# What's on tap: 2023 Beers Criteria update

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In 1991, Mark Beers, MD, and colleagues at University of California Los Angeles developed the Beers Criteria to identify potentially inappropriate medication (PIM) for nursing home residents.[1] Since their initial release, the Beers Criteria has been updated six times and expanded the criteria to apply to all adults 65 years and older.[2,3] In 2011, the American Geriatrics Society (AGS) took ownership of updating the Beers Criteria, which was then updated in 2019.[4] In May 2023, AGS 2023 updated the AGS Beers Criteria for PIM use in older adults.[5]

The number of medications that older adults take continues to grow, with more than 40% of this age group taking five or more prescriptions a day, also known as polypharmacy.[6] The high medication burden associated with polypharmacy has shown to increase odds of developing an adverse drug event (ADE), which is harm experienced by a patient because of exposure to a medication.[7] An additional factor that leads to older adults experiencing ADEs include pharmacokinetic and pharmacodynamic changes that result from aging.[8] A reduction in renal and hepatic clearance and an increase in volume of distribution for lipid-soluble drugs prolong the elimination half-life of medications and increased sensitivity to medications demonstrates these changes.[9]

According to CDC, older adults visit emergency departments (EDs) more than 450,000 times a year for an ADE, creating an additional $3.5 billion in health care costs.[10,11] Knowledge of the PIMs and potential risks of using the medications can decrease further ADEs in your patients.

## Updates to 2023 Beers Criteria

### Structural updates

The updated 2023 Beers Criteria is structured similarly to the prior publication, with a few exceptions.[5] One notable exception is the removal of medications with low or absent use in the United States. Medications that were previously included in tables within the publication that were used by less than 4,000 Medicare beneficiaries based on the 2020 data that are no longer on the U.S. market were removed from their prior table and included in a separate table within the publication. Some examples of medications that were removed include the benzodiazepines flurazepam and quazepam as well as the NSAIDs fenoprofen, ketoprofen, meclofenamate, and mefenamic acid—all of which were removed due to low use. Ranitidine was also removed due to its removal from the U.S. market in 2020.[12]

Another structural element added to the 2023 Beers Criteria is the addition of a table that summarizes companion articles that were written to accompany the 2015 and 2019 iterations of the Beers Criteria to provide recommendations for patients, providers, and health systems for how to use the Beers Criteria.[5,13,14] This table reinforces the principle that the Beers Criteria help clinicians identify PIM use in older adults, but that clinicians should make decisions based on individual patient characteristics and goals.

Additional time will be spent on how pharmacists should use the Beers Criteria later in this article.

Lastly, one subtle but important update to the 2023 Beers Criteria was the addition of language around exceptions noted within the criteria to ensure the criteria are more individualized to clinical practice and more diverse and relevant across multiple settings of care. The panel recognizes the limitations caused by a lack of diversity in clinical study populations and includes exceptions within the criteria in hopes of ensuring that the recommendations are not oversimplified and that the full clinical scenario is taken into consideration during decision-making.[5]

### Clinical updates

The 2023 Beers Criteria had several relevant clinical updates for pharmacists.

It should be noted that only a selection of clinically important updates is reviewed in this article.

**Learning objectives**

At the conclusion of this knowledge-based activity, the pharmacist will be able to

- Discuss the prevalence, mechanism, and impact of adverse drug reactions in older adults.
- Recall updates to the 2023 Beers Criteria for Potentially Inappropriate Medication Use in Older Adults.
- Review evidence to support updates to the 2023 Beers Criteria for Potentially Inappropriate Medication Use in Older Adults.
- Identify how pharmacists should apply the 2023 Beers Criteria in practice.

**Preassessment questions**

Before participating in this activity, test your knowledge by answering the following questions. These questions will also be part of the CPE assessment.

1. **According to CDC, older adults visit emergency departments more than ____ times a year due to an ADE?**
   a. 350,000
   b. 450,000
   c. 550,000
   d. 650,000

2. **What additional adverse outcomes were added to the 2023 Beers Criteria rationale to avoid the use of proton pump inhibitors in older adults?**
   a. *Clostridioides difficile* infection and pneumonia
   b. GI malignancies and pneumonia
   c. Bone loss and fractures
   d. Blood clots and bone loss

3. **In which of the following patients should baclofen be avoided based on updates to the 2023 Beers Criteria?**
   a. A 74-year-old man with an eGFR of 65 mL/min/1.73 m$^2$ taking baclofen for chronic low back pain
   b. A 66-year-old woman with an eGFR of 35 mL/min/1.73 m$^2$ taking baclofen for spasticity related to multiple sclerosis
   c. A 55-year-old man with an eGFR of 90 mL/min/1.73 m$^2$ taking baclofen for chronic low-back pain
   d. A 75-year-old woman with an eGFR of 70 mL/min/1.73 m$^2$ taking baclofen for spasticity related to multiple sclerosis

Updates related to cardiovascular disease, diabetes, fall, fracture and delirium prevention, estrogens, and proton pump inhibitors (PPIs) will be reviewed. Table 1 provides a summary of selected changes and recommendations for pharmacists.

## Relevant updates in cardiovascular disease

A large focus of the 2023 Beers Criteria was the use of anticoagulants in older adults. Because anticoagulants are a mainstay of therapy for conditions such as prevention of thromboembolic stroke in patients with chronic atrial fibrillation (AFib) and prevention and treatment of venous thromboembolism (VTE), it is unsurprising that the number of patients using these medications has increased as the population in the United States continues to age.[15]

Over 11% of Medicare Part D beneficiaries use an oral anticoagulant.[16] Bleeding is the primary ADE associated with the use of anticoagulants, with intracranial hemorrhage and GI bleeding among the more severe bleeding events associated with use.[15] The vitamin K antagonist (VKA) warfarin and the direct oral anticoagulants (DOACs) apixaban and rivaroxaban are among the most used anticoagulants in older adults that pose a potential risk of an ADE.

The 2023 Beers Criteria recommends that the anticoagulants warfarin and rivaroxaban should be avoided in older adults.[5] Warfarin was added to this list based on emerging evidence that, compared with DOACs, warfarin has higher risk of major bleeding and similar or lower effectiveness for initial treatment of nonvalvular AFib and VTE, leaving DOACs to be the preferred choice. This recommendation is consistent with the 2019 AHA/ACC/HRS Focused Update of the 2014 AHA/ACC/HRS Guideline for the Management of Patients with Atrial Fibrillation, which stated that non–vitamin K oral anticoagulants (NOACs) are recommended over warfarin in NOAC-eligible patients with AFib.[17] The evidence supporting this recommendation comes from four randomized controlled trials (RCTs) that demonstrate at least noninferiority of NOACs compared with warfarin.

A similar statement comes from the American Society of Hematology 2020 Guidelines for Management of Venous Thromboembolism, which suggests using DOACs over VKAs for treatment of VTE.[18]

It should be noted that patients whose symptoms are well-controlled (i.e., >70% time in range [TIR] INR and no adverse effects) with warfarin could remain on warfarin therapy.[5]

The recommendation of rivaroxaban for the treatment of long-term nonvalvular AFib and VTE was previously to use with caution in older adults, but the 2023 Beers Criteria now recommends to avoid its use in older adults. New evidence surrounding the bleeding risk associated with rivaroxaban use compared to apixaban or dabigatran found that rivaroxaban had a higher risk of major bleeding.[19] Bonde and colleagues found that rivaroxaban was associated with 1.89 RR of major bleeding compared to apixaban.[19]

A 2017 systematic review and meta-analysis found that rivaroxaban was associated with significantly higher major bleeding risk compared with dabigatran.[20] With these recommendations in mind, there may be situations in which warfarin and rivaroxaban are the better choice for a patient; for example, when finances are a barrier to use or medication adherence is a concern (and thus once-daily dosing is preferred).

**Table 1.** Summary of select changes to the 2023 Beers Criteria

| Drug or drug class | Recommendation | Recommendation for pharmacists |
|---|---|---|
| **Cardiovascular disease** | | |
| Warfarin | Avoid use due to increased risk of major bleeding for initial treatment of nonvalvular atrial fibrillation or VTE. | Recommend alterative options for treatment (i.e., DOACs) as appropriate if not contraindicated or limited by cost. |
| Warfarin | Avoid use with SSRIs due to increased risk of bleeding. | Review for drug–drug interactions, if an alternative anticoagulant or antidepressant can't be identified, moniter INR closely. |
| Rivaroxaban | Avoid use due to increased risk of major bleeding for long-term treatment of nonvalvular atrial fibrillation or VTE. | Recommend alterative options for treatment (i.e., apixaban) as appropriate if not contraindicated or limited by once-daily dosing. |
| Rivaroxaban | Reduce dose when CrCl <50 mL/min based on package insert. | Refer to package insert for dose reduction in patients with reduced kidney function. Recommend dose reduction based on indication. |
| Apixaban | Use is safe in CrCl <25 mL/min. | Closely monitor patient for adverse drug events such as bleeding. |
| Aspirin | Avoid initiating aspirin for primary prevention of cardiovascular disease in older adults. | Use shared clinical decision-making to determine if benefits outweigh risks of initiating/deprescribing aspirin for primary prevention of cardiovascular disease based on age, level of cardiovascular disease risk, and bleeding risk. |
| **Diabetes** | | |
| Sulfonylureas | Avoid as first- or second-line monotherapy or add-on therapy unless there are substantial barriers to use of other agents. | Look for opportunities to recommend deprescribing or offer more appropriate alternatives (e.g., new start prescription; titration; or if patient presents with dizziness, shakiness, or low blood sugar; patient purchases glucose tablets). |
| SGLT-2 inhibitors | Use with caution in older adults due to increased risk of urogenital infections and euglycemic diabetic ketoacidosis. | Educate patient on signs and symptoms of euglycemic diabetic ketoacidosis such as mailaise, nausea, and vomiting and of urogenital infections. |
| **Fall, fracture, and delirium prevention** | | |
| Anticholinergic agents | Cummulative exposure is associated with increased risk of falls, delirium, and dementia. | Review full medication profile for total anticholinergic burden. Make recommendations to reduce anticholinergic burden whenever possible. |
| CNS active agents | Avoid any combination of >3 CNS-active drugs. The guidelines now include gabapentinoids and skeletal muscle relaxants due to risk of falls and fractures. | Review full medication profile for use of multiple CNS-active agents. Make recommendations to reduce use of medications with sedative properties whenever possible. |
| Opioids | Opioids may increase risk of developing delirium. | Recommend a multimodal approach to pain management in older adults. Optimize nonpharmacologic and nonopioid pharmacologic options prior to using opioids in most circumstances. |
| Antidepressants | Mixed evidence for risk of falls and fractures; emerging evidence that SNRI use may increase risk of falls. | Re-evaluate effectiveness of antidepressants in older adults often; taper if continued use is not beneficial. |

**Table 1.** Summary of select changes to the 2023 Beers Criteria cont'd

| | | |
|---|---|---|
| **Other** | | |
| Baclofen | Avoid use when eGFR <60 mL/min/1.73 $m^2$. | Confirm eGFR; if <60 mL/min/1.73 $m^2$, suggest tapering to discontinuation or safer alternative. |
| Estrogens | Do not initiate systemic estrogen (e.g., oral tablets or transdermal patch). Consider deprescribing among older women already using estrogens. | Use shared clinical decision-making to determine if benefits outweigh risks of initiating/deprescribing systemic estrogen therapy. |
| Proton pump inhibitors | Avoid use due to increased evidence for risk of developing pneumonia and GI malignancies. | Look for opportunities to recommend deprescribing if more than 8 weeks of scheduled use unless for high-risk patients or failure of H2RAs. |

Abbreviations used: CNS, central nervous system; CrCL, creatine clearance; DOACs, direct oral anticoagulants; eGFR, estimated glomerular filtration rate; INR, international normalized ratio; SSRI, selective serotonin reuptake inhibitor; VTE, venous thromboembolism.

Source: Adapted from Reference 5.

The drug–drug interaction between warfarin and selective serotonin reuptake inhibitors (SSRIs) is now included in 2023 Beers Criteria as part of drug–drug interactions that should be avoided in older adults.[5]

The mechanism behind the interaction is thought to be due to serotonin's ability to inhibit platelet aggregation coupled with inhibition of warfarin metabolism via the cytochrome P450 pathway.[21] SSRIs are found to have a favorable safety profile in older adults and therefore are commonly used in an estimated 20% of older adults.[22]

In addition to overall safety concerns, DOACs have also been updated to reflect dose adjustment guidelines based on kidney function. The recommendation to avoid use of apixaban at CrCl of <25 mL/min was removed based on increased evidence of safe use at lower CrCl. Only 25% of apixaban is eliminated by the kidneys, making it the DOAC least reliant on kidney function for clearance.[23] Based on the package insert, emerging evidence continues to become available for the safe use with careful monitoring of apixaban in patients with reduced CrCl.[24] The modification to rivaroxaban directs clinicians to refer to the package insert based on the indication for patients with a CrCl <50 mL/min.[25] The various indications for rivaroxaban use and the action points for dose reduction are numerous and are best reflected in the package insert.

To better align with the U.S. Preventive Services Task Force Recommendation (USPSTF) on the use of aspirin for primary prevention of cardiovascular disease (CVD), the 2023 Beers Criteria also recommends avoiding use of aspirin for primary prevention of CVD in older adults.[26] Based on the evidence from 14 RCTs provided in the USPSTF's recommendation, the increased risk of GI bleeding, intracranial bleeding, and hemorrhagic stroke do not outweigh the benefit of low-dose aspirin to reduce risk of cardiovascular events.[26]

The discontinuation of aspirin in older adults should be based on shared decision-making and take into account a person's age, level of CVD risk and bleeding risk, preferences, and reasons for taking aspirin. It is important to note that aspirin is generally still indicated in this population for secondary prevention of CVD.

Ticagrelor, an oral P2Y12 inhibitor, should be used with caution in older adults due to an increased risk of major bleeding compared with clopidogrel, especially in adults 75 years and older. A 2021 systematic review and meta-analysis found a 20% increased risk of a bleeding event in older adults using ticagrelor compared to clopidogrel.[27] It is still possible that the benefit of using ticagrelor may outweigh the risk for certain patients.

Dextromethorphan/quinidine, which is used for the treatment of pseudobulbar affect, experienced a slight modification in the 2023 Beers Criteria. As seen in its package insert, dextromethorphan/quinidine is contraindicated in heart failure due to concerns of QT prolongation.[28] Phase 2 clinical trials of the medication found in a randomized, double-blind (except for moxifloxacin) placebo- and positive-controlled (400 mg moxifloxacin) crossover thorough study found mean changes in corrected QT interval were 6.8 ms for dextromethorphan/quinidine alone and 9.1 ms for dextromethorphan/quinidine plus 400 mg moxifloxacin. Dextromethorphan/quinidine may exacerbate heart failure and should not be used in this patient population.

## Relevant updates in diabetes

An update to the recommendation for the use of sulfonylureas in older adults has been added to the 2023 Beers Criteria. In the previous edition of the criteria, only long-acting sulfonylureas (e.g., glyburide, and glimepiride) were recommended to avoid in older adults due to risk of prolonged hypoglycemia.[4] The updated recommendation states that both short- (e.g., glipizide) and long-acting sulfonylureas should be avoided in older adults due to the increased risk of cardiovascular events, all-cause mortality, and hypoglycemia

compared to other agents.[5] The recommendation states to avoid use of these agents as first- or second-line monotherapy or add-on therapy unless there are substantial barriers to use of other options, such as cost of medication.

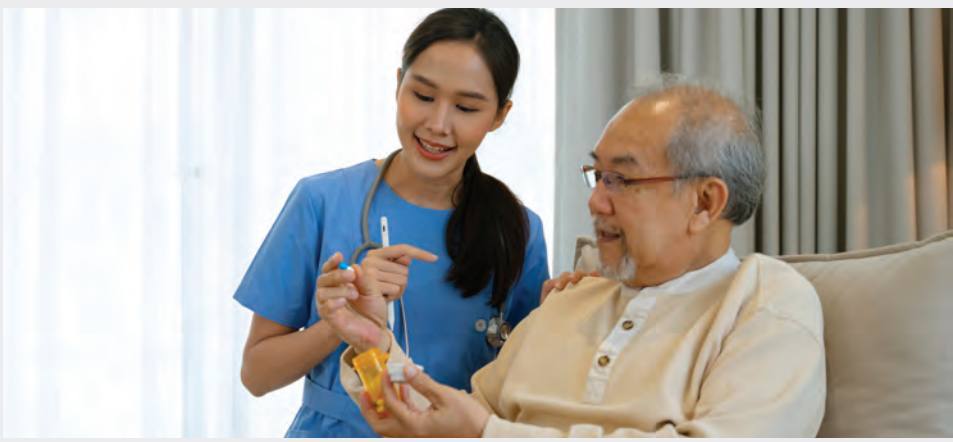
If sulfonylureas must absolutely be used, the 2023 Beers Criteria recommends that short-acting agents are chosen instead of long-acting ones because it is hypothesized that the likelihood of developing hypoglycemia increases with age due to a reduction in glucagon secretion and decreased ability to recognize warning signs of hypoglycemia.[29] The natural increase in hypoglycemia coupled with the role of sulfonylureas in an increasing chance of hypoglycemia leads to a great cause for concern in this population. A 2022 population-based cohort study demonstrated how sulfonylurea use compared to metformin was associated with an increased risk of cardiovascular death and ventricular arrythmia.[30] Sulfonylureas are thought to lead to a prolonged QTc interval via the blocking of potassium channels at the cellular level.

A popular alternative to sulfonylureas are sodium-glucose cotransporter-2 (SGLT-2) inhibitors due to their additional benefits to cardiovascular and kidney outcome that coincide with their effectiveness for treating patients with diabetes. According to the 2023 Standards of Care in Diabetes, "among individuals with type 2 diabetes who have established atherosclerotic cardiovascular disease or indicators of high cardiovascular risk, established kidney disease, or heart failure, sodium-glucose cotransporter 2 inhibitor and/or glucagon-like peptide 1 receptor agonist with demonstrated cardiovascular disease benefit is recommended as part of the glucose-lowering regimen and comprehensive cardiovascular risk reduction, independent of A1C and in consideration of person-specific factors."[31]

While these medications do provide an increased benefit to many patients with diabetes, they should be used in caution in older adults with careful monitoring. The 2023 Beers Criteria notes that the SGLT-2 inhibitors canagliflozin, dapagliflozin, empagliflozin, and ertugliflozin should be used with caution due to the risk of developing urogenital infections (especially in women) in the first month of treatment and the risk of developing euglycemic diabetic ketoacidosis (DKA). The panel recognizes the value of these medications but strongly urges the recommendation to closely monitor these medications for ADEs.[5] Providers should screen patients regularly for signs and symptoms of urogenital infections and UTIs early on. Euglycemic DKA (i.e., blood glucose <250 mg/dL) may be more difficult to identify compared to DKA with hyperglycemia.[32] Signs of euglycemic DKA include malaise, nausea, and/or vomiting.

## Reducing the risk of falls, fractures, and delirium in older adults

Delirium is common among hospitalized older adults and associated with adverse outcomes from increased risk of falls to prolonged hospitalization, institutionalism, and death. It has been estimated that delirium costs the U.S. health care system $38 billion to $152 billion annually.[33]



One recent systematic review identified potential predisposing factors associated with delirium and listed multiple medications, psychoactive medications, narcotic analgesics, and anticholinergic medication use as predisposing factors, among others that are not medication related.[33] Falls are a leading cause of injury among older adults, with an estimated 36 million falls reported each year.[34] Approximately 20% of falls lead to injury, including fractures, which is estimated to cost the U.S. health care system $5.96 billion annually.[35] The 2023 Beers Criteria continues to acknowledge the importance of reducing medication-related risk of delirium, falls, and fractures, and updates associated with use of medications with anticholinergic and sedative properties, opioids, and antidepressants will be discussed here.

Risks related to the use of medications with anticholinergic properties have been well-documented in the literature. ADEs related to anticholinergic medication use range from dry mouth, constipation, urinary retention, tachycardia, and blurred vision to cognitive impairment, delirium, and increased risk of falls and fractures.[36] Studies have also found correlation with use of medications with anticholinergic properties and increased risk of development of pulmonary infections, brain atrophy leading to dementia, and all-cause mortality.[36]

While risks related to medications with anticholinergic properties have been included in the Beers Criteria for some time, the 2023 update now includes the increased risk of delirium and falls or fractures within the risk rationale for the use of more than one medication with anticholinergic properties, acknowledging the cumulative effect of using multiple medications with anticholinergic properties.[5]

While medication classes like

**Table 2.** Medications in the top 200 with anticholinergic and sedative properties

| Activity | Medications with anticholinergic properties |
|---|---|
| Low | Metoprolol, sertraline, escitalopram, bupropion, furosemide, trazodone, fluoxetine, prednisone, citalopram, alprazolam, venlafaxine, clonazepam, lorazepam, famotidine, acetaminophen/oxycodone, loratadine, diltiazem, aripiprazole, celecoxib, hydralazine, mirtazapine, valproate, sumatriptan, isosorbide, clindamycin, methocarbamol, diazepam, chlorthalidone, nifedipine, risperidone, morphine, hydrocortisone, prednisolone, methylprednisolone, levocetirizine, carbamazepine, buprenorphine, acetaminophen/codeine, lansoprazole, pramipexole, lithium |
| Moderate | Tramadol, cyclobenzaprine, quetiapine, pregabalin, paroxetine, baclofen, oxcarbazepine, olanzapine, desvenlafaxine |
| High | Meclizine, dicyclomine, nortriptyline, diphenhydramine, hydroxyzine, amitriptyline, tizanidine, oxybutynin |
| **Activity** | **Medications with sedative properties** |
| Low | Oxybutynin, metoprolol, furosemide, famotidine, loratadine, diltiazem, celecoxib, nifedipine, levocetirizine, lansoprazole, pramipexole, atorvastatin, lisinopril, amlodipine, omeprazole, losartan, hydrochlorothiazide, simvastatin, montelukast, rosuvastatin, pantoprazole, carvedilol, meloxicam, pravastatin, ibuprofen, estradiol, diclofenac, clonidine, glimepiride, propranolol, naproxen, hydrochlorothiazide/losartan, fenofibrate, lovastatin, cephalexin, donepezil, methotrexate, esomeprazole, valsartan, hydroxychloroquine, olmesartan, benazapril, timolol, irbesartan, verapamil, memantine, ropinirole, progesterone, mirabegron, amlodipine/benazepril, testosterone, gemfibrozil, prazosin, ramipril, glyburide |
| Moderate | Meclizine, dicyclomine, hydroxyzine, tizanidine, sertraline, escitalopram, bupropion, trazodone, fluoxetine, citalopram, venlafaxine, acetaminophen/oxycodone, aripiprazole, mirtazapine, valproate, sumatriptan, methocarbamol, diazepam, risperidone, morphine, carbamazepine, buprenorphine, acetaminophen/codeine, tramadol, cyclobenzaprine, quetiapine, pregabalin, paroxetine, baclofen, oxcarbazepine, olanzapine, desvenlafaxine, gabapentin, acetaminophen/hydrocodone, duloxetine, lamotrigine, levetiracetam, benzonatate |
| High | Nortriptyline, diphenhydramine, amitriptyline, alprazolam, clonazepam, lorazepam, lithium |

first-generation antihistamines, antiparkinsonian agents, antidepressants and antipsychotics with strong anticholinergic activity, urinary antimuscarinics, and antispasmodics are considered common culprits, it is important to acknowledge that other medications with low or moderate anticholinergic properties may also contribute to a cumulative anticholinergic risk and lead to ADEs. For example, combining loratadine (low) with citalopram (low) and cyclobenzaprine (moderate) may cumulatively lead to anticholinergic ADEs. Fifty-eight of the top 200 medications prescribed in 2020 have anticholinergic properties ranging from low to high.[36,37] Table 2 includes a list of the top 200 medications with their respective anticholinergic and sedative activity.

Similar to medications with anticholinergic properties, medications with sedative properties are well-documented for causing ADEs in older adults. ADEs associated with the use of medication with sedative properties include drowsiness, lethargy, respiratory depression, poorer cognitive and physical functioning, falls, and fractures. The risks of ADEs associated with medications with sedative properties are also additive and cumulative.[36,38,39] AGS has previously acknowledged the additive sedative potential and includes three or more CNS-active agents as a point at which clinicians should intervene.[4] In the 2023 Beers Criteria, gabapentinoids and skeletal muscle relaxants were added to the list of CNS-active agents that should be avoided in combination due to increased risk of falls and fracture.[5]

Gabapentinoids are frequently used in older adults for management of neuropathic and other pain and nonpain syndromes. In light of the opioid epidemic, clinicians have increased use of gabapentinoids to decrease opioid prescribing in many settings.[40] One study assessed the prevalence of prolonged use of gabapentin in a postsurgical setting and found that among 17,970 patients who were post total knee (45%) or total hip (21%) replacement, 22% who were initiated a new prescription for gabapentin as part of their post operative plan continued use of the medication at >90 days following discharge.[41]

While gabapentoids are considered to have moderate sedative potential, use of the medications are not without risk. Researchers in Ontario, Canada, conducted a retrospective population-based study to assess the 30-day risk of hospitalization in older adults initiated on gabapentin.[42] The study analyzed records from 34,159 patients initiated on doses >600 mg/day and 76,025 records from patients initiated on doses <600 mg/day. Patients initiated on higher doses were more likely to present to the hospital with altered mental status (1.27% vs. 1.06%).[42]

It is important to remember that, when gabapentinoids are used, to "start low and go slow" to avoid ADEs.

Skeletal muscle relaxants also are generally considered to have a moderate sedative potential but have been found to cause ADEs in older adults. A retrospective cohort study analyzed a cohort of 1,807,404 patients from Veteran Affairs hospitals and found that patients prescribed skeletal muscle relaxants were more likely to seek emergency care and be hospitalized compared to patients taking antihistamines.[43]

Skeletal muscle relaxants do not modify underlying properties of disease and are only useful for short-term symptomatic improvement in older adults.[44]

On top of the addition of skeletal muscle relaxants to the list of CNS-active agents that should be avoided, baclofen is now listed as one to avoid in patients with an eGFR <60 mL/min/1.73 $m^2$ due to the risk for encephalopathy.[45]

Baclofen is one of the most commonly prescribed medications and is used for various conditions including spasticity related to multiple sclerosis or spinal cord injury (a labeled use) and chronic low back pain (an off-label use).[37,46]

Baclofen is primarily eliminated via the kidneys unchanged, and its elimination half-life increases as kidney function declines. A retrospective population-based cohort study conducted in 15,942 older adults with chronic kidney disease who were newly prescribed baclofen found a dose- and renal function–dependent increased risk of hospitalization with encephalopathy in patients with an eGFR <60 mL/min/1.73 $m^2$ within 30 days of initiation.[45] Patients with the highest risk were those taking doses of >20 mg per day or those with a progressively lower eGFR.

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Additionally, opioids have now been added to the list of medications that may exacerbate delirium in older adults based on emerging data, as recent studies have evaluated the association of opioids with delirium in various practice settings ranging from critical care to outpatient presentation to the ED.[47,48] While data are mixed within the outpatient/ED setting, studies have found a correlation between opioid use and development of delirium in the inpatient setting.[47] Pharmacists working in inpatient settings should be cognizant of emerging data related to opioid use and offer appropriate nonpharmacologic or nonopioid pharmacologic treatment options when possible in older adults.

One additional update related to the risk of falls and fractures was the change of the level of evidence supporting the recommendation to avoid the use of antidepressants in patients with a history of falls and fractures from "high-quality" to "moderate-quality" due to mixed evidence related to causality. The rationale behind the recommendation acknowledges that evidence is increasing related to the risk of using SNRIs. In early 2021, CDC published a report that identified a 30% increased risk of falling in older adults taking SSRIs and SNRIs.[49]

Additionally, a systematic review and meta-analysis published by AGS noted duloxetine as a causative agent for falls as compared to placebo.[50] The change in level of evidence related to this class reinforces that each patient and their unique clinical scenario should be considered when making recommendations based on the 2023 Beers Criteria.

### Additional relevant updates

The recommendation to avoid estrogens with or without progestins is not new in the 2023 Beers Criteria. The updated wording to the recommendation includes the statement to avoid initiating systemic estrogens (e.g., oral tablets or transdermal patches) and to consider deprescribing estrogens among older women already using these medications.[5]

Evidence supporting additional recommendations remains a hot topic for debate among geriatricians and gynecologists. The American College of Obstetricians and Gynecologists and the North American Menopause Society do not recommend the routine discontinuation of systemic estrogens in women based on age due to the paucity of evidence in this population.[51] The 2022 hormone therapy position statement of The North American Menopause Society states that extended duration of hormone therapy "remains an individual decision in select, well-counseled women aged older than 60 years to continue therapy."[52]

Shared decision-making should be used to evaluate benefits and risk of initiation or discontinuation of systemic estrogens in women older than 60 years.

It is also important to note that the gender-specific language is consistent with recommendations in publications but does not accurately represent individuals with differing identities.

PPIs are one of the most-prescribed medications and over 25% of Medicare Part D beneficiaries use them.[53] PPIs have been part of the Beers Criteria list PIMs since 2015 due to risk of *Clostridioides difficile* infection, bone loss, and fractures with use for greater than 8 weeks.[54] New supporting data for the 2023 Beers Criteria led to the addition of pneumonia and GI malignancies as possible risks with the use of the PPIs dexlansoprazole, esomeprazole, lansoprazole, omeprazole, pantoprazole, and rabeprazole.[5]

The mechanism of pneumonia development with prolonged PPI use relates back to the H+/K+–ATPase enzymes on which PPIs exert their effect. The reduction in acid secretion leads to a decreased innate immune response to bacterial infection and an increased risk of bacterial

micro-aspiration and pulmonary aspiration.[55] A 2018 longitudinal analysis of electronic medical records of adults 60 years and older found that long-term use of PPIs was associated with greater hazard of incident pneumonia.[56] The inhibition of gastric acid leading to hypergastrinemia, gastric atrophy, and bacterial overgrowth are also the potential source of GI malignancy with prolonged PPI use.[56] A recent systematic review with meta-analysis found an increased gastric cancer risk among PPI users.[57]

The 2023 Beers Criteria continues to recommend the avoidance of scheduled use of PPIs for longer than 8 weeks unless for high-risk patients (e.g., those who use oral corticosteroids or chronic NSAIDs), erosive esophagitis, Barret's esophagitis, pathologic hypersecretory condition, or demonstrated need for maintenance treatment (e.g., because of failure of drug discontinuation trial or H2-receptor antagonists.)[5] Like many medications on the 2023 Beers Criteria, to counteract the overprescription of PPIs, deprescribing guidelines specific to PPIs have been developed. The PPI Deprescribing Algorithm developed by the Canadian Medication Appropriateness and Deprescribing Network can serve as a tool when deprescribing PPIs.[58]

## Applying Beers Criteria updates in practice

As medication experts, pharmacists are uniquely positioned to prevent and reduce the incidence of ADEs in older adults.

Several studies have demonstrated the pharmacist's impact. One meta-analysis involving 13 studies and 6,198 patients conducted in Europe, North America, and Australia across a variety of clinical settings evaluated the impact of interventions to optimize medication use on ADEs in older adults.[59] Of the 13 studies included, eight included pharmacist-led intervention to identify medication-related problems. Pharmacists made recommendations to prescribers through various modes of communication, including in-person and electronic. Pharmacists also provided education directly to patients in some studies. The study found that patients randomized to the intervention group were 21% less likely to experience an ADE overall, and when restricted to only the 8 studies that included pharmacist-led intervention, patients were 35% less likely to experience an ADE.[59]

Six of the studies also evaluated the rate of serious ADEs, which was defined as those associated with hospitalization, prolonged hospitalization, permanent disability, need for intervention to prevent permanent impairment, or death. In those studies, patients who received intervention were 36% less likely to experience a serious ADE compared to the control group.[59]

This study is just one example of how pharmacists can be successful in preventing ADEs in older adults through a variety of mechanisms, whether it be providing recommendations directly to prescribers as part of the interdisciplinary team or speaking with patients and suggesting they follow up with their prescriber.

AGS provides some general criteria for how clinicians should interpret the recommendations included within the publication.[5] First, the term "avoid" is used throughout the Beers Criteria and has been since its inception. The expert panel acknowledges that medications listed as avoid "the medication should be avoided except under unusual circumstances."[5] It is important for pharmacists to remember that each patient has their own unique needs and goals.

When pharmacists see an older adult taking a medication included in the Beers Criteria, it is important to have a conversation with that patient or provider about the potential risks and considerations specific to that patient.

For example, consider the scenario of a presenting patient who has been taking and tolerating glipizide for years. As the patient's pharmacist, you engage in a conversation with the patient with the purpose of convincing them to change to a different agent that does not carry the same risk for hypoglycemia or cardiovascular mortality. In speaking with the patient, you learn

that they have had similar conversations with their prescriber, but they did not tolerate metformin in the past and are unable to afford the newer agents that are only available under a brand name. In this scenario, it is perfectly acceptable to educate the patient about signs and symptoms of hypoglycemia that they should be looking for.

In addition to the term "avoid," the Beers Criteria also includes a list of medications identified as "use with caution."[5] These medications may be lacking consistent evidence regarding potential harms of use. When a pharmacist sees one of these medications, additional education or monitoring can often be beneficial. For example, an older adult recently initiated on an SGLT-2 inhibitor should be educated about signs and symptoms of urogenital infections; however, the benefits of using the SGLT-2 inhibitor likely outweigh the risk of experiencing this ADE.

Lastly, within each section of the criteria, it is important for pharmacists to thoroughly read the recommendation and rationale. AGS has different recommendations that are specific to each medication and scenario that should be considered. For example, while use of benzodiazepines should generally be avoided due to numerous risks related in older adults, AGS

acknowledges indications in which the class may be appropriate, including seizure disorders, rapid eye movement sleep behavior disorder, benzodiazepine or ethanol withdrawal, severe generalized anxiety disorder and periprocedural anesthesia. This is just one of many examples in which a pharmacist's recommendation may change based on the rationale included.

In 2015 and 2019, AGS published companion articles that provided additional guiding principles for how to use the Beers Criteria. The purpose of these articles was to ensure proper interpretation of the criteria, and pharmacists should consider these principles when interpreting the Beers Criteria.[13,14] General principles for pharmacists to consider when using the Beers Criteria include

- Consider each patient's unique clinical scenario and circumstance. Medications included in the Beers Criteria serve as guidance for potentially inappropriate use.
- Thoroughly review and understand the rationale and recommendations for each medication included in order to communicate the most accurate information possible to providers.
- When you identify a potentially inappropriate medication, consider recommending deprescribing or offering appropriate alternatives depending on what is best for the patient.

As the most accessible and informed medication expert, pharmacists are key in ensuring safe use of medications in older adults. Multiple studies have shown that when a pharmacist performs a medication review in older adults, ADEs are prevented.[59]

The 2023 Beers Criteria serves as a resource to support medication safety and should be considered in clinical practice often. Take the few minutes to send a message, fax, or make a phone call—your action may improve the quality of or save a patient's life.

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# CPE Assessment

This assessment must be taken online; please see "CPE information" in the sidebar on the previous page for further instructions. The online system will present these questions in random order to help reinforce the learning opportunity. There is only one correct answer to each question.

**1. Which of the following increases the odds of an older adult experiencing an adverse drug event?**
a. Polypharmacy
b. Age-related pharmacokinetic changes
c. Age-related pharmacodynamic changes
d. All of the above

**2. According to CDC, older adults visit emergency departments more than ____ times a year due to an ADE?**
a. 350,000
b. 450,000
c. 550,000
d. 650,000

**3. What additional adverse outcomes were added to the 2023 Beers Criteria rationale to avoid the use of proton pump inhibitors in older adults?**
a. *Clostridioides difficile* infection and pneumonia
b. GI malignancies and pneumonia
c. Bone loss and fractures
d. Blood clots and bone loss

**4. What is the rationale for SGLT-2 inhibitors being listed as PIMs to be used with caution in older adults in the 2023 Beers Criteria?**
a. Increased risk of hypoglycemia and cardiovascular death
b. Dehydration and hyperglycemic diabetic ketoacidosis
c. Euglycemic diabetic ketoacidosis and urogenital infections
d. Increased risk of bleeding and intracranial hemorrhage

**5. In which of the following patients should baclofen be avoided based on updates to the 2023 Beers Criteria?**
a. A 74-year-old man with an eGFR of 65 mL/min/1.73 $m^2$ taking baclofen for chronic low back pain
b. A 66-year-old woman with an eGFR of 35 mL/min/1.73 $m^2$ taking baclofen for spasticity related to multiple sclerosis
c. A 55-year-old man with an eGFR of 90 mL/min/1.73 $m^2$ taking baclofen for chronic low-back pain
d. A 75-year-old woman with an eGFR of 70 mL/min/1.73 $m^2$ taking baclofen for spasticity related to multiple sclerosis

**6. Which of the following DOACs has the highest risk of major bleeding and GI bleeding in older adults?**
a. Apixaban
b. Dabigatran
c. Warfarin
d. Rivaroxaban

**7. According to the study by Fleet and colleagues, which of the following is true about the correlation between gabapentin use and altered mental status?**
a. Older adults taking gabapentin are more likely to experience altered mental status than those taking opioids.
b. Older adults taking gabapentin are more likely to die within 30 days than those taking opioids.
c. Older adults taking gabapentin at doses of >600 mg per day upon initiation are more likely to die within 30 days than those taking doses of <600 mg per day.
d. Older adults taking gabapentin at doses of >600 mg per day upon initiation are more likely to be hospitalized with altered mental status than those taking doses <600 mg per day.

**8. Based on a meta-analysis published by the *Journal of American Geriatrics Society*, which antidepressant may cause an increased risk of falls compared to placebo?**
a. Sertraline
b. Vilazodone
c. Escitalopram
d. Duloxetine

**9. How should pharmacists apply the updated 2023 Beers Criteria in practice?**
a. Restrict use of all medications listed as "avoid."
b. Recommend deprescribing anticoagulants when used long-term for VTE in older adults.
c. Make recommendations based on each patient's unique clinical scenario and goals.
d. Recommend alternative agents to reduce use of all medications with anticholinergic properties.

**10. Match the correct interpretation of terminology included within the 2023 Beers Criteria.**
a. Avoid: Avoid use of medications under all circumstances.
b. Use with caution: Avoid use of medications except under unusual circumstances.
c. Avoid: Avoid use of medications except under unusual circumstances.
d. Use with caution: Avoid use of medications unless the risk outweighs the potential benefit.