTION

The Beers Criteria was developed by the late Mark Beers, MD, and colleagues at the University of California Los Angeles in 1991, with the purpose of identifying medications for which potential harm outweighed the expected benefit and that should be avoided in nursing home residents.[1] The 1997 update, led by Dr. Beers, expanded the criteria to apply to all older adults.[2] The criteria was updated by an interprofessional group in 2003 and the American Geriatrics Society took over stewardship in 2010. The 2023 American Geriatrics Society (AGS) Beers Criteria® (AGS Beers Criteria®) for Potentially Inappropriate Medication (PIM) Use in Older Adults is the seventh overall update and fourth since AGS became the criteria's steward. As with previous updates, the AGS and its expert panel have attempted to preserve the spirit and

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Panel Members and Affiliations are provided in Appendix.

intent of the original Beers Criteria by providing an explicit list of PIMs that are best avoided by older adults in most circumstances or under specific situations, such as certain diseases, conditions, or care settings.

The AGS Beers Criteria® comprises drugs and drug classes that the AGS and its expert panel consider to be potentially inappropriate medications (PIMs) for use in older adults. The expert panel organized the criteria into the same five general categories that were used in the 2019 update:

1. Medications considered as potentially inappropriate (Table 2);
2. Medications potentially inappropriate in patients with certain diseases or syndromes (Table 3);
3. Medications to be used with caution (Table 4);
4. Potentially inappropriate drug–drug interactions (Table 5); and
5. Medications whose dosages should be adjusted based on renal function (Table 6).

Using the five categories of criteria as a framework, an interprofessional expert panel reviewed new data published since the 2019 update (beginning in 2017, the cutoff date for the prior update's literature review) to identify evidence that would remove, sustain, or alter existing criteria recommendations, rationale, level of evidence, or strength of recommendations. The panel also considered evidence that would support the addition of new criteria. For the first time, the panel systematically considered usage in the United States to determine whether any medications (and resulting criteria) should be removed because of very low or absent usage in the United States. Finally, the panel aimed to enhance usability by consolidating the formatting of the criteria for clarity and space.

Key points

- The intention of the AGS Beers Criteria® is to: (1) reduce older adults' exposure to potentially inappropriate medications (PIMs) by improving medication selection; (2) educate clinicians and patients; and (3) serve as a tool for evaluating the quality of care, cost, and patterns of drug use in older adults.
- The target audience for the 2023 AGS Beers Criteria® is practicing clinicians and others who utilize the criteria including healthcare consumers, researchers, pharmacy benefits managers, regulators, and policymakers.
- The criteria are intended to be applied to adults 65 years old and older in all ambulatory, acute, and institutionalized settings of care, except hospice and end-of-life care settings.

Why does this paper matter?

The American Geriatrics Society (AGS) Beers Criteria® (AGS Beers Criteria®) for Potentially Inappropriate Medication (PIM) Use in Older Adults is widely used by clinicians, educators, researchers, healthcare administrators, and regulators. Since 2011, the AGS has been the steward of the criteria and has produced updates on a regular cycle. The AGS Beers Criteria® is an explicit list of PIMs that are typically best avoided by older adults in most circumstances or under specific situations, such as in certain diseases or conditions. Although the AGS Beers Criteria® may be used internationally, it is specifically designed for use in the United States and there may be additional considerations for certain drugs in specific countries. Whenever and wherever used, the AGS Beers Criteria® should be applied thoughtfully and in a manner that supports, rather than replaces, shared clinical decision-making.

OBJECTIVES

The specific aim was to update the 2019 AGS Beers Criteria® using a comprehensive, systematic review and grading of the evidence on drug-related problems and adverse events in older adults. The strategies to achieve this aim were to:

- Convene an interprofessional panel of 12 experts in geriatric care and pharmacotherapy and three ex-officio representatives from key stakeholder groups who would:
  - Review evidence published between 2017 and 2022 and use this to update the 2019 AGS Beers Criteria®, with consideration to removing or modifying existing criteria and adding new criteria.
  - Incorporate exceptions to the 2023 AGS Beers Criteria® that the panel deemed clinically appropriate. These exceptions were designed to make the criteria more individualized to clinical practice and more diverse and relevant across settings of care and populations of older adults.
  - Grade the strength and quality of each PIM criterion based on the level of evidence and strength of recommendation.

- Apply a modified Delphi method, informed by the systematic review and grading, to reach a consensus on the 2023 update.

INTENT OF CRITERIA

The primary target audience for the 2023 AGS Beers Criteria® is practicing clinicians. The criteria are intended to support shared decision-making about pharmacologic therapy with adults 65 years old and older in all ambulatory, acute, and institutionalized settings of care, except hospice and end-of-life care settings. The intention of the AGS Beers Criteria® is to reduce older adults' exposure to PIMs by improving medication selection; educate clinicians and patients; reduce adverse drug events; and serve as a tool for evaluating the quality of care, cost, and patterns of drug use in older adults. Others who utilize the criteria include healthcare consumers, researchers, pharmacy benefits managers, regulators, and policymakers. As with previous updates, the panel had discussions and debates in an effort to attain a balance between the multiple uses and users. We note that the criteria are a blunt instrument and that we are unable to delineate all specialized use cases and possible exceptions to the criteria.

The AGS and the panel remind users of the AGS Beers Criteria® that the criteria are not to be used in a punitive manner. Prescribing for older adults is often a complex endeavor involving the consideration of many factors, particularly the preferences and goals of the older person and their family. Deprescribing studies have demonstrated how critical patient and family input and buy-in can be to the success of discontinuing medications responsible for actual or potential harm or that provide little to no therapeutic value.[3] Quality measures must be clearly defined, easily applied, and measured with limited information and, thus, although useful, cannot perfectly distinguish appropriate from inappropriate care. The panel's review of evidence at times identified subgroups of individuals who should be exempt from a given criterion or to whom a specific criterion should apply. Such a criterion may not be easily applied as a quality measure, particularly when such subgroups cannot be easily identified through structured and readily accessible electronic data (e.g., when diagnoses, the purpose of prescribing, or laboratory measures such as kidney function are not available).

METHODS

Methods used for the 2023 update of the AGS Beers Criteria® were similar to those used in the 2019 update, including the rigor of the evidence review and synthesis process.[4] These methods were adapted from the Grading of Recommendations Assessment, Development and Evaluation (GRADE) guidelines for clinical practice guideline development and are consistent with recommendations from the National Academy of Medicine.[5,6]

Panel composition

The AGS Beers Criteria® expert panel included 12 interprofessional members drawn from medicine, nursing, and pharmacy, 10 of whom had participated in the 2019 update. Panelists had experience in different practice settings, including ambulatory care, home care, acute hospital care, skilled nursing facilities, and long-term care. In addition, the panel included ex-officio representatives from the Centers for Medicare & Medicaid Services, the National Committee for Quality Assurance, and the Pharmacy Quality Alliance. Potential conflicts of interest were disclosed at the beginning of the process and before each full panel call and are listed in the disclosures section of this paper. Panelists were recused from discussion in areas in which they had a potential conflict of interest.

Literature review

Literature searches were conducted in PubMed from June 1, 2017, to May 31, 2022. Search terms for each criterion included individual drugs, drug classes, specific conditions, and combinations thereof, each with a focus on "adverse drug events" and "adverse drug reactions," as well as on any specific focus defined by the expert panel. Searches targeted controlled clinical trials, observational studies, and systematic reviews and meta-analyses, with filters for human participants, 65 years old and older, and the English language. Clinical reviews and guidelines were also included to provide context. Case reports, case series, letters to the editor, and editorials were excluded.

Searches identified 33,965 references; 7352 abstracts were sent to panelists for review, of which 1574 references were selected for full-text review. Among these, 451 manuscripts were abstracted into evidence tables, and an additional 148 were included as background reports.

Development process

The full panel convened for a series of conference calls between December 2020 and November 2022. Between

the full panel calls, work was conducted via email. In addition, the panel was divided into four workgroups, each assigned a subset of the criteria, with each workgroup leading the review and synthesis of evidence for its subset of the criteria.

The panel began its work using an anonymous Delphi process to review the 2019 AGS Beers Criteria®. Using a 5-point Likert scale with anchors of "strongly disagree" and "strongly agree," criteria receiving three or more panel votes of "unsure" or below were brought back for group discussion and flagged for the individual workgroups to review for possible updating. Of note, during the full process, all legacy criteria were reviewed for accuracy and appropriateness. Panelists also provided input about drugs to be explored further for possible addition.

To guide the evidence selection, review, and synthesis process, each workgroup reviewed and updated worksheets created for the 2019 criteria that identified a priori which clinical outcomes, indications, and comparison groups were most relevant when considering the evidence for each criterion, that is, the "desired evidence" for reviewing each criterion. These discussions were not considered binding but provided guidance for keeping the evidence review and synthesis focused on what was most clinically relevant.

Each workgroup reviewed abstracts from the literature searches for the criteria in its purview and collectively selected a subset for full-text review. This selection process considered the methodologic quality of each study, its relevance to older adults, and its concordance with the desired evidence noted above. After reviewing the full text of each selected article, the workgroup then decided by consensus which papers represented the best available evidence, based on a balance of these same three key considerations (methodologic quality, relevance to older adults, and concordance with desired evidence). Special emphasis was placed on selecting systematic reviews and meta-analyses when available because resource constraints precluded the panel from conducting these types of comprehensive analyses. In general, a study was considered relevant to older adults if the mean or median age of participants was at least 65 years, and especially relevant if most or all participants were older than this age threshold.

Papers comprising the best available evidence were abstracted into evidence tables. These tables summarized the design, study population, and findings of each study, and identified markers of methodologic quality highlighted by the GRADE criteria for clinical trials and observational studies and by the AMSTAR criteria for systematic reviews and meta-analyses.[10–12] Each workgroup then synthesized evidence for each criterion from the 2017–2022 literature reviews informed by GRADE guidelines and the American College of Physicians' evidence grading framework (Table 1).[7,10]

Using evidence from the 2017–2022 literature review, findings from the previous AGS-led 2012, 2015, and 2019 updates, and clinical judgment, each workgroup presented to the full panel their findings and suggestions for changes (or no change) to the criteria, with ensuing discussion. For most criteria, a consensus emerged: to leave an existing criterion from the 2019 update unchanged, to modify it, to remove it entirely, or to add a new criterion. Possible modifications included which drug(s) to include, the recommendation, the rationale, the quality of evidence, and the strength of the recommendation. As noted in the GRADE guidelines, the strength of recommendation ratings incorporate a variety of considerations, including expert opinion and clinical judgment and context, and thus do not always align with the quality of evidence ratings.

After proposed changes to the criteria were drafted, a second anonymous Delphi process was used to ascertain panel consensus on the changes, using the same 5-point Likert scale as was previously used. As a general rule, criteria receiving three or more panel votes of "unsure" or disagreement were brought back for group discussion to reach a consensus decision. Final edits after a public comment period were approved through the assent of panel members.

In addition to changes made based on available evidence, the panel decided on several modifications to improve the clarity and usability of the AGS Beers Criteria®. The panel changed the order and wording of certain criteria, recommendations, and rationale statements to improve clarity, avoid possible misinterpretations, and maintain consistency of formatting. The order of drugs and categories listed in Table 2 was also modified for similar reasons. To enhance usability, where feasible we have listed individual drugs that belong to a specified drug class, not including agents that are rarely or never used in the United States (as defined using the methods described immediately below). Note that when such drug class labels are used, the general intent is that the criteria apply to all drugs within that class except when specified otherwise.

To simplify and thereby increase usability, the panel also voted to omit from key reference tables a number of medications included in previous iterations of the criteria that have low or zero usage in the U.S. Drugs that were moved off the main tables due to low or absent use in the United States are shown in Table 8. We defined low use as <4000 U.S. Medicare beneficiaries aged 65 years or older receiving the drug in 2020 based on data from Medicare Part D Public Use Files (with the <4000 thresholds representing approximately <0.01% of Medicare

beneficiaries). Based on group consensus, the panel decided to retain an explicit listing of certain drugs in key reference tables despite having <4000 mentions in these files, based on over-the-counter availability and concerns that these drugs are still being used commonly enough to pose a population risk, including in settings not ascertainable through Medicare Part D data. Table 8 also includes a number of PIMs that are no longer available in the United States because there is no current manufacturer, they have been removed from the market, or available dosage forms limit use to specific uses outside the scope of the criteria. These changes should not be interpreted as condoning the use of these medications—they are still considered potentially inappropriate in alignment with the 2019 AGS Beers Criteria®[5] criteria—but were moved off the main tables to "declutter" the 2023 AGS Beers Criteria® and not distract from information on commonly used medications in the United States. Because medications included in the criteria reflect the U.S. context, clinicians in other countries should consider adaptations that may be warranted due to differing patterns of medication approval and use.

The initial draft of the 2023 AGS Beers Criteria® was reviewed by the AGS Executive Committee, the Chairs/Vice Chairs of the AGS Clinical Practice and Models of Care Committee (CPMC), the AGS Ethnogeriatrics Committee, and the AGS Quality & Performance Measurement Committee (QPMC) and subsequently released for public comment via the AGS website. The availability of the criteria for public comment was communicated via

TABLE 1 Designations of quality of evidence and strength of recommendations.

Quality of evidence

Quality of evidence ratings for each criterion are based on a synthetic assessment of 2 complementary approaches to evaluating the quality of evidence.

	ACP-based approach[7]	GRADE-based approach[5]
High-quality evidence	"Evidence…obtained from 1 or more well-designed and well-executed randomized, controlled trials (RCTs) that yield consistent and directly applicable results. This also means that further research is very unlikely to change our confidence in the estimate of effect."	Consider the following 5 factors for the studies that comprise the best-available evidence for a given criterion: 1. *Risk of bias*: Severity of threats to studies' internal validity (eg, randomized vs observational design, the potential for confounding, bias in measurement, etc) 2. *Inconsistency*: Do different studies provide similar or different estimates of effect size? 3. *Indirectness*: How relevant are the studies to the clinical question at hand (eg, nature of the study of population, comparison group, type of outcomes measured, etc)? 4. *Imprecision*: Precision of estimates of effect 5. *Publication bias*: Risk of bias because of selective publication of results
Moderate-quality evidence	"Evidence…obtained from RCTs with important limitations…. In addition, evidence from well-designed controlled trials without randomization, well-designed cohort or case–control analytic studies, and multiple time series with or without intervention are in this category. Moderate-quality evidence also means that further research will probably have an important effect on our confidence in the estimate of effect and may change the estimate."	
Low-quality evidence	"Evidence obtained from observational studies would typically be rated as low quality because of the risk for bias. Low-quality evidence means that further research is very likely to have an important effect on our confidence in the estimate of effect and will probably change the estimate. However, the quality of evidence may be rated as moderate or even high, depending on circumstances under which evidence is obtained from observational studies."	

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Overall quality of evidence that supports a given criterion: high, moderate, low.

Strength of recommendation

Strength of recommendation ratings for each criterion are based on synthetic integration of the quality of evidence, the frequency and severity of potential adverse events and their relationship to potential benefits, and clinical judgment.

Strong	Harms, adverse events, and risks clearly outweigh the benefits.
Weak	Harms, adverse events, and risks may not outweigh the benefits.

Source: Adapted from Qaseem et al.,[7] Guyatt et al.,[8] Andrews et al.[9]

TABLE 2 2023 American Geriatrics Society Beers Criteria® for potentially inappropriate medication use in older adults.

Organ system, therapeutic category, drug(s)[a]	Rationale	Recommendation	Quality of evidence[b]	Strength of recommendation[b]
Antihistamines				
First-generation antihistamines Brompheniramine Chlorpheniramine Cyproheptadine Dimenhydrinate Diphenhydramine (oral) Doxylamine Hydroxyzine Meclizine Promethazine Triprolidine	Highly anticholinergic; clearance reduced with advanced age, and tolerance develops when used as hypnotic; risk of confusion, dry mouth, constipation, and other anticholinergic effects or toxicity. Cumulative exposure to anticholinergic drugs is associated with an increased risk of falls, delirium, and dementia, even in younger adults. Consider total anticholinergic burden during regular medication reviews and be cautious in "young-old" as well as "old-old" adults. Use of diphenhydramine in situations such as acute treatment of severe allergic reactions may be appropriate.	Avoid	Moderate	Strong
Anti-infective				
Nitrofurantoin	Potential for pulmonary toxicity, hepatoxicity, and peripheral neuropathy, especially with long-term use; safer alternatives available.	Avoid in individuals with CrCl <30 mL/min or for long-term suppression.	Low	Strong
Cardiovascular and antithrombotics				
Aspirin for primary prevention of cardiovascular disease	Risk of major bleeding from aspirin increases markedly in older age. Studies suggest a lack of net benefit and potential for net harm when initiated for primary prevention in older adults. There is less evidence about stopping aspirin among long-term users, although similar principles for initiation may apply. *Note:* Aspirin is generally indicated for secondary prevention in older adults with established cardiovascular disease.	Avoid initiating aspirin for primary prevention of cardiovascular disease. Consider deprescribing aspirin in older adults already taking it for primary prevention.	High	Strong
Warfarin for the treatment of nonvalvular atrial fibrillation or venous thromboembolism (VTE)	Compared with DOACs, warfarin has higher risks of major bleeding (particularly intracranial bleeding) and similar or lower effectiveness for the treatment of nonvalvular atrial fibrillation and VTE. DOACs are thus the preferred choice for anticoagulation for most people with these conditions.	Avoid starting warfarin as initial therapy for the treatment of nonvalvular atrial fibrillation or VTE unless alternative options (i.e., DOACs) are contraindicated or there are substantial barriers to their use. For older adults who have been using warfarin long-term, it may be reasonable to continue this medication, particularly among those with well-controlled INRs (i.e., >70% time in the therapeutic range) and no adverse effects.	High	Strong

(Continues)

TABLE 2 (Continued)

Organ system, therapeutic category, drug(s)[a]	Rationale	Recommendation	Quality of evidence[b]	Strength of recommendation[b]
		See also criteria on rivaroxaban (Table 2) and dabigatran (Table 4) and footnote regarding choice among DOACs.		
Rivaroxaban for long-term treatment of nonvalvular atrial fibrillation or venous thromboembolism (VTE)	At doses used for long-term treatment of VTE or nonvalvular atrial fibrillation, rivaroxaban appears to have a higher risk of major bleeding and GI bleeding in older adults than other DOACs, particularly apixaban.[c] Rivaroxaban may be reasonable in special situations, for example when once-daily dosing is necessary to facilitate medication adherence. All DOACs confer a lower risk of intracranial hemorrhage than warfarin.[c]	Avoid for long-term treatment of atrial fibrillation or VTE in favor of safer anticoagulant alternatives. See also criteria on warfarin (Table 2) and dabigatran (Table 4) and footnote regarding the choice between warfarin and DOACs and among DOACs.	Moderate	Strong
Dipyridamole, oral short-acting (does not apply to extended-release combination with aspirin)	May cause orthostatic hypotension; more effective alternatives available; IV form acceptable for use in cardiac stress testing.	Avoid	Moderate	Strong
Non-selective peripheral alpha-1 blockers for the treatment of hypertension Doxazosin Prazosin Terazosin	High risk of orthostatic hypotension and associated harms, especially in older adults; not recommended as routine treatment for hypertension; alternative agents have superior risk/benefit profile.	Avoid use as an antihypertensive.	Moderate	Strong
Central alpha-agonists for the treatment of hypertension Clonidine Guanfacine	High risk of adverse CNS effects; may cause bradycardia and orthostatic hypotension; not recommended as routine treatment for hypertension.	Avoid clonidine as first-line treatment for hypertension. Avoid other central alpha-agonists for the treatment of hypertension.	Low	Strong
Nifedipine, immediate release	Potential for hypotension; risk of precipitating myocardial ischemia.	Avoid	High	Strong
Amiodarone	Effective for maintaining sinus rhythm but has greater toxicities than other antiarrhythmics used in atrial fibrillation; may be reasonable first-line therapy in patients with concomitant heart failure or substantial left ventricular hypertrophy if rhythm control is preferred over rate control.	Avoid as first-line therapy for atrial fibrillation unless the patient has heart failure or substantial left ventricular hypertrophy.	High	Strong
Dronedarone	Worse outcomes in people who have permanent atrial fibrillation or severe or recently decompensated heart failure. In some circumstances, worse outcomes have also been reported in people with HFrEF (e.g., left ventricular ejection fraction ≤35%) who have milder symptoms (NYHA class I or II).	Avoid in individuals with permanent atrial fibrillation or severe or recently decompensated heart failure. Use caution in patients with HFrEF with less severe symptoms (NYHA class I or II).	High	Strong

TABLE 2 (Continued)

Organ system, therapeutic category, drug(s)[a]	Rationale	Recommendation	Quality of evidence[b]	Strength of recommendation[b]
Digoxin for first-line treatment of atrial fibrillation or heart failure	Use in atrial fibrillation: should not be used as a first-line agent because there are safer and more effective alternatives for rate control. Use in heart failure: evidence for benefits and harms of digoxin is conflicting and of lower quality; most (but not all) evidence concerns use in HFrEF. There is strong evidence for other agents as first-line therapy to reduce hospitalizations and mortality in adults with HFrEF. In heart failure, higher dosages are not associated with additional benefits and may increase the risk of toxicity. Use caution in discontinuing digoxin among current users with HFrEF, given limited evidence suggesting worse clinical outcomes after discontinuation. Decreased renal clearance of digoxin may lead to an increased risk of toxic effects; further dose reduction may be necessary for those with Stage 4 or 5 chronic kidney disease.	Avoid this rate control agent as first-line therapy for atrial fibrillation. Avoid as first-line therapy for heart failure. See rationale for caution about withdrawal in long-term users with HFrEF. If used for atrial fibrillation or heart failure, avoid dosages >0.125 mg/day.	Atrial fibrillation; heart failure: low Dosage > 0.125 mg/day: moderate	Strong
Central nervous system				
Antidepressants with strong anticholinergic activity, alone or in combination Amitriptyline Amoxapine Clomipramine Desipramine Doxepin >6 mg/day Imipramine Nortriptyline Paroxetine	Highly anticholinergic, sedating, and cause orthostatic hypotension; the safety profile of low-dose doxepin (≤6 mg/day) is comparable to that of placebo.	Avoid	High	Strong
Antiparkinsonian agents with strong anticholinergic activity Benztropine (oral) Trihexyphenidyl	Not recommended for prevention or treatment of extrapyramidal symptoms due to antipsychotics; more effective agents available for the treatment of Parkinson disease.	Avoid	Moderate	Strong
Antipsychotics, first- (typical) and second- (atypical) generation Aripiprazole Haloperidol Olanzapine Quetiapine Risperidone Others[d]	Increased risk of stroke and greater rate of cognitive decline and mortality in persons with dementia. Additional evidence suggests an association of increased risk between antipsychotic medication and mortality independent of dementia.	Avoid, except in FDA-approved indications such as schizophrenia, bipolar disorder, Parkinson disease psychosis (see Table 3), adjunctive treatment of major depressive disorder, or for short-term use as an antiemetic.	Moderate	Strong

(Continues)

TABLE 2 (Continued)

Organ system, therapeutic category, drug(s)[a]	Rationale	Recommendation	Quality of evidence[b]	Strength of recommendation[b]
	Avoid antipsychotics for behavioral problems of dementia or delirium unless documented nonpharmacologic options (e.g., behavioral interventions) have failed and/or the patient is threatening substantial harm to self or others. If used, periodic deprescribing attempts should be considered to assess ongoing need and/or the lowest effective dose.			
Barbiturates Butalbital Phenobarbital Primidone	High rate of physical dependence, tolerance to sleep benefits, greater risk of overdose at low dosages.	Avoid	High	Strong
Benzodiazepines Alprazolam Chlordiazepoxide (alone or in combination with amitriptyline or clidinium) Clobazam Clonazepam Clorazepate Diazepam Estazolam Lorazepam Midazolam Oxazepam Temazepam Triazolam	The use of benzodiazepines exposes users to risks of abuse, misuse, and addiction. Concomitant use of opioids may result in profound sedation, respiratory depression, coma, and death. Older adults have increased sensitivity to benzodiazepines and decreased metabolism of long-acting agents; the continued use of benzodiazepines may lead to clinically significant physical dependence. In general, all benzodiazepines increase the risk of cognitive impairment, delirium, falls, fractures, and motor vehicle crashes in older adults. May be appropriate for seizure disorders, rapid eye movement sleep behavior disorder, benzodiazepine withdrawal, ethanol withdrawal, severe generalized anxiety disorder, and periprocedural anesthesia.	Avoid	Moderate	Strong
Nonbenzodiazepine benzodiazepine receptor agonist hypnotics (“Z-drugs”) Eszopiclone Zaleplon Zolpidem	Nonbenzodiazepine benzodiazepine receptor agonist hypnotics (“Z-drugs”) have adverse events similar to those of benzodiazepines in older adults (e.g., delirium, falls, fractures, increased emergency room visits/hospitalizations, motor vehicle crashes); minimal improvement in sleep latency and duration.	Avoid	Moderate	Strong
Meprobamate	High rate of physical dependence; very sedating.	Avoid	Moderate	Strong
Ergoloid mesylates (dehydrogenated ergot alkaloids)	Lack of efficacy.	Avoid	High	Strong

TABLE 2 (Continued)

Organ system, therapeutic category, drug(s)[a]	Rationale	Recommendation	Quality of evidence[b]	Strength of recommendation[b]
Endocrine				
Androgens Methyltestosterone Testosterone	Potential for cardiac problems; potential risks in men with prostate cancer.	Avoid unless indicated for confirmed hypogonadism with clinical symptoms.	Moderate	Weak
Estrogens with or without progestins (includes natural and synthetic estrogen preparations)	Evidence of carcinogenic potential (breast and endometrium); lack of cardioprotective effect and cognitive protection in older women. For women who start HRT at age 60 and older, the risks of HRT are greater than the benefits, as HRT is linked to a higher risk of heart disease, stroke, blood clots, and dementia. Evidence indicates that vaginal estrogens for the treatment of vaginal dryness are safe and effective; women with a history of breast cancer who do not respond to nonhormonal therapies are advised to discuss the risks and benefits of low-dose vaginal estrogen (e.g., dosages of estradiol <25 mcg twice weekly) with their healthcare provider.	Do not initiate systemic estrogen (e.g., oral tablets or transdermal patches). Consider deprescribing among older women already using this medication. Vaginal cream or vaginal tablets: acceptable to use low-dose intravaginal estrogen for the management of dyspareunia, recurrent lower urinary tract infections, and other vaginal symptoms.	Oral and patch: high Vaginal cream or vaginal tablets: moderate	Oral and patch: strong Topical vaginal cream or tablets: weak
Insulin, sliding scale (insulin regimens containing only short- or rapid-acting insulin dosed according to current blood glucose levels without concurrent use of basal or long-acting insulin)	Higher risk of hypoglycemia without improvement in hyperglycemia management regardless of care setting. Avoid insulin regimens that include only short- or rapid-acting insulin dosed according to current blood glucose levels without concurrent use of basal or long-acting insulin. This recommendation does not apply to regimens that contain basal insulin or long-acting insulin.	Avoid	Moderate	Strong
Sulfonylureas (all, including short- and longer-acting) Gliclazide Glimepiride Glipizide Glyburide (Glibenclamide)	Sulfonylureas have a higher risk of cardiovascular events, all-cause mortality, and hypoglycemia than alternative agents. Sulfonylureas may increase the risk of cardiovascular death and ischemic stroke. Among sulfonylureas, long-acting agents (e.g., glyburide, glimepiride) confer a higher risk of prolonged hypoglycemia than short-acting agents (e.g., glipizide).	Avoid sulfonylureas as first- or second-line monotherapy or add-on therapy unless there are substantial barriers to the use of safer and more effective agents. If a sulfonylurea is used, choose short-acting agents (e.g., glipizide) over long-acting agents (e.g., glyburide, glimepiride).	Hypoglycemia: High CV events and all-cause mortality: Moderate CV death and ischemic stroke: Low	Strong
Desiccated thyroid	Concerns about cardiac effects; safer alternatives available.	Avoid	Low	Strong

(Continues)

TABLE 2 (Continued)

Organ system, therapeutic category, drug(s)[a]	Rationale	Recommendation	Quality of evidence[b]	Strength of recommendation[b]
Megestrol	Minimal effect on weight; increases the risk of thrombotic events and possibly death in older adults.	Avoid	Moderate	Strong
Growth hormone	Impact on body composition is small and associated with edema, arthralgia, carpal tunnel syndrome, gynecomastia, and impaired fasting glucose.	Avoid, except for patients rigorously diagnosed by evidence-based criteria with growth hormone deficiency due to an established etiology.	High	Strong
Gastrointestinal				
Proton-pump inhibitors Dexlansoprazole Esomeprazole Lansoprazole Omeprazole Pantoprazole Rabeprazole	Risk of *C. difficile* infection, pneumonia, GI malignancies, bone loss, and fractures.	Avoid scheduled use for >8 weeks unless for high-risk patients (e.g., oral corticosteroids or chronic NSAID use), erosive esophagitis, Barrett's esophagitis, pathologic hypersecretory condition, or demonstrated need for maintenance treatment (e.g., because of failure of drug discontinuation trial or H2-receptor antagonists).	*C. difficile*, bone loss, and fractures: High Pneumonia and GI malignancies: Moderate	Strong
Metoclopramide	Can cause extrapyramidal effects, including tardive dyskinesia; the risk may be greater in frail older adults and with prolonged exposure.	Avoid, unless for gastroparesis with a duration of use not to exceed 12 weeks except in rare cases.	Moderate	Strong
GI antispasmodics with strong anticholinergic activity Atropine (excludes ophthalmic) Clidinium-chlordiazepoxide Dicyclomine Hyoscyamine Scopolamine	Highly anticholinergic, uncertain effectiveness.	Avoid	Moderate	Strong
Mineral oil, given orally	Potential for aspiration and adverse effects; safer alternatives available.	Avoid	Moderate	Strong
Genitourinary				
Desmopressin	High risk of hyponatremia; safer alternative treatments for nocturia (including non-pharmacologic).	Avoid for treatment of nocturia or nocturnal polyuria.	Moderate	Strong
Pain medications				
Non-COX-2-selective NSAIDs, oral: Aspirin >325 mg/day Diclofenac Diflunisal Etodolac Flurbiprofen	Increased risk of GI bleeding or peptic ulcer disease in high-risk groups, including those >75 years old or taking oral or parenteral corticosteroids, anticoagulants, or antiplatelet agents; use of proton-pump inhibitor or misoprostol reduces but does not eliminate	Avoid chronic use unless other alternatives are not effective and the patient can take a gastroprotective agent (proton-pump inhibitor or misoprostol). Avoid short-term scheduled use in combination with oral or parenteral	Moderate	Strong

TABLE 2 (Continued)

Organ system, therapeutic category, drug(s)[a]	Rationale	Recommendation	Quality of evidence[b]	Strength of recommendation[b]
Ibuprofen Indomethacin Ketorolac Meloxicam Nabumetone Naproxen Oxaprozin Piroxicam Sulindac	risk. Upper GI ulcers, gross bleeding, or perforation caused by NSAIDs occur in ~1% of patients treated for 3–6 months and in ~2%–4% of patients treated for 1 year; these trends continue with longer duration of use. Also can increase blood pressure and induce kidney injury. Risks are dose-related.	corticosteroids, anticoagulants, or antiplatelet agents unless other alternatives are not effective and the patient can take a gastroprotective agent (proton-pump inhibitor or misoprostol).		
Indomethacin Ketorolac (oral and parenteral)	Increased risk of GI bleeding/peptic ulcer disease and acute kidney injury in older adults. Of all the NSAIDs, indomethacin has the most adverse effects, including a higher risk of adverse CNS effects.	Avoid	Moderate	Strong
Meperidine	Oral analgesic not effective in dosages commonly used; may have a higher risk of neurotoxicity, including delirium, than other opioids; safer alternatives available.	Avoid	Moderate	Strong
Skeletal muscle relaxants Carisoprodol Chlorzoxazone Cyclobenzaprine Metaxalone Methocarbamol Orphenadrine	Muscle relaxants typically used to treat musculoskeletal complaints are poorly tolerated by older adults due to anticholinergic adverse effects, sedation, and increased risk of fractures; effectiveness at dosages tolerated by older adults is questionable. This criterion does not apply to skeletal muscle relaxants typically used for the management of spasticity (i.e., baclofen and tizanidine) although these drugs can also cause substantial adverse effects.	Avoid	Moderate	Strong

Abbreviations: CNS, central nervous system; COX, cyclooxygenase; CrCl, creatinine clearance; CV, cardiovascular; DOACs, direct oral anticoagulants; GI, gastrointestinal; HFrEF, heart failure with reduced ejection fraction; HRT, hormone replacement therapy; INR, international normalized ratio; NSAIDs, nonsteroidal anti-inflammatory drugs; NYHA, New York Heart Association; SIADH, syndrome of inappropriate antidiuretic hormone secretion; VTE, venous thromboembolism.

[a]Under each drug class, drugs commonly used in the United States are listed, except in cases where doing so is infeasible due to space considerations. Unless stated otherwise, all drugs within a stated drug class are considered potentially inappropriate in the context of the criterion in which they appear, even if not listed in this table.

[b]Quality of evidence and strength of recommendation ratings apply to all drugs and recommendations within each criterion unless stated otherwise.

[c]When selecting among DOACs and choosing a dose, pay special consideration to kidney function (see Table 6), indication, and body weight.

[d]Antipsychotics used in the United States include: First-generation ("typical")—chlorpromazine, fluphenazine, haloperidol, perphenazine; Second-generation ("atypical")—aripiprazole, brexpiprazole, cariprazine, clozapine, lurasidone, olanzapine, paliperidone, pimavanserin, quetiapine, risperidone, ziprasidone. This list does not include antipsychotics rarely or never used in the U.S. among older adults.

AGS' regular communication channels for reaching the public. AGS members were also encouraged to submit comments with multiple posts included on the weekly member listserv and notices in MyAGSOnline, the society's online member community. AGS also made outreach to 47 organizations to alert them to the public comment period and with a request that they provide expert, external review. Fifty-eight total comment forms were submitted comprising more than 200 comments and suggestions; the expert panel reviewed these and modified the criteria and accompanying text based on the strength of the evidence supporting each recommended change and clinical judgment. The AGS Executive Committee and CPMC Chair and Vice Chair reviewed the resulting draft of the 2023 AGS Beers Criteria®. The Criteria went through peer review by the *Journal of the American Geriatrics Society* (JAGS).

RESULTS

Noteworthy changes to PIMS for older adults

The drugs and drug class criteria included in the 2023 AGS Beers Criteria® are listed in Tables 2–6. To enhance clarity, a special box that summarizes the criteria for anticoagulants (warfarin, rivaroxaban, and dabigatran) has been added (Box 1). Table 7 is a list of drugs with strong anticholinergic properties referred to in Tables 2, 3, and 5. Table 8 is a list of drugs from the 2019 AGS Beers Criteria that the panel still considers to be PIMs (unless specified otherwise) but which are now moved off of Tables 2–7 on account of having low usage in the United States, not being currently available in the United States, or for other reasons. A summary of modifications and additions to the criteria is shown in Tables 9 and 10. Online supplemental Appendix S1 contains a list of drugs removed from the AGS Beers Criteria® since the 2012 update.

In Table 2, the rationale for anticholinergic drugs to avoid has been expanded to recognize the risks associated with concurrent use (cumulative anticholinergic burden) and is also recognized in Tables 3 and 5. The criterion for the use of aspirin for the primary prevention of cardiovascular disease has been revised and moved from the "use with caution" table (Table 4) to Table 2, with the new recommendation being to avoid initiating aspirin for the primary prevention of cardiovascular disease in older adults (in agreement with the U.S. Preventive Services Task Force's recommendation).[13] For older adults who are already taking aspirin for primary prevention, the panel recommends deprescribing be considered, pending any new data on this issue.

Changes to the criteria involving anticoagulation were discussed at length, including the proposed changes, the supporting literature, and ramifications. The recommendation for rivaroxaban has changed from "use with caution" to "avoid" for long-term treatment of nonvalvular atrial fibrillation and venous thromboembolism (VTE), with the rationale being that observational studies and network meta-analyses find that this drug confers a higher risk of major and gastrointestinal bleeding in older adults than other direct-acting oral anticoagulants (DOACs), particularly apixaban, but also dabigatran. The panel recognizes there may be circumstances when rivaroxaban may be a reasonable choice, including for other

BOX 1 Synthesis of anticoagulation recommendations.

Explanation	Recommendation
This criterion summarizes recommendations for warfarin (Table 2), rivaroxaban (Table 2), and dabigatran (Table 4)—anticoagulants to avoid or to use with caution. A "use with caution" recommendation reflects less concern and/or less clear evidence than an "avoid" recommendation. See individual criteria on these medications for more information about anticoagulant-related recommendations. When selecting among DOACs and choosing a dosage, pay special consideration to kidney function (see Table 6), indication, and body weight.	Warfarin: *Avoid* starting warfarin as initial therapy for the treatment of venous thromboembolism (VTE) or nonvalvular atrial fibrillation unless alternative options (e.g., DOACs) are contraindicated or there are substantial barriers to their use. For older adults who have been using warfarin long-term, it may be reasonable to continue this medication, particularly among those with well-controlled INRs (i.e., >70% time in the therapeutic range) and no adverse effects. Rivaroxaban: *Avoid* rivaroxaban for long-term treatment of nonvalvular atrial fibrillation or VTE in favor of safer anticoagulant alternatives. Dabigatran: *Use caution* in selecting dabigatran over other DOACs (e.g., apixaban) for long-term treatment of nonvalvular atrial fibrillation or VTE.

TABLE 3 2023 American Geriatrics Society Beers Criteria® for potentially inappropriate medication use in older adults due to drug–disease or drug–syndrome interactions that may exacerbate the disease or syndrome.

Disease or syndrome	Drug(s)[a]	Rationale	Recommendation	Quality of evidence[b]	Strength of recommendation[b]
Cardiovascular					
Heart failure	Cilostazol Dextromethorphan-quinidine Nondihydropyridine calcium channel blockers (CCBs) Diltiazem Verapamil Dronedarone NSAIDs and COX-2 inhibitors Thiazolidinediones Pioglitazone	Potential to promote fluid retention and/or exacerbate heart failure (NSAIDs and COX-2 inhibitors, non-dihydropyridine CCBs, thiazolidinediones); potential to increase mortality in older adults with heart failure (cilostazol and dronedarone); concerns about QT prolongation (dextromethorphan-quinidine). *Note:* This is not a comprehensive list of medications to avoid in patients with heart failure.	Avoid: Cilostazol Dextromethorphan-quinidine --- Avoid in heart failure with reduced ejection fraction: Nondihydropyridine calcium channel blockers (CCBs) Diltiazem Verapamil --- Use with caution in patients with heart failure who are asymptomatic; avoid in patients with symptomatic heart failure: Dronedarone NSAIDs and COX-2 inhibitors Thiazolidinediones Pioglitazone	Cilostazol, dextromethorphan-quinidine, COX-2 inhibitors: Low Non-dihydropyridine CCBs, NSAIDs: Moderate Dronedarone, thiazolidenediones: High	Strong
Syncope	Antipsychotics (selected) Chlorpromazine Olanzapine Cholinesterase inhibitors (AChEIs) Donepezil Galantamine Rivastigmine Non-selective peripheral alpha-1 blockers Doxazosin Prazosin Terazosin Tertiary tricyclic antidepressants (TCAs) Amitriptyline Clomipramine Doxepin Imipramine	Antipsychotics listed and tertiary TCAs increase the risk of orthostatic hypotension. AChEIs cause bradycardia and should be avoided in older adults whose syncope may be due to bradycardia. Non-selective peripheral alpha-1 blockers cause orthostatic blood pressure changes and should be avoided in older adults whose syncope may be due to orthostatic hypotension.	Avoid	High	Antipsychotics, non-selective peripheral alpha-1 blockers: Weak AChEIs, tertiary TCAs: Strong

(Continues)

TABLE 3 (Continued)

Disease or syndrome	Drug(s)[a]	Rationale	Recommendation	Quality of evidence[b]	Strength of recommendation[b]
Central nervous system					
Delirium	Anticholinergics (see Table 7) Antipsychotics[c] Benzodiazepines Corticosteroids (oral and parenteral)[d] H2-receptor antagonists Cimetidine Famotidine Nizatidine Nonbenzodiazepine benzodiazepine receptor agonist hypnotics ("Z-drugs") Eszopiclone Zaleplon Zolpidem Opioids	Avoid in older adults with or at high risk of delirium because of the potential of inducing or worsening delirium. Antipsychotics: avoid for behavioral problems of dementia or delirium unless nonpharmacologic options (eg, behavioral interventions) have failed or are not possible and the older adult is threatening substantial harm to self or others. If used, periodic deprescribing attempts should be considered to assess ongoing need and/or the lowest effective dose. Corticosteroids: if needed, use the lowest possible dose for the shortest duration and monitor for delirium. Opioids: emerging data highlights an association between opioid administration and delirium. For older adults with pain, use a balanced approach, including the use of validated pain assessment tools and multimodal strategies that include nondrug approaches to minimize opioid use.	Avoid, except in situations listed under the rationale statement.	H2-receptor antagonists: Low All others: Moderate	Strong
Dementia or cognitive impairment	Anticholinergics (see Table 7) Antipsychotics, chronic use or persistent as-needed use[c] Benzodiazepines Nonbenzodiazepine benzodiazepine receptor agonist hypnotics ("Z-drugs") Eszopiclone Zaleplon Zolpidem	Avoid because of adverse CNS effects. See criteria on individual drugs for additional information. Antipsychotics: increased risk of stroke and greater rate of cognitive decline and mortality in people with dementia. Avoid antipsychotics for behavioral problems of dementia or delirium unless documented nonpharmacologic options (e.g., behavioral interventions) have failed and/or the patient is threatening substantial harm to self or others. If used, periodic deprescribing attempts should be considered to assess ongoing need and/or the lowest effective dose.	Avoid	Moderate	Strong
History of falls or fractures	Anticholinergics (see Table 7) Antidepressants (selected classes) SNRIs SSRIs Tricyclic antidepressants (TCAs) Antiepileptics Antipsychotics[c] Benzodiazepines	May cause ataxia, impaired psychomotor function, syncope, or additional falls. Antidepressants (selected classes): evidence for risk of falls and fractures is mixed; newer evidence suggests that SNRIs may increase falls risk. Benzodiazepines: shorter-acting ones are not safer than long-acting ones. If one of the drugs must be used, consider reducing the use of other CNS-active medications that increase the risk of falls and fractures	Avoid unless safer alternatives are not available. Antiepileptics: avoid except for seizures and mood disorders. Opioids: avoid except for pain management in the setting of severe acute pain.	Antidepressants, opioids: Moderate All others: High	Strong

TABLE 3 (Continued)

Disease or syndrome	Drug(s)[a]	Rationale	Recommendation	Quality of evidence[b]	Strength of recommendation[b]
History of falls and fractures, cont'd	Nonbenzodiazepine benzodiazepine receptor agonist hypnotics ("Z-drugs") Eszopiclone Zaleplon Zolpidem Opioids	(i.e., anticholinergics, selected antidepressants, antiepileptics, antipsychotics, sedative/hypnotics including benzodiazepines and, nonbenzodiazepine benzodiazepine receptor agonist hypnotics, opioids) and implement other strategies to reduce fall risk.			
Parkinson disease	Antiemetics Metoclopramide Prochlorperazine Promethazine Antipsychotics (except clozapine, pimavanserin, and quetiapine)	Dopamine-receptor antagonists with the potential to worsen parkinsonian symptoms Exceptions: clozapine, pimavanserin, and quetiapine appear to be less likely to precipitate the worsening of Parkinson disease than other antipsychotics.	Avoid	Moderate	Strong
Gastrointestinal					
History of gastric or duodenal ulcers	Aspirin Non-COX-2 selective NSAIDs	May exacerbate existing ulcers or cause new/additional ulcers	Avoid unless other alternatives are not effective and the patient can take a gastroprotective agent (i.e., proton-pump inhibitor or misoprostol).	Moderate	Strong
Kidney/urinary tract					
Urinary incontinence (all types) in women	Non-selective peripheral alpha-1 blockers[e] Doxazosin Prazosin Terazosin Estrogen, oral and transdermal (excludes intravaginal estrogen)	Aggravation of incontinence (alpha-1 blockers), lack of efficacy (oral estrogen)	Avoid in women See also recommendation on estrogen (Table 2)	Non-selective peripheral alpha-1 blockers: Moderate Estrogen: High	Non-selective peripheral alpha-1 blockers: Strong Estrogen: Strong
Lower urinary tract symptoms, benign prostatic hyperplasia	Strongly anticholinergic drugs, except antimuscarinics for urinary incontinence (see Table 7)	May decrease urinary flow and cause urinary retention	Avoid in men	Moderate	Strong

Abbreviations: AChEI, acetylcholinesterase inhibitor; CCBs, calcium channel blockers; CNS, central nervous system; COPD, chronic obstructive pulmonary disease; COX, cyclooxygenase; CrCl, creatinine clearance; NSAIDs, nonsteroidal anti-inflammatory drugs; SNRIs, serotonin-norepinephrine reuptake inhibitors; SSRIs, selective serotonin reuptake inhibitors; TCAs, tricyclic antidepressants.

[a]Under each drug class, drugs commonly used in the United States are listed, except in cases where doing so is infeasible due to space considerations. Unless stated otherwise, all drugs within a stated drug class are considered potentially inappropriate in the context of the criterion in which they appear, even if not listed in this table.

[b]Quality of evidence and strength of recommendation ratings apply to all drugs and recommendations within each criterion unless stated otherwise.

[c]May be required to treat concurrent schizophrenia, bipolar disorder, and other selected mental health and neuropsychiatric conditions but should be prescribed in the lowest effective dose and for the shortest possible duration.

[d]Excludes inhaled and topical forms. Oral and parenteral corticosteroids may be required for conditions such as exacerbation of COPD but should be prescribed in the lowest effective dose and for the shortest possible duration.

[e]Data are limited for selective peripheral alpha-1 blockers (e.g., tamsulosin, silodosin, and others) but may apply as well.

TABLE 4 2023 American Geriatrics Society Beers Criteria® for potentially inappropriate medications: drugs to be used with caution in older adults[a].

Drug(s)[b]	Rationale	Recommendation	Quality of evidence[c]	Strength of recommendation[c]
Dabigatran for long-term treatment of nonvalvular atrial fibrillation or venous thromboembolism (VTE)	Increased risk of GI bleeding compared with warfarin (based on head-to-head clinical trials) and of GI bleeding and major bleeding compared with apixaban (based on observational studies and meta-analyses) in older adults when used for long-term treatment of nonvalvular atrial fibrillation or VTE.	Use caution in selecting dabigatran over other DOACs (e.g., apixaban) for long-term treatment of nonvalvular atrial fibrillation or VTE. See also criteria on warfarin and rivaroxaban (Table 2) and footnote[d] regarding choice among DOACs.	Moderate	Strong
Prasugrel Ticagrelor	Both increase the risk of major bleeding in older adults compared with clopidogrel, especially among those 75 years old and older. However, this risk may be offset by cardiovascular benefits in select patients.	Use with caution, particularly in adults 75 years old and older. If prasugrel is used, consider a lower dose (5 mg) for those 75 years old and older.	Moderate	Strong
Antidepressants (selected) Mirtazipine SNRIs SSRIs TCAs Antiepileptics (selected) Carbamazepine Oxcarbazepine Antipsychotics Diuretics Tramadol	May exacerbate or cause SIADH or hyponatremia; monitor sodium levels closely when starting or changing dosages in older adults.	Use with caution	Moderate	Strong
Dextromethorphan-quinidine	Limited efficacy in patients with behavioral symptoms of dementia (does not apply to the treatment of pseudobulbar affect). May increase the risk of falls and concerns with clinically significant drug interactions and with use in those with heart failure (see Table 3).	Use with caution	Moderate	Strong
Trimethoprim-sulfamethoxazole	Increased risk of hyperkalemia when used concurrently with an ACEI, ARB, or ARNI in presence of decreased CrCl.	Use with caution in patients on ACEI, ARB, or ARNI and decreased CrCl.	Low	Strong
Sodium-glucose co-transporter-2 (SGLT2) inhibitors Canigliflozin Dapagliflozin Emplaglifozin Ertuglifozin	Older adults may be at increased risk of urogenital infections, particularly women in the first month of treatment. An increased risk of euglycemic diabetic ketoacidosis has also been seen in older adults.	Use with caution. Monitor patients for urogenital infections and ketoacidosis.	Moderate	Weak

Abbreviations: ACEI, angiotensin-converting enzyme inhibitor; ARB, angiotensin receptor blocker; ARNI, angiotensin receptor-neprilysin inhibitor; CrCl, creatinine clearance; DOAC, direct oral anticoagulant; GI, gastrointestinal; SIADH, syndrome of inappropriate antidiuretic hormone secretion; SGLT2, sodium glucose co-transporter-2; SNRIs, serotonin-norepinephrine reuptake inhibitors; SSRIs, selective serotonin reuptake inhibitors; TCAs, tricyclic antidepressants; VTE, venous thromboembolism.

[a]"Use with caution" recommendations reflect concern about the balance of benefits and harms of medication compared with alternatives in the situation when those concerns do not rise to the level of "avoid" recommendations in other Tables because of limited evidence, a lesser degree of potential harm compared with alternative therapies, and/or extenuating clinical circumstances.

[b]Under each drug class, drugs commonly used in the United States are listed, except in cases where doing so is infeasible due to space considerations. Unless stated otherwise, all drugs within a stated drug class are considered potentially inappropriate in the context of the criterion in which they appear, even if not listed in this table.

[c]Quality of evidence and strength of recommendation ratings apply to all drugs and recommendations within each criterion unless stated otherwise.

[d]When selecting among DOACs and choosing a dosage, pay special consideration to kidney function (see Table 6), indication, and body weight.

clinical conditions and in special circumstances such as when a once-daily DOAC is necessary to facilitate medication adherence, and that all DOACs have a lower risk of intracranial hemorrhage than warfarin.

Warfarin has been added to Table 2 as a medication to be avoided when starting initial therapy for VTE or nonvalvular atrial fibrillation unless alternatives (e.g., DOACs) are contraindicated or there are substantial barriers to the use of an alternative. The distinction between starting warfarin as initial therapy versus maintaining warfarin among current long-term users (especially those with well-controlled international normalized ratio [INR] levels) reflects different evidence for these scenarios as well as considerations of shared decision-making. The AGS is concerned that there are significant barriers to the use of newer alternatives including high out-of-pocket drug costs and formulary restrictions. These barriers could lead to inequitable access to DOACs that may be safer for older adults. We urge policymakers, insurers, and organizations in the pharmaceutical supply chain to ensure that out-of-pocket costs and access restrictions are not a barrier to safe and effective anticoagulation for all of us as we age. AGS and the expert panel recognize that cost and access will continue to be a factor in individualized decision-making between warfarin and DOACs and among different DOACs until payment policies are enacted that support equitable access for all individuals regardless of their economic and insurance status. The recommendation for dabigatran remains as "use with caution" for the long-term treatment of nonvalvular atrial fibrillation and VTE (Table 4) because of evidence suggesting an increased risk of gastrointestinal and major bleeding compared with alternatives such as apixaban.

Another change from the 2019 criteria pertains to the initiation and continuation of estrogen in postmenopausal women. The initiation of oral and transdermal estrogen is to be avoided in older women; topical vaginal estrogen remains appropriate for its major indications of symptomatic vaginal atrophy or urinary tract infection prophylaxis. Deprescribing should be considered for older women already using nonvaginal estrogen replacement. The recommendation for sulfonylureas has been expanded to avoid all sulfonylureas as first- or second-line monotherapy or add on-therapy in recognition of their association with a higher risk of cardiovascular events, all-cause mortality, and hypoglycemia than alternative choices. Here the panel recognizes there may be substantial barriers to or pressures opposing the recommendation, including financial ones, with similar considerations as those discussed above for anticoagulants. If a sulfonylurea must be used, then a short-acting agent is preferred because of the higher risk of prolonged hypoglycemia with longer-acting sulfonylureas (e.g., glimepiride, chlorpropramide, or glyburide, which is also known as glibenclamide).

Changes to the criteria involving PIMs exacerbating specific drug diseases and drug syndromes (Table 3) are relatively minimal. The combination of dextromethorphan/quinidine was added to the list of drugs to avoid in patients with heart failure. In the criterion of PIMs to avoid in older adults with a history of falls or fractures, the level of evidence for antidepressants has been lowered to "moderate." Modifications and clarifications were made to the criteria for delirium, dementia, and Parkinson disease, including adding opioids to the list of drugs that can exacerbate delirium. The update continues to stress the need to avoid antipsychotics and other medications for behavioral problems of dementia and delirium as their use is frequently associated with harm and increased during and after pandemic lockdowns.[14–16] The use of behavioral interventions and search for modifiable triggers for behavior[14,17] remains the preferred management strategy and should be clearly documented in the health record. The use of antipsychotics and other medications listed in these criteria should be a last resort in collaboration and with the use of shared decision-making with older adults and their care partners. Many evidence-based approaches for behavior in persons with dementia are now available including the Describe, Investigate, Create, Evaluate (DICE) approach and others.[18,19] We remind readers that the AGS Beers Criteria® do not apply to care in hospice and at the end of life, in which setting decision-making about these and other drugs may require other considerations.

As mentioned above, the criteria for aspirin and rivaroxaban have been moved from Table 4 to Table 2. Ticagrelor has been added to the criterion about prasugrel, advising that it be used with caution, particularly among adults 75 years old and older because of concerns of major bleeding. A new criterion was added advising that sodium-glucose co-transporter-2 (SGLT2) inhibitors be used with caution because of the increased risk of urogenital infection and euglycemic diabetic ketoacidosis, and recommends monitoring early during treatment. Of note, the panel recognizes the value of SGLT2-inhibitors but also wishes to emphasize that patients taking these drugs should be monitored actively for possible adverse effects.

The panel worked to clarify and consolidate the clinically important drug–drug interactions (Table 5), most notably the use of multiple agents with anticholinergic activity, the concurrent use of ≥3 CNS-active drugs from specific therapeutic categories (which now include skeletal muscle relaxants), and the addition of SSRIs to the list of warfarin drug–drug interactions.

TABLE 5 2023 American Geriatrics Society Beers Criteria® for potentially clinically important drug–drug interactions that should be avoided in older adults.

Object drug or class	Interacting drug or class	Risk rationale	Recommendation	Quality of evidence[a]	Strength of recommendation[a]
RAS inhibitors (ACEIs, ARBs, ARNIs, aliskiren) or potassium-sparing diuretics (amiloride, triamterene)	Another RAS inhibitor or a potassium-sparing diuretic	Increased risk of hyperkalemia.	Avoid routinely using 2 or more RAS inhibitors, or a RAS inhibitor and potassium-sparing diuretic, concurrently in those with chronic kidney disease Stage 3a or higher.	Moderate	Strong
Opioids	Benzodiazepines	Increased risk of overdose and adverse events.	Avoid	Moderate	Strong
Opioids	Gabapentin Pregabalin	Increased risk of severe sedation-related adverse events, including respiratory depression and death.	Avoid; exceptions are when transitioning from opioid therapy to gabapentin or pregabalin, or when using gabapentinoids to reduce opioid dose, although caution should be used in all circumstances.	Moderate	Strong
Anticholinergic	Anticholinergic	Use of more than one medication with anticholinergic properties increases the risk of cognitive decline, delirium, and falls or fractures.	Avoid; minimize the number of anticholinergic drugs (Table 7).	Moderate	Strong
Antiepileptics (including gabapentinoids) Antidepressants (TCAs, SSRIs, and SNRIs) Antipsychotics Benzodiazepines Nonbenzodiazepine benzodiazepine receptor agonist hypnotics (i.e., "Z-drugs") Opioids Skeletal muscle relaxants	Any combination of ≥3 of these CNS-active drugs	Increased risk of falls and of fracture with the concurrent use of ≥3 CNS-active agents (antiepileptics including gabapentinoids, antidepressants, antipsychotics, benzodiazepines, nonbenzodiazepine benzodiazepine receptor agonist hypnotics, opioids, and skeletal muscle relaxants).	Avoid concurrent use of ≥3 CNS-active drugs (among types as listed at left); minimize the number of CNS-active drugs.	High	Strong
Lithium	ACEIs ARBs ARNIs	Increased risk of lithium toxicity.	Avoid; monitor lithium concentrations.	Moderate	Strong
Lithium	Loop diuretics	Increased risk of lithium toxicity.	Avoid; monitor lithium concentrations.	Moderate	Strong
Non-selective peripheral alpha-1 blockers[b]	Loop diuretics	Increased risk of urinary incontinence in older women.	Avoid in older women, unless conditions warrant both drugs.	Moderate	Strong
Phenytoin	Trimethoprim-sulfamethoxazole	Increased risk of phenytoin toxicity	Avoid	Moderate	Strong

TABLE 5 (Continued)

Object drug or class	Interacting drug or class	Risk rationale	Recommendation	Quality of evidence[a]	Strength of recommendation[a]
Theophylline	Cimetidine	Increased risk of theophylline toxicity	Avoid	Moderate	Strong
Theophylline	Ciprofloxacin	Increased risk of theophylline toxicity	Avoid	Moderate	Strong
Warfarin	Amiodarone Ciprofloxacin Macrolides (excluding azithromycin) Trimethoprim-sulfamethoxazole SSRIs	Increased risk of bleeding.	Avoid when possible; if used together, monitor INR closely.	Moderate	Strong

Note: This table is not a comprehensive list of all drug–drug interactions relevant for older adults.

Abbreviations: ACEIs, angiotensin-converting enzyme inhibitors; ARBs, angiotensin receptor blockers; ARNIs, angiotensin receptor-neprilysin inhibitors; CNS, central nervous system; INR, international normalized ratio; NSAIDs, nonsteroidal anti-inflammatory drugs; RAS, renin-angiotensin system; SNRIs = serotonin-norepinephrine reuptake inhibitors; SSRIs, selective serotonin reuptake inhibitors; TCAs, tricyclic antidepressants.

[a]Quality of evidence and strength of recommendation ratings apply to all drugs and recommendations within each criterion unless stated otherwise.

[b]Data are limited for selective peripheral alpha-1 blockers (e.g., tamsulosin, silodosin, and others) but may apply as well.

The anticoagulants also dominated the panel's attention when updating drugs to avoid or reduce doses with varying levels of kidney function (Table 6). The criterion for apixaban has been removed given the evidence for its safe use in patients with end-stage renal disease. Rivaroxaban's dosing in reduced kidney function is variable and is based on indication; thus, the criteria refer to the product label. Baclofen has been added with a recommendation to avoid its use when eGFR is <60 mL/min because of the increased risk for encephalopathy in older adults. Finally, the use of NSAIDs by patients with a CrCl <30 mL/min was moved from Table 3 to Table 6 for consistency of presentation.

DISCUSSION

The AGS Beers Criteria® continues to evolve to address the changing landscape of available medications and emerging data about their harms and benefits. Some of the most notable updates from the 2019 criteria include a series of new and revised criteria regarding anticoagulants and expanding the "avoid" recommendation for sulfonylureas, which previously focused on long-acting sulfonylureas but now includes all medications in this class (in particular, avoiding them as first- or second-line therapy, while still advising that if a sulfonylurea is used, shorter-acting ones pose less risk of hypoglycemia than longer-acting ones).

The introductory section of this article describes the intent of the criteria. In addition, we strongly encourage readers to understand and apply the guidance on how to interpret the recommendations, apply them to policy and practice, use best practices for deprescribing, and understand the criteria's strengths and limitations. These are explained below.

Interpreting recommendations

The original Beers Criteria used "avoid" as a recommendation, meaning "the medication should be avoided except under unusual circumstances."[1] Such circumstances include (but are not limited to) when a safer alternative did not achieve the desired therapeutic outcome. Thus, PIMs "would be chosen infrequently through such careful considerations of benefit and risk."[1] "Avoid" in the 2023 AGS Beers Criteria® has the same meaning. "Avoid" is not defined as an absolute contraindication unless specified in the medication's label. It is the expert panel's intent that when a PIM is chosen, it is done so through shared decision-making that includes recognition of its potential harms and consideration of

TABLE 6 2023 American Geriatrics Society Beers Criteria® for medications that should be avoided or have their dosage reduced with varying levels of kidney function in older adults.

Drug	CrCl (mL/min) at which action is required	Rationale	Recommendation	Quality of evidence	Strength of recommendation
Anti-infective					
Ciprofloxacin	<30	Increased risk of CNS effects (e.g., seizures, confusion) and tendon rupture.	Dosages used to treat common infections typically require reduction when CrCl <30 mL/min.	Moderate	Strong
Nitrofurantoin	<30	Potential for pulmonary toxicity, hepatoxicity, and peripheral neuropathy, especially with long-term use. (See also Table 2).	Avoid if CrCl <30 mL/min	Low	Strong
Trimethoprim-sulfamethoxazole	<30	Increased risk of worsening of kidney function and hyperkalemia; risk of hyperkalemia especially prominent with concurrent use of an ACE, ARB, or ARNI.	Reduce dosage if CrCl is 15–29 mL/min. Avoid if CrCl <15 mL/min.	Moderate	Strong
Cardiovascular and antithrombotics					
Amiloride	<30	Hyperkalemia and hyponatremia	Avoid	Moderate	Strong
Dabigatran	<30	Lack of evidence for efficacy and safety in individuals with a CrCl <30 mL/min. Label dose for patients with CrCl 15–30 mL/min based on pharmacokinetic data.	Avoid when CrCl <30 mL/min; dose adjustment is advised when CrCl >30 mL/min in the presence of drug–drug interactions.	Moderate	Strong
Dofetilide	<60	QTc prolongation and torsades de pointes.	Reduce dose if CrCl is 20–59 mL/min. Avoid if CrCl <20 mL/min.	Moderate	Strong
Edoxaban	15–50 <15 or > 95	Lack of evidence of efficacy or safety in patients with CrCl <30 mL/min.	Reduce dose if CrCl is 15–50 mL/min. Avoid if CrCl <15 or > 95 mL/min.	Moderate	Strong
Enoxaparin	<30	Increased risk of bleeding	Reduce dose	Moderate	Strong
Fondaparinux	<30	Increased risk of bleeding	Avoid	Moderate	Strong
Rivaroxaban	<50	Lack of efficacy or safety evidence in people with CrCl <15 mL/min; limited evidence for CrCl 15–30 mL/min.	Avoid if CrCl <15 mL/min. Reduce the dose if CrCl is 15–50 mL/min following manufacturer dosing recommendations based on indication-specific dosing.	Moderate	Strong

TABLE 6 (Continued)

Drug	CrCl (mL/min) at which action is required	Rationale	Recommendation	Quality of evidence	Strength of recommendation
Spironolactone	<30	Hyperkalemia	Avoid	Moderate	Strong
Triamterene	<30	Hyperkalemia and hyponatremia	Avoid	Moderate	Strong
Central nervous system and analgesics					
Baclofen	eGFR <60	Increased risk of encephalopathy requiring hospitalization in older adults with eGFR <60 mL/min or who require chronic dialysis.	Avoid baclofen in older adults with impaired kidney function (eGFR <60 mL/min). When baclofen cannot be avoided, use the lowest effective dose and monitor for signs of CNS toxicity, including altered mental status.	Moderate	Strong
Duloxetine	<30	Increased GI adverse effects (nausea, diarrhea)	Avoid	Moderate	Weak
Gabapentin	<60	CNS adverse effects	Reduce dose	Moderate	Strong
Levetiracetam	≤80	CNS adverse effects	Reduce dose	Moderate	Strong
NSAIDs (non-selective, COX-2 selective, and nonacetylated salicylates, oral and parenteral)[a]	< 30	May increase the risk of acute kidney injury and a further decline in kidney function	Avoid	Moderate	Strong
Pregabalin	<60	CNS adverse effects	Reduce dose	Moderate	Strong
Tramadol	<30	CNS adverse effects	Immediate release: reduce dose Extended-release: avoid	Low	Weak
Gastrointestinal					
Cimetidine	<50	Mental status changes	Reduce dose	Moderate	Strong
Famotidine	<50	Mental status changes	Reduce dose	Moderate	Strong
Nizatidine	<50	Mental status changes	Reduce dose	Moderate	Strong
Hyperuricemia					
Colchicine	<30	GI, neuromuscular, and bone marrow toxicity	Reduce dose; monitor for adverse effects.	Moderate	Strong
Probenecid	<30	Loss of effectiveness	Avoid	Moderate	Strong

Note: This table is not a comprehensive list of all drugs that should be avoided or dose-adjusted in older adults with renal impairment.
Abbreviations: ACEI, angiotensin-converting enzyme inhibitor; ARB, angiotensin receptor blocker; ARNI, angiotensin receptor-neprilysin inhibitor; CNS, central nervous system; CrCl, creatinine clearance; eGFR, estimated glomerular filtration rate; GI, gastrointestinal.
[a]NSAIDs include: Non-selective: diclofenac, diflunisal, etodolac, flurbiprofen, ibuprofen, indomethacin, ketorolac, meloxicam, nabumetone, naproxen, oxaprozin, piroxicam, sulindac; COX-2 selective: celecoxib; Nonacetylated salicylates: diflunisal, magnesium salicylate. This list does not include NSAIDs rarely or never used in the U.S. among older adults.

the older person's preferences and goals of care. As in previous updates to the AGS Beers Criteria®, the panel has included caveats about when choosing a PIM may be reasonable, for example, a benzodiazepine for alcohol withdrawal.

The panel also deliberated about and recognizes that clinicians and older adults may face substantial financial pressures to use PIMs—such as when a safer treatment option incurs substantially higher out-of-pocket costs—and that drug affordability is an important consideration

TABLE 7 Drugs with strong anticholinergic properties.

Antidepressants
Amitriptyline
Amoxapine
Clomipramine
Desipramine
Doxepin (>6 mg/day)
Imipramine
Nortriptyline
Paroxetine
Antiemetics
Prochlorperazine
Promethazine
Antihistamines (first-generation)
Brompheniramine
Chlorpheniramine
Cyproheptadine
Dimenhydrinate
Diphenhydramine
Doxylamine
Hydroxyzine
Meclizine
Promethazine
Triprolidine
Antimuscarinics (urinary incontinence)[a]
Darifenacin
Fesoterodine
Flavoxate
Oxybutynin
Solifenacin
Tolterodine
Trospium
Antiparkinsonian agents
Benztropine
Trihexyphenidyl
Antipsychotics
Chlorpromazine
Clozapine
Olanzapine
Perphenazine
Antispasmodics
Atropine
Clidinium-chlordiazepoxide
Dicyclomine
Homatropine
Hyoscyamine
Scopolamine
Skeletal muscle relaxants
Cyclobenzaprine
Orphenadrine

Note: This table is not a comprehensive list of all medications with anticholinergic properties.
[a]Data on whether certain bladder antimuscarinics confer greater adverse cognitive effects than others lack consistent quality. Oxybutynin has the best evidence for adverse cognitive effects. However, caution is warranted for all bladder antimuscarinics given their potential anticholinergic effects.[20]

for many older adults and their caregivers. In general, the panel did not account for drug costs to different stakeholders when making decisions about which PIMs to include in the criteria. However, costs of care may play an important role in shared decision-making, and the panel strongly encourages policymakers and health plans to ensure that safer alternatives to PIMs are affordable so that access to safe, appropriate treatment is not limited and inequities are not exacerbated. In addition to drug costs, costs of avoidable drug-related harms should be considered as well.

While most of the criteria (i.e., those listed in Tables 2, 3, 5, and 6) generally use the "avoid" recommendation noted above, Table 4 comprises drugs to "use with caution." The intent of this "use with caution" table is to highlight drugs that raise some cause for concern but not to the level of an "avoid" recommendation. This can occur because the evidence for the concern is limited or lacks consistency, the degree of harm relative to alternative therapies is not high enough to warrant an "avoid" recommendation, or extenuating clinical circumstances are often present. The panel encourages clinicians to recognize the potential harms of these medications and, as the moniker states, to use them with caution. We also remind readers that drugs removed from the AGS Beers Criteria® due to low usage or unavailability in the United States (Table 8) are still considered potentially inappropriate per recommendations of the 2019 AGS Beers Criteria® update.

Unless specified otherwise, the criteria are designed to apply to adults 65 years old and older. The panel recognizes that drug-related harms are typically more pronounced in the "old-old" than in the "young-old" and in persons with complex multimorbidity and frailty. Thus, two older adults of the same age can have markedly different risks of drug-related harm. Certain criteria include a specific age cutoff; these are provided when the evidence is specific to that age group. However, for most criteria, the evidence base is insufficient to set a specific age threshold for applying the criteria or to set a threshold for other factors that can increase the risk of medication-related harms (e.g., functional and cognitive status, the burden of multimorbidity, and polypharmacy). We encourage clinicians to use common sense in applying the criteria in clinical practice.

For some criteria, the panel distinguished between initiating a medication versus continuing one already in long-standing use. Such distinctions were considered by the panel in cases when the evidence suggested differential risk of harm in these two scenarios, when the evidence primarily addressed initiation rather than a continuation, and/or when other professional society recommendations made this distinction. In a number of these criteria, the criteria recommend *avoiding* initiating the drug in nonusers and *considering deprescribing* among current users.

TABLE 8 Medications/criteria removed since 2019 American Geriatrics Society Beers Criteria®[a].

Medication/Criterion	Reason for removal[b]
Independent of diagnosis or condition (Table 2)	
Carbinoxamine[c]	Low use
Clemastine[c]	Low use
Dextrobromphiniramine[c]	Not on the U.S. market
Dexchlorpheniramine[c]	Low use
Pyrilamine[c]	Not on the U.S. market
Belladonna alkaloids[c]	Not on the U.S. market
Methscopolamine[c]	Low use
Propantheline[c]	Not on the U.S. market
Guanabenz	Not on the U.S. market
Methyldopa	Not on the U.S. market
Reserpine (>0.1 mg/day)	Not on the U.S. market
Disopyramide[c]	Low use
Protriptyline[c]	Low use
Trimipramine[c]	Low use
Amobarbital	Low use, available only as an injection
Butobarbital	Low use
Mephobarbital	Not on the U.S. market
Pentobarbital	Not on the U.S. market
Secobarbital	Not on the U.S. market
Flurazepam	Low use
Quazepam	Low use
Isoxsuprine	Not on the U.S. market
Chlorpropamide	Not on the U.S. market
Fenoprofen	Low use
Ketoprofen	Low use
Meclofenamate	Low use
Mefenamic acid	Low use
Tolmetin	Not on the U.S. market
Considering disease and syndrome interactions (Table 3)	
Heart failure	
Rosiglitazone	Not on the U.S. market
Syncope	
Thioridazine[c]	Low use
Delirium	
Meperidine	Specific mention of meperidine was removed from this criterion because it is subsumed under the general category of opioids, which was added to this criterion.
Ranitidine	Removed from the U.S. market
Clinically important drug–drug interactions (Table 5)	
Corticosteroids, oral or parenteral + NSAIDs	Incorporated into oral NSAIDs criterion in Table 2
Warfarin + NSAIDs	Incorporated into oral NSAID criterion in Table 2 (i.e, recommendation to avoid short-term regular, scheduled use of NSAIDs in older adults taking an anticoagulant)

(Continues)

TABLE 8 (Continued)

Medication/Criterion	Reason for removal[b]
Medications that should be avoided or have their dosage reduced with reduced kidney function (Table 6)	
Apixaban in patients with CrCl <25 mL/min	Emerging evidence and clinical experience supporting safe use at lower levels of renal function.
Ranitidine	Removed from the U.S. market
Drugs with strong anticholinergic properties (Table 7)	
Loxapine	Low use
Trifluoperazone	Low use

Abbreviations: CrCl, creatinine clearance; NSAIDs, nonsteroidal anti-inflammatory drugs.
[a]Drugs removed from Tables 2–6 on account of low usage or unavailability in the U.S. are still considered potentially inappropriate per recommendations in the 2019 AGS Beers Criteria®[4] update. Enhanced attention to these drugs may be necessary for countries outside the U.S., where they may be more widely used.
[b]Not on the U.S. market = no product is currently marketed in the U.S. (although a product could be marketed in the future); this is not the same as being removed from the U.S. market.
[c]Removed from Table 7 as well.

TABLE 9 Medications/criteria added since 2019 American Geriatrics Society Beers Criteria®.

Medication/Criterion	Reason for addition
Independent of diagnosis or condition (Table 2)	
Warfarin	Emerging data and changes in national recommendations/expert guidance
Considering disease and syndrome interactions (Table 3)	
Heart failure	
Dextromethorphan-quinidine	Supported by package insert
Delirium	
Opioids	Emerging data
History of falls or fractures Anticholinergics	Emerging data and consistency across recommendations
Use with caution (Table 4)	
Ticagrelor	Emerging data
Sodium-glucose co-transporter-2 (SGLT2) inhibitors	Emerging data and clinical concern
Clinically important drug–drug interactions (Table 5)	
Skeletal muscle relaxants added to any combination of ≥3 of these CNS-active drugs	Concern for adverse effects when used in combination with other CNS-active drugs
Lithium + ARBs and ARNIs	Supported by data and reference sources
Warfarin + SSRIs	Supported by data
Medications that should be avoided or have their dosage reduced with reduced kidney function (Table 6)	
Baclofen	Data supporting concern

Note: The updated version of the criteria includes specific lists of drugs that were not included in prior versions. These lists are meant to enhance clarity and searchability, and unless stated otherwise do not change the intent of the prior version of the criteria.
Abbreviations: ARBs, angiotensin receptor blockers; ARNIs, angiotensin receptor-neprilysin inhibitors; CNS, central nervous system; SSRIs, selective serotonin reuptake inhibitors.

Applying the criteria to policy and practice

The panel continues to be aware of and discuss the controversies and misinformation about the proper interpretation of the AGS Beers Criteria®. As such, the panel advises users of the criteria to read and use guidance from companion articles written to accompany the 2015 and 2019 AGS Beers Criteria® that advise patients, providers, and health systems on how to use (and not use) the AGS Beers Criteria®, as these recommendations are applicable to the 2023 update.[21,22] Key recommendations from those articles are summarized in Table 11. Certain clarifications to items in the table and additional considerations that arose during the 2023 update panel discussion merit special note. First, as noted above, different older adults may have markedly different risks of

TABLE 10 Medications/criteria modified since 2019 American Geriatrics Society Beers Criteria®.

Medication/Criterion	Modification
Independent of diagnosis or condition (Table 2)	
Aspirin	Moved from Table 4 to Table 2 on basis of new evidence.
Rivaroxaban	Moved from Table 4 to Table 2 on basis of accumulating evidence
Dronedarone	Clarified to reflect data about potential risks in people with non-severe forms of heart failure
Digoxin	Added statement clarifying that caution should be used discontinuing digoxin among current users with HFrEF.
Antidepressants with strong anticholinergic activity	Clarified that this criterion refers to antidepressants with strong anticholinergic activity
Antipsychotics	Updated language to reflect new evidence and enhance clarity
Benzodiazepines	Clarified language
Androgens	Clarified that androgens pose potential risks but are not firmly contraindicated in men with a history of prostate cancer.
Estrogens, systemic	Provided additional information, supported by data
Sulfonylureas	Expanded criterion from long-acting sulfonylureas to all sulfonylureas given data supporting adverse outcomes for all sulfonylureas.
Proton pump inhibitors	Noted additional adverse outcomes in the rationale statement given supporting data.
NSAIDs, oral	Clarified application in high-risk scenarios for short-term use (i.e., including drug–drug interactions such as with warfarin)
Skeletal muscle relaxants	Clarified language to differentiate skeletal muscle relaxants typically used for musculoskeletal complaints from those used to treat spasticity.
Considering disease and syndrome interactions (Table 3)	
Syncope—TCAs Amitriptyline Clomipramine Doxepin Imipramine	Clarified that the tertiary TCAs referenced by this criterion include those listed here.
Dementia Antipsychotics	Modified language to reflect data and enhance clarity
Delirium	Updated rationale to comment on opioids and enhance clarity
History of falls or fracture Antidepressants	Level of evidence lowered from "high" to "moderate" based on evidence; updated rationale to reflect new evidence and enhance clarity.
Parkinson disease	Rationale shortened for clarity.
Urinary incontinence in women	Modified language to enhance clarity
Use with caution (Table 4)	
Prasugrel	Adding dosing consideration, supported by American College of Cardiology/American Heart Association guidelines.
Dextromethorphan-quinidine	Added heart failure concerns, supported by package insert.
Trimethoprim-sulfamethoxazole	Added ARNIs for completeness (given that they contain ARBs).
Clinically important drug–drug interactions (Table 5)	
Opioid + benzodiazepine	Modified to include risk for adverse effects; supported by data.
Anticholinergic + anticholinergic	Modified to recognize specific adverse events.
Use of ≥3 CNS active agents	Clarified classes of medications of concern; level of evidence raised to "high."
Warfarin	Consolidated interacting drugs into a list versus reporting as separate lines for each interaction.

(Continues)

TABLE 10 (Continued)

Medication/Criterion	Modification
Medications that should be avoided or have their dosage reduced with reduced kidney function (Table 6)	
Nitrofurantoin	Existing recommendations from Table 2 are duplicated in Table 6 to enhance clarity and usability.
Trimethoprim-sulfamethoxazole	Added clarifying language to support clinical usability.
Rivaroxaban	Clarified CrCl cutoffs per available evidence and package insert.
NSAIDs	Moved this criterion from Table 3 for greater consistency; clarified language.

Abbreviations: ARB, angiotensin receptor blocker; ARNI, angiotensin receptor-neprilysin inhibitor; CNS, central nervous system; CrCl, creatinine clearance.
[a]In addition to the changes listed above, a number of formatting and other changes were made to enhance clarity and usability without changing the meaning of the criteria. This includes specific lists of drugs that were not included in prior versions; these lists are meant to enhance clarity and searchability, and unless stated otherwise do not change the intent of the prior version of the criteria.

experiencing severe medication-related harms, with advanced age, cognitive and physical impairment, multimorbid burden, frailty, renal impairment, and a high degree of polypharmacy each conferring risk. A person's underlying risk of experiencing drug-related harms should inform decisions about using drugs in the criteria. Second, close attention to the recommendations is essential to avoid misinterpretation; many criteria note exceptions and other considerations and should not be overly simplified as "avoid in everyone over age 65." Third, the risk of harm arises not just from drugs considered in isolation but from how multiple drugs affect an older adult when given together. Thus, evaluations of medication appropriateness should be made in the context of the totality of a person's medication regimen and their goals of care. Fourth, the intent of the AGS Beers Criteria® is not simply to swap out a better drug in place of a worse one. In many cases, nonpharmacologic treatments (or no treatment at all) may be preferable. Finally, the panel affirms the importance of shared decision-making in selecting and changing treatment regimens. There may be situations in which initiating or continuing a drug on the criteria is reasonable because it is consistent with an older person's stated preferences, values, and treatment goals.

TABLE 11 Principles for how patients, clinicians, health systems, and payors should use the AGS Beers Criteria®.

Medications in the AGS Beers Criteria® are potentially inappropriate, not definitely inappropriate.
Read the rationale and recommendations statements for each criterion. The caveats and guidance listed there are important.
Understand why medications are included in the AGS Beers Criteria® and adjust your approach to those medications accordingly.
Optimal application of the AGS Beers Criteria® involves identifying PIMs and, when appropriate, offering safer nonpharmacologic and pharmacologic therapies.
The AGS Beers Criteria® should be a starting point for a comprehensive process of identifying and improving medication appropriateness and safety.
Access to medications included in the AGS Beers Criteria® should not be excessively restricted by prior authorization and/or health plan coverage policies.
The AGS Beers Criteria® are not equally applicable to all countries (because of cross-national differences in drug availability).

Source: Adapted from Steinman et al.[21,22]

Deprescribing

Successful deprescribing of medications on the AGS Beers Criteria® involves much more than a clinician simply telling an older person to stop taking a medication. Communication gaps and misunderstandings, patient reluctance and fear of stopping, coordination among multiple clinicians, dosage tapering, withdrawal symptoms, and conveying stop orders to pharmacies are just some of the challenges that can arise. The panel encourages clinicians to be aware of and develop skills to address these challenges. Useful resources include:

- https://deprescribing.org/resources/—deprescribing resources, especially evidence-based guidelines and easy-to-use algorithms about when and how to stop common types of medications
- https://www.deprescribingnetwork.ca/professionals—resources for healthcare professionals, including deprescribing-oriented patient handouts about medications that are commonly inappropriate for older adults

Systemic solutions are essential as well, for example increasing the adoption of the CancelRx Script Standard to communicate to pharmacies when a drug is stopped and should no longer be refilled.

Strengths and limitations

As with previous versions of the AGS Beers Criteria®, this update is subject to the same limitations. First, the evidence available is often plagued by the small number of clinical trials in older adults or by the lack of inclusion of a sufficient number of older adults to conduct an age-specific analysis. The panel often relied on observational studies and meta-analyses for evidence of harm and whether the harm was more common or resulted in more serious outcomes in older adults.

Second, the lack of diversity in study populations was another challenge to the panel. Inadequate enrollment of underrepresented, disproportionately affected, and understudied populations in clinical trials is a distressingly well-described phenomenon. In the evidence the panel reviewed, a seemingly larger number of studies identified were generated within a specific country, possibly contributing to greater racial and ethnic homogeneity among study participants. Even when more diverse populations were included in a study, there was often inadequate power to determine outcomes by specific groups. Third, the criteria include only medications available in the United States. Clinicians outside the United States, with access to different medications from the same drug class as those the criteria recommends avoiding, will need to adapt the criteria to their local context. Fourth, it is possible that our literature search did not identify all published evidence that would have been pertinent. Our search strategy did not include unpublished studies, papers not published in English, white papers, abstracts, technical reports, or other evidence published in the "gray literature."

Despite its limitations, the 2023 AGS Beers Criteria® has its strengths. The panel and staff are highly experienced; most have participated in updating the criteria since 2012, and some since 2003. Their familiarity with the process and modified Delphi technique is an advantage. The panel also included ad hoc members from important stakeholders, namely the Centers for Medicare and Medicaid, the National Committee for Quality Assurance, and the Pharmacy Quality Alliance, who provided valuable insight and feedback throughout the process. Robust internal review and external public comment processes are additional strengths.

CONCLUSION

The 2023 update of the AGS Beers Criteria® includes many modifications including a number of new and significantly modified criteria and many minor changes in formatting and wording to enhance clarity and usability. To support clinicians in practice, the AGS has released the 2023 AGS Beers Criteria® App as well as a pocket card, both of which can be accessed via GeriatricsCareOnline.org. As with past updates, the AGS has also created a suite of public education materials that are available for free at HealthinAging.org, a resource created by the AGS Foundation for Health in Aging to bring the expertise of geriatrics to the public. It is the hope of the AGS and the 2023 AGS Beers Criteria® expert panel that the updated criteria will be used as intended—to improve drug therapy and outcomes for all of us as we age by identifying and reducing prescribing of PIMs in older adults through a process of shared decision-making that focuses on goals of care.

AUTHOR CONTRIBUTIONS

All panel members contributed to the concept and design, acquisition of subjects and/or data, analysis, and interpretation of data, and preparation of the manuscript.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

Appendix S1. Supporting information.

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APPENDIX A: PANEL MEMBERS AND AFFILIATIONS

The following individuals were members of the AGS Panel convened to update the 2023 AGS Beers Criteria®: (co-chair) Todd P. Semla, PharmD, MS, BCPG, FCCP, AGSF, Northwestern University Feinberg School of Medicine, Chicago, IL; (co-chair) Michael Steinman, MD, University of California San Francisco and San Francisco Veterans Affairs Medical Center, San Francisco, CA; (co-chair) Judith Beizer, PharmD, BCGP, FASCP, AGSF, St. John's University, Queens, NY; Nicole Brandt, PharmD, MBA, BCPP, BCGP, FASCP, University of Maryland, Baltimore, MD; Rachel Digmann, PharmD, Pharmacy Quality Alliance, Alexandria, VA (nonvoting member); Robert Dombrowski, PharmD, Centers for Medicare and Medicaid Services, Baltimore, MD (nonvoting member); Catherine E. DuBeau, MD, Dartmouth-Hitchcock Medical Center, Lebanon, NH; Donna M. Fick, PhD, RN, FGSA, AGSF, FAAN, College of Nursing and Medicine, The Pennsylvania State University, University Park, PA; Nina Flanagan, PhD, GNP-BC, APHM-BC, Binghamton University, Vestal, NY; Claudene George, MD, MS, RPh, Montefiore Medical Center, The Bronx, NY; Rachel Harrington, PhD, National Committee for Quality Assurance, Washington, DC (nonvoting member); Peter Hollmann, MD, AGSF, Brown Medicine, Providence, RI; Holly Holmes, MD, MS,AGSF, McGovern Medical School at UT Health, Houston, TX; Rosemary Laird, MD, MHSA, AGSF, Winter Park Memorial Hospital, Winter Park, FL; and Sunny Linnebur, PharmD, FCCP, BCPS, BCGP, FASCP, University of Colorado, Aurora, CO.