2019 AGS Beers Criteria for older adults

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Introduction

Polypharmacy, often defined as the use of five or more medications, is prevalent in adults ages 65 years and older, with 40% taking 5 to 9 medications and 18% taking 10 or more.[1] Polypharmacy can result in inappropriate prescribing of medications, causing adverse drug events (ADEs).[2] Studies have shown that ADEs in older adults can lead to increased emergency department visits and hospitalizations, resulting in increased health care utilization and cost.[1,3]

The Beers Criteria were first developed in 1991 by Mark H. Beers, MD, to decrease inappropriate prescribing and ADEs and, in particular, to identify medications or medication classes that should be avoided in older adults in nursing homes.[4] In 2011, after Beers's death, the American Geriatrics Society (AGS) began to oversee the revisions and updates to the criteria. AGS has provided updates to the criteria every 3 years, starting in 2012.[6,7] In January 2019, AGS published the latest update to the Beers Criteria for Potentially Inappropriate Medication Use in Older Adults. This update includes specific recommendations for a medication or therapeutic class that should not be considered or should be used with caution in older adults.[5]

Development of the AGS Beers Criteria

The AGS Beers Criteria are widely used by health care providers, researchers, and educators but are intended primarily for practicing clinicians to manage and improve the care of adults ages 65 years and older.[5] For the 2019 AGS Beers Criteria, an interdisciplinary expert panel reviewed published evidence since the last update in 2015, focusing on data from January 1, 2015, to September 30, 2017.[5] During the review process, the panel determined whether new criteria should be added or if existing criteria should be removed or changed. The aim was to provide an update using a comprehensive, systematic review and grading of the evidence on drug-related problems and adverse events in older adults.[5]

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Learning objectives
After participating in this activity, pharmacists will be able to
- Evaluate and make recommendations for medication regimens using the 2019 American Geriatrics Society Beers Criteria.
- Identify potentially inappropriate medications and drugs to be used with caution in older adults.
- Identify risks associated with clinically important drug–drug interactions in older adults.
- Develop an alternative therapeutic plan for medications that have varying doses, based on renal function in older adults.

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. **Which medication may increase the risk of delirium?**
   a. Pantoprazole
   b. Fluticasone
   c. Sertraline
   d. Ranitidine

2. **Which statement is correct?**
   a. SSRIs can increase the risk of syncopal episodes and falls.
   b. Vaginal estrogens may be appropriate for recurrent lower urinary tract infections.
   c. Meloxicam is more likely than other NSAIDs to have adverse CNS effects.
   d. Dextromethorphan/quinidine is not recommended for adults 80 years and older with pseudobulbar affect.

3. **The risk of hyponatremia is increased with use of escitalopram in combination with which of the following?**
   a. Tramadol
   b. TMP-SMX
   c. Bupropion
   d. Alprazolam

The writing committee for the 2019 update was tasked with the following:

- Incorporate new evidence on potentially inappropriate medications (PIMs) included in the 2015 AGS Beers Criteria, as well as develop new or modify existing criteria.
- Grade the strength and quality of each PIMs statement based on the level of evidence and strength of recommendation (see Table 1 in this CPE article).
- Convene an interdisciplinary panel of 13 experts in geriatric care and pharmacotherapy who would apply a modified Delphi method to reach consensus.
- Incorporate exceptions in the AGS Beers Criteria that the panel deemed clinically appropriate. These exceptions would be designed to make the criteria more individualized to clinical practice and be more relevant across care settings.

The 2019 update addresses medications through the following perspectives: medications that are potentially inappropriate in older adults, medications that may exacerbate a disease or syndrome, drugs to be used with caution in older adults, those with clinically important drug interactions, and those that should be avoided or have their dose reduced due to renal function.[5] Drugs with strong anticholinergic properties are one addition to the 2019 AGS Beers Criteria.

As mentioned above, the intent of the AGS Beers Criteria is to improve medication selection, educate clinicians and patients, reduce ADEs, and serve as a tool for evaluating quality of care, cost, and patterns of drug use among older adults.[5] However, these criteria are not meant to be used punitively but as a guide, along with clinical judgment. There are prescribing scenarios in which medications listed in the criteria cannot be avoided or the recommendation does not apply to a specific population. Therefore, clinicians should consider patient-specific factors when determining if a medication is to be discontinued, modified, or added.

Updates to the AGS Beers Criteria

The 2019 AGS Beers Criteria contain six tables: PIMs in older adults, drug–disease or drug–syndrome interactions that may exacerbate the disease or syndrome, drugs to be used with caution in older adults, drug–drug interactions that should be avoided in older adults, medications that should be avoided or have their dosage reduced with varying levels of kidney function in older adults, and drugs with strong anticholinergic properties. Tables 2 through 4 in this CPE article are modified versions of those six tables.

Changes to PIMs list

A few changes were made to the PIMs list from the 2015 to the 2019 criteria. Two medications were removed, three medications were added, and six medications or medication classes underwent modification of their recommendation (Table 2).

Ticlopidine and oral pentazocine were removed because they are no longer available on the U.S. market. Methscopolamine was added to the list of antispasmodics and pyrilamine to the list of first-generation antihistamines because of their strong anticholinergic properties. Another notable addition was glimepiride. Glimepiride was added to the list of sulfonylureas (chlorpropamide and glyburide) with the rationale of causing severe, prolonged hypoglycemia in older adults.[8] These three sulfonylureas are classified as long-acting agents that pose an increased risk of hypoglycemia because of decreased clearance, especially in older adults. However, glipizide, a short-acting sulfonylurea, is not on this list, indicating it is likely safer to use in older adults.

In addition, modifications were made to the 2015 medications or medication classes to improve clarity for users. Within cardiovascular medications, modifications were made to peripheral alpha-1 blockers and digoxin. Peripheral alpha-1 blockers have been on the Beers Criteria with the recommendation to "avoid use as an antihypertensive due to risk of orthostatic hypotension"; however, for further clarity, "for treatment of hypertension" was added with peripheral alpha-1 blockers with the same recommendation. Multiple modifications were made to digoxin to specifically address its use and rationale in heart failure and atrial fibrillation. In addition, quality of evidence was changed from moderate to low for use of digoxin in older adults with atrial fibrillation. For patients with heart failure, the recommendation specifies evidence regarding patients who have heart failure with reduced ejection fraction.[5]

Within endocrine medications, modifications were made to estrogen with or without progestin and sliding-scale insulin. The 2015 criteria recommendation stated that vaginal estrogen cream or tablets were acceptable to use at a low dose for management of dyspareunia, lower urinary tract infections, and other vaginal symptoms. To be more specific, "re-

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

Quality of evidence[a]	ACP-based approach	GRADE-based approach
High quality	"Evidence … obtained from one 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 five 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 (e.g., randomized vs. observational design, potential for confounding, bias in measurement) 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 (e.g., nature of study of population, comparison group, type of outcome measured) 4. *Imprecision:* Precision of estimates of effect 5. *Publication bias:* Risk of bias due to selective publication of results
Moderate quality	"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 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."	
↓ ↓ ↓ ↓ ↓		
Overall quality of evidence that supports a given criterion: high, moderate, low		
Strength of evidence[b]		
Strong	Harms, adverse events, and risks clearly outweigh benefits	
Weak	Harms, adverse events, and risks may not outweigh benefits.	

[a]Quality of evidence ratings for each criterion are based on synthetic assessment of two complementary approaches to evaluating the quality of evidence.
[b]Strength of evidence ratings for each criterion are based on synthetic integration of the quality of evidence, the frequency and severity of potential adverse events and relationship to potential benefits, and clinical judgment.
Abbreviations used: ACP, American College of Physicians; GRADE, Grading of Recommendations Assessment, Development, and Evaluation.
Source: Adapted with permission from reference 5.

current" was added to lower urinary tract infections to avoid increased risks of carcinogenic, cardiovascular, and cognitive effects in patients without an appropriate indication. Furthermore, a definition of sliding-scale insulin was added to decrease confusion for clinicians managing diabetes. The definition states "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."[5]

Additional modifications were made to metoclopramide, listed under the GI section, and to meperidine, listed under pain medications. The recommendation for metoclopramide was lengthened from "avoid, unless for gastroparesis" to "avoid, unless for gastroparesis, with duration of use not to exceed 12 weeks except in rare cases," noting the recommended duration of use.

This length of recommendation is important because chronic use of metoclopramide can cause tardive dyskinesia, which may be irreversible.[9] For meperidine, the 2015 criteria stated "avoid, especially in those with chronic kidney disease." The caveat "especially in those with chronic kidney disease" was removed because of the increased risk of adverse effects such as neurotoxicity and delirium in older adults, not just those with chronic kidney disease.

Changes to Drug–Disease or Drug–Syndrome Interactions section

The Drug–Disease or Drug–Syndrome Interactions section provides recommendations on medications or medication classes to avoid because of potential exacerbation of a disease or adverse effects. Specific areas of focus include cardiovascular, central nervous system (CNS), GI, and kidney/urinary tract. Four deletions, two additions, and six modifications were made to the 2015 criteria (Table 3).

Medications increasing the risk of chronic seizures or epilepsy as well as insomnia were removed, as these are not mutually exclusive to older adults. Histamine 2 (H2)-receptor antagonists were removed from the dementia section because of weak evidence. Furthermore, the panel stated that highlighting H2-receptor antagonists would limit therapeutic options for gastroesophageal reflux since PPIs are listed as a PIM.[5] In addition, aripiprazole was removed from the Parkinson's disease section as a preferred antipsychotic in older adults because of safety and efficacy concerns, such as extrapyramidal effects, irreversible cognitive decompensation, or death.[10] The preferred antipsychotics in older adults with Parkinson's disease include clozapine, quetiapine, and pimavanserin, the latter of which was approved by FDA in 2016. The panel also lengthened the rationale section for quetiapine, clozapine and pimavanserin, stating that "quetiap-

Table 2. Incorporated changes of potentially inappropriate medications in older adults

Medication or medication class	Recommendation; rationale *(changes to the 2015 criteria)*
Anticholinergics	
First-generation antihistamines	Avoid; clearance reduced with advanced age, and tolerance develops when used as hypnotic; risk of confusion, dry mouth, constipation, and other anticholinergic effects or toxicity
Antiparkinsonian agents (benztropine, trihexyphenidyl)	Avoid; not recommended for prevention of extrapyramidal symptoms with antipsychotics
Antispasmodics	Avoid; high anticholinergic and uncertain effectiveness
Antithrombotics	
Dipyridamole, oral short-acting	Avoid; may cause orthostatic hypotension, and more effective alternatives available; I.V. form acceptable to use in cardiac stress testing
Anti-infective	
Nitrofurantoin	Avoid in individuals with CrCL < 30 mL/min or long-term suppression; potential for pulmonary toxicity, hepatotoxicity, and peripheral neuropathy, especially with long-term use
Cardiovascular	
Peripheral alpha-1 blockers *for treatment of hypertension*	Avoid use as antihypertensive; high risk of orthostatic hypotension and associated harms, especially in older adults
Central-alpha agonists (clonidine, guanabenz, guanfacine, methyldopa, reserpine > 0.1 mg/d)	Avoid clonidine as first-line antihypertensive. Avoid other CNS alpha-agonists as listed; high risk of adverse CNS effects; may cause bradycardia and orthostatic hypotension
Disopyramide	Avoid; may induce heart failure in older adults because of potent inotropic action; strongly anticholinergic
Dronedarone	Avoid in individuals with permanent atrial fibrillation or severe or recently decompensated heart failure; worse outcomes have been reported in patients who have permanent atrial fibrillation or severe or recently decompensated heart failure
Digoxin *for first-line treatment of atrial fibrillation or heart failure*	Avoid this rate control agent as first-line therapy for atrial fibrillation. Avoid as first-line therapy for heart failure. If used, avoid dosages > 0.125 mg/d. Atrial fibrillation: should not be used as first-line because *there are safer* and more effective alternatives for rate control *supported by high-quality evidence.* Heart failure: *evidence for benefits and harms of digoxin is conflicting and of lower quality; most but not all of the 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.* Decreased renal clearance of digoxin may lead to increased risk of toxic effects. Further dose reduction may be necessary in those with Stage 4 or 5 chronic kidney disease.
Nifedipine, immediate release	Avoid; potential for hypotension; risk of precipitating myocardial ischemia
Amiodarone	Avoid as first-line therapy for atrial fibrillation unless patient has heart failure or substantial left ventricular hypertrophy; effective for maintaining sinus rhythm but has greater toxicities than other antiarrhythmics used in atrial fibrillation
CNS	
Antidepressants, alone or in combination (amitriptyline, amoxapine, clomipramine, desipramine, doxepin > 6 mg/d, imipramine, nortriptyline, paroxetine, protriptyline, trimipramine)	Avoid; high anticholinergic, sedating, and cause orthostatic hypotension
Antipsychotics, first (conventional) and second (atypical) generation	Avoid, except in schizophrenia, bipolar disorder, or for short-term use as antiemetic during chemotherapy; increased risk of cerebrovascular accident and greater rate of cognitive decline and mortality in persons with dementia; avoid for behavioral problems of dementia or delirium unless nonpharmacological options have failure or are not possible and the older adult is threatening substantial harm to self or others
Barbiturates	Avoid; high rate of physical dependence, tolerance to sleep benefits, greater risk of overdose at low dosages
Benzodiazepines (short, intermediate, and long-acting)	Avoid; older adults have increased sensitivity to and decreased metabolism with long-acting agents; increased risk of cognitive impairment, delirium, falls, fractures, and motor vehicle crashes; may be appropriate for seizure disorders, rapid eye movement sleep behavior disorder, benzodiazepine withdrawal, ethanol withdrawal, severe generalized anxiety disorder, and periprocedural anesthesia
Meprobamate	Avoid; high rate of physical dependence and sedating
Nonbenzodiazepine, benzodiazepine receptor agonist hypnotics (Z drugs)	Avoid; adverse events similar to those of benzodiazepines in older adults; increased emergency department visits/hospitalizations; motor vehicle crashes; minimal improvement in sleep latency and duration
Ergoloid mesylates	Avoid; lack of efficacy
Endocrine	
Androgens	Avoid unless indicated for confirmed hypogonadism with clinical symptoms; potential for cardiac problems; contraindicated in men with prostate cancer
Desiccated thyroid	Avoid; concerns about cardiac effects

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Table 2, continued

Estrogens with or without progestins	Avoid systemic estrogen (oral, topical). Vaginal cream or vaginal tablets acceptable to use low dose for management of dyspareunia, *recurrent* lower urinary tract infections, and other vaginal symptoms; carcinogenic potential; lack of cardio and cognitive protection
Growth hormone	Avoid, except for patients diagnosed with growth hormone deficiency due to an established etiology; impact on body composition is small and associated with edema, arthralgia, carpal tunnel syndrome, gynecomastia, and impaired fasting glucose
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)*	Avoid; higher risk of hypoglycemia without improvement in hyperglycemia management regardless of care setting
Megestrol	Avoid; minimal effect on weight with increased risk of thrombotic events and possibly death in older adults
Sulfonylureas, long-acting (chlorpropamide, glimepiride, glyburide)	Avoid; chlorpropamide: long half-life and can cause prolonged hypoglycemia and SIADH; glimepiride and glyburide: higher risk of severe prolonged hypoglycemia
GI	
Metoclopramide	Avoid, unless for gastroparesis *with duration not to exceed 12 weeks except in rare cases*; can cause extrapyramidal effects, including tardive dyskinesia
Mineral oil, given orally	Avoid; potential for aspiration and adverse effects
PPIs	Avoid scheduled use for > 8 weeks unless for high-risk patients, erosive esophagitis, Barrett's esophagitis, pathological hypersecretory condition, or demonstrated need for maintenance treatment; risk of Clostridium difficile infection, bone loss, and fractures
Pain medications	
Meperidine	Avoid; not effective in dosages commonly used and has a higher risk of neurotoxicity, including delirium, than other opioids
COX nonselective NSAIDs, oral	Avoid chronic use, unless other alternatives are not effective and patient can take gastroprotective agent; increased risk of GI bleeding or peptic ulcer disease in high-risk groups, including those > 75 years or taking oral or parenteral corticosteroids, anticoagulants, or antiplatelet agents; can increase blood pressure and induce kidney injury
Indomethacin, ketorolac, includes parenteral	Avoid; increased risk of GI bleeding/peptic ulcer disease and acute kidney injury; indomethacin is more likely than other NSAIDs to have adverse CNS effects
Skeletal muscle relaxants	Avoid; poorly tolerated by older adults because some have anticholinergic adverse effects, sedation, and increased risk of fractures
Genitourinary	
Desmopressin	Avoid for treatment of nocturia or nocturnal polyuria; high risk of hyponatremia

Note: Recommendations are underlined; italics denote changes to 2015 criteria.
Abbreviations used: CrCL, creatinine clearance; CNS, central nervous system; HFrEF, reduced ejection fraction.
Source: Adapted with permission from reference 5.

ine has only been studied in low-quality clinical trials with efficacy comparable to that of placebo in 5 trials and to that of clozapine in 2 others."[5]

In addition, SNRIs were added to the medication list for patients with a history of falls or fractures, joining anticonvulsants, antipsychotics, benzodiazepines, nonbenzodiazepine, benzodiazepine receptor agonist hypnotics (Z drugs), tricyclic antidepressants (TCAs), SSRIs, and opioids. These modifications are based on two studies in community-dwelling older adults.[11,12] One study assessed the risk of falls in older adults taking antidepressants, including venlafaxine, whereas the second study assessed the incidence of hip fractures among older adults taking antidepressants, including SNRIs. The study assessing fall risk found a 48% increase in the risk of falls in older adults taking antidepressants, whereas the other study found the rate of hip fractures was 2.28 (95% CI 1.94–2.61) per 100 person-years.[11,12] The 2019 criteria recommendation is to "avoid [antidepressants] unless safer alternatives are not available." The recommendation also mentions that "data for antidepressants are mixed[,] but [there is] no compelling evidence that certain antidepressants confer less fall risk than others."[5,11,12]

Other modifications were made to the heart failure, syncope, delirium, chronic kidney disease, and NSAID sections. In the heart failure section, modifications provided more information to the recommendations on medications to avoid. For instance, the 2015 criteria stated "avoid, potential to promote fluid retention and exacerbate heart failure."[7] The 2019 criteria list medications that may exacerbate heart failure or promote fluid retention: NSAIDs, COX-2 inhibitors, nondihydropyridine calcium channel blockers (CCBs), and thiazolidinediones. They also expand on avoiding nondihydropyridine CCBs in older adults with reduced ejection fraction and on considering NSAIDs, COX-2 inhibitors, dronedarone, and thiazolidinediones with caution in older adults who are asymptomatic. All of these medications should be avoided in older adults with symptomatic heart failure. In addition, the criteria include a statement about an increased risk of mortality with use of cilostazol and dronedarone in older adults with heart failure.[5]

For older adults with a history of syncope, the 2015 criteria recommended avoiding acetylcholinesterase inhibitors (AChEIs), peripheral alpha-1 blockers, tertiary TCAs, and a few antipsychotics (chlorpromazine, thioridazine, and olanzapine). Changes to the syncope section included specification of "nonselective" peripheral alpha-1 blockers (doxazosin,

Table 3. Incorporated changes of drug–drug, drug–disease, or drug–syndrome interactions in older adults

Medication or medication class	Recommendation; rationale *(changes to the 2015 criteria)*
Cardiovascular	
Heart failure (cilostazol, nondihydropyridine CCBs, NSAIDs, COX-2 inhibitors, thiazolidinediones, dronedarone)	Avoid: cilostazol; potential to increase mortality Avoid in HFrEF: nondihydropyridine CCBs; may promote fluid retention and/or exacerbate heart failure *Use with caution in patients with asymptomatic heart failure; avoid in patients with symptomatic heart failure:* NSAIDs, COX-2 inhibitors, and thiazolidinediones (may promote fluid retention and/or exacerbate heart failure); dronedarone (potential to increase mortality)
Syncope (AChEIs, nonselective peripheral alpha-1 blockers, tertiary TCAs, antipsychotics [chlorpromazine, thioridazine, olanzapine])	Avoid; AChEIs cause bradycardia; nonselective peripheral alpha-1 blockers cause orthostatic blood pressure changes; tertiary TCAs and antipsychotics increase risk of orthostatic hypotension and bradycardia
CNS	
Delirium (anticholinergics, antipsychotics, benzodiazepines, corticosteroids, H2-receptor antagonists, meperidine, Z drugs	Avoid; potential of inducing or worsening delirium; avoid antipsychotics for behavioral problems of dementia and/or delirium unless nonpharmacological options have failed or are not possible and the older adult is threatening substantial harm to self or others; antipsychotics are associated with greater risk of cerebrovascular accident and mortality in patients with dementia
Dementia or cognitive impairment (anticholinergics, benzodiazepines, Z drugs, antipsychotics used chronically and "as needed")	Avoid; adverse CNS effects; avoid antipsychotics for behavioral problems of dementia and/or delirium unless nonpharmacological options have failed or are not possible and the older adults is threatening substantial harm to self or others; antipsychotics are associated with greater risk of cerebrovascular accident and mortality in patients with dementia
History of falls or fractures (antiepileptics, antipsychotics, benzodiazepines, Z drugs, antidepressants [TCAs, SSRIs, SNRIs], opioids)	Avoid unless safer alternatives are not available; avoid antiepileptics except for seizure and mood disorders; avoid opioids except for pain management in setting of acute pain; may cause ataxia, impaired psychomotor function, syncope, additional falls
Parkinson disease (antiemetics [metoclopramide, prochlorperazine, promethazine], all antipsychotics except quetiapine, clozapine, and pimavanserin)	Avoid; dopamine-receptor antagonists with potential to worsen parkinsonian symptoms
GI	
History of gastric or duodenal ulcers (aspirin > 325 mg/d, COX-2 nonselective NSAIDs)	Avoid unless alternatives are not effective and patient can take gastroprotective agent; may exacerbate existing ulcers or cause new/additional ulcers
Kidney/urinary tract	
Chronic kidney disease stage 4 or higher, CrCL < 30 mL/min (NSAIDs)	Avoid; may increase risk of acute kidney injury and further decline of renal function
Urinary incontinence in women (oral and transdermal estrogen, peripheral alpha-1 blockers)	Avoid in women; oral estrogen: lack of efficacy Peripheral alpha-1 blockers: aggravation of incontinence
Lower urinary tract symptoms, benign prostatic hyperplasia (strongly anticholinergic drugs, except antimuscarinics for urinary incontinence)	Avoid in men; may decrease urinary flow and cause urinary retention
Drug–drug interactions	
RAS inhibitor or potassium-sparing diuretics and another RAS inhibitor	Avoid routine use in those with chronic kidney disease stage 3a or higher; increased risk of hyperkalemia
Opioids and benzodiazepines	*Avoid; increased risk of overdose*
Opioids and gabapentin, pregabalin	*Avoid; increased risk of severe sedation-related adverse events (respiratory depression and death)*
Anticholinergic and anticholinergic	Avoid; increased risk of cognitive decline
Antidepressants (TCAs, SSRIs, and SNRIs), antipsychotics, antiepileptics, benzodiazepines, Z drugs, and opioids plus any combination of three or more of these CNS-active drugs	Avoid total of three or more CNS-active drugs; All: increased risk of falls Benzodiazepines and Z drugs: increased risk of fracture
Corticosteroids (oral or parenteral) plus NSAIDs	Avoid; increased risk of peptic ulcer disease or GI bleeding
Lithium plus ACEIs or loop diuretics	Avoid; increased risk of lithium toxicity
Peripheral alpha-1 blockers plus loop diuretics	Avoid in older women; increased risk of urinary incontinence
Phenytoin plus TMP-SMX	Avoid; increased risk of phenytoin toxicity
Theophylline plus cimetidine or ciprofloxacin	*Avoid; increased risk of theophylline toxicity*
Warfarin plus amiodarone or *ciprofloxacin or macrolides (except azithromycin)* or *TMP-SMX* or NSAIDs	Avoid when possible; increased risk of bleeding

Note: Recommendations are underlined; italics denote changes to 2015 criteria.
Abbreviations used: CCBs, calcium channel blockers; HFrEF, reduced ejection fraction; AChEIs, acetylcholinesterase inhibitors; TCAs, tricyclic antidepressants; CNS, central nervous system; CrCL, creatinine clearance; RAS, renin-angiotensin system; TMP-SMX, trimethoprim/sulfamethoxazole.
Source: Adapted with permission from reference 5.

prazosin, and terazosin). The recommendation to avoid these medication classes remained the same; however, rationales were added for each medication class. For example, AChEIs should be avoided because of the risk of bradycardia, which may lead to a syncopal episode. The quality of evidence for this recommendation changed from moderate to high in the 2019 criteria. Nonselective peripheral alpha-1 blockers can cause orthostatic blood pressure changes, resulting in a syncopal episode. Last, tertiary TCAs and the listed antipsychotics may cause orthostatic hypotension or bradycardia. The quality of evidence for this recommendation was also changed from moderate to high. These medication class risks are not new. Instead, the 2019 criteria highlight the specific risk associated with each medication class.

Only minor changes were made within the delirium and chronic kidney disease sections. "Sedative/hypnotics" were changed to "nonbenzodiazepine, benzodiazepine receptor agonist hypnotics" in the delirium section, and the NSAID class was further explained in the chronic kidney disease section. One important change to the delirium section was decreasing the quality of evidence to "low" for H2-receptor antagonists. The quality of evidence for the risk of delirium is moderate for the remaining medication classes (i.e., anticholinergics, antipsychotics, benzodiazepines, corticosteroids, meperidine, nonbenzodiazepine, benzodiazepine receptor agonist hypnotics).

Changes to Clinically Important Drug–Drug Interactions list

The Clinically Important Drug–Drug Interactions list previously included "non–anti-infective" drug–drug interactions. The 2019 criteria includes non–anti-infective and anti-infective medications. Seven drug–drug interactions were added, and two drug–drug interactions were modified (Table 3).

Opioids and benzodiazepines, along with opioids and gabapentin/pregabalin, were added to the 2019 criteria, reflecting an increase in published evidence. The criteria recommend avoiding the combination of opioids and benzodiazepines because of the increased risk of overdose.[26–29] For the opioid and gabapentin/pregabalin combination, the recommendation is to avoid, except when transitioning from an opioid to gabapentin or pregabalin, or when using these medications to reduce the opioid dose. The rationale for avoiding this combination is an increased risk of sedation-related adverse events such as respiratory depression and death.[29] While clinicians may not be able to avoid these combinations in some of their patients, it is important to counsel patients on the potential risks associated with these medication combinations.

Other additions include interactions with anti-infective medications and warfarin that could lead to an increased bleeding risk. These medications include ciprofloxacin, TMP-SMX, and macrolides (except for azithromycin).[30] If possible, health care providers should avoid these combinations; however, if the combinations cannot be avoided, increased INR monitoring is recommended. Other combinations were added, such as phenytoin with TMP-SMX, because of the increased risk of phenytoin toxicity, and theophylline with ciprofloxacin, because of the increased risk of theophylline toxicity.[5]

Slight modifications were made to the ACEIs and ARBs section and the combination of three or more CNS agents section. The title of the ACEI section was changed to renin-angiotensin system (RAS) inhibitors, further specifying the interaction between different RAS inhibitors and not just ACEIs. Within the CNS agents section, the medication classes were listed separately in the 2015 criteria. The 2019 criteria have all the medication classes listed together with one recommendation.

Changes to Use with Caution list

The Use with Caution list provides recommendations for medications or medication classes that should be used with caution in older adults. The list focuses on specific ages and patient populations and therefore may not be applicable to all older adults age 65 years, depending on the medication and indication. Five deletions, four additions, and three modifications were made to the 2015 criteria.

Four medications (carboplatin, cyclophosphamide, cisplatin, and vincristine) within the syndrome of inappropriate antidiuretic hormone secretion (SIADH) were removed because they are specialized drugs beyond the scope of the criteria. However, tramadol was added to the list based on evidence of hospitalization from hyponatremia.[13] The 2019 list of medications that may exacerbate or cause SIADH/hyponatremia includes antipsychotics, carbamazepine, diuretics, mirtazapine, oxcarbazepine, SNRIs, SSRIs, TCAs, and tramadol. In addition, vasodilators were removed as agents that may cause syncope, as use of these agents is not unique to the older adult population.

Rivaroxaban was added to the list, which included dabigatran, with the recommendation to "use with caution for treatment of venous thromboembolism (VTE) or atrial fibrillation in adults ≥ 75 years old." Previously, the list had only contained dabigatran and did not specify VTE and atrial fibrillation, but recent evidence suggests an increased risk of GI bleeding compared with warfarin in adults ages 75 years and older being treated for VTE or atrial fibrillation.[14–18] Currently, apixaban, edoxaban, and warfarin are not on the Use with Caution list. Evidence suggests that apixaban is the safest anticoagulant for older adults.[19]

Other additions include dextromethorphan/quinidine and trimethoprim–sulfamethoxazole (TMP-SMX). Dextromethorphan/quinidine is indicated for patients with pseudobulbar affect. It was added because of the risk of drug–drug interactions, potential to increase fall risk, and limited efficacy for use in patients with behavioral symptoms related to dementia.[20] TMP-SMX was added because of the increased risk of hyperkalemia in combination with ACEIs and ARBs in patients with reduced kidney function.[21,22] For older adults taking this combination, clinicians may need to monitor potassium more frequently, especially in patients with a decreased creatinine clearance (CrCL).

Furthermore, modifications were made to prasugrel and aspirin for primary prevention. The 2015 recommendation and rationale for prasugrel stated, "Use with cau-

Table 4. Incorporated changes of medications to avoid or dose reduce with varying levels of kidney function

Medication and CrCL, mL/min	Recommendation; rationale *(changes to the 2015 criteria)*
Ciprofloxacin < 30	*Doses used to treat common infections typically require reduction; increased risk of CNS effects and tendon rupture*
TMP-SMX < 30	*Reduce dose if CrCL 15–29 mL/min, and avoid if < 15 mL/min; increased risk of worsening renal function and hyperkalemia*
Amiloride < 30	Avoid; increased potassium and decreased sodium
Apixaban < 25	Avoid; *lack of evidence for efficacy and safety*
Dabigatran < 30	Avoid, *dose adjustment advised with CrCL > 30 mL/min if drug–drug interactions; lack of evidence for efficacy and safety*
Dofetilide < 60	Reduce dose if CrCL 20–59 mL/min and avoid if < 20 mL/min; QTc prolongation and torsades de pointes
Edoxaban 15–50 and < 15 or > 95	*Reduce dose if CrCL 15–50 mL/min; avoid if CrCL < 15 or > 95 mL/min; lack of evidence for efficacy and safety*
Enoxaparin < 30	Reduce dose; increased risk of bleeding
Fondaparinux < 30	Avoid; increased risk of bleeding
Rivaroxaban < 50	*Nonvalvular atrial fibrillation: Reduce dose if CrCL 15–50 mL/min, and avoid if < 15 mL/min; VTE: avoid if CrCL < 30 mL/min; lack of evidence for efficacy or safety*
Spironolactone < 30	Avoid; increased potassium
Triamterene < 30	Avoid; increased potassium and decreased sodium
Duloxetine < 30	Avoid; increased GI adverse effects
Gabapentin < 60	Reduce dose; CNS adverse effects
Levetiracetam ≤ 80	Reduce dose; CNS adverse effects
Pregabalin < 60	Reduce dose; CNS adverse effects
Tramadol < 30	Immediate release: reduce dose; extended release: avoid; CNS adverse effects
Cimetidine < 50	Reduce dose; mental status changes
Famotidine < 50	Reduce dose; mental status changes
Nizatidine < 50	Reduce dose; mental status changes
Ranitidine < 50	Reduce dose; mental status changes
Colchicine < 30	Reduce dose and monitor for adverse effects; GI, neuromuscular, bone marrow toxicity
Probenecid < 30	Avoid; loss of effectiveness

Note: Recommendations are underlined; italics denote changes to 2015 criteria.
Source: Adapted with permission from reference 5.

tion in adults aged ≥ 75 years; increased risk of bleeding in older adults; benefit in highest-risk older adults may offset risk." The recommendation did not change; however, "when used for its approved indication of acute coronary syndrome to be managed with percutaneous coronary intervention" was added to the rationale, further specifying the indication for use.

To incorporate recent evidence on use of aspirin for primary prevention, modifications were made to age, indication, rationale, and quality of evidence. The "use with caution" age was lowered from 80 years to 70 years with the rationale that increased risk of major bleeding increases with older age.[23] The rationale also highlights a lack of net benefit for aspirin use for primary prevention in older adults with cardiovascular risk factors. However, it does state that aspirin is indicated for secondary prevention in older adults with established cardiovascular disease. In addition, the quality of evidence was changed from low to moderate on the basis of results from the Aspirin in Reducing Events in the Elderly (ASPREE) trial.[24,25] The ASPREE trial included adults aged 65 years and older without cardiovascular disease who were assigned to either aspirin or placebo. The results showed increased mortality and risk of major hemorrhage in the aspirin group.[24,25] Because the evidence shows that the risks outweigh the benefits, clinicians should consider discontinuing aspirin for primary prevention in adults ages 70 years and older.

Changes to Medications That Should Be Avoided or Have Their Dosage Reduced list

The Medications That Should be Avoided or Have Their Dosage Reduced list previously included non–anti-infective medications. The 2019 list added two anti-infective medications and modified four medications previously on the list (Table 4).

Ciprofloxacin and TMP-SMX were added to the 2019 criteria. Both medications require provider action when the CrCL is less than 30 mL/min. Specifically, the dose of ciprofloxacin should be decreased when the CrCL is less than 30 mL/min, as a higher dose carries an increased risk of tendon rupture and CNS effects, such as seizures and confusion.[31,32] For TMP-SMX, the dose should be reduced when the CrCL is 15–29 mL/min and avoided when the CrCL is less than 15 mL/min because of an increased risk of hyperkalemia and worsening of renal function.[33] Both of these anti-infectives are commonly used in older adults to treat infections such as urinary tract infections; however, with evidence of antimicrobial resistance to TMP-SMX along with FDA warnings for fluoroquinolones, it is important to ensure appropriate use of these medications in older adults, especially those with reduced renal function.[34,35]

Updates were made to the direct oral anticoagulants to reflect current labeling dosing recommendations. For

example, the CrCL threshold to avoid edoxaban use was lowered from a CrCL of less than 30 mL/min to less than 15 mL/min. The only anticoagulant that does not require renal adjustment is warfarin; however, clinicians should consider the increased number of bleeding events, drug–drug interactions, and drug–food interactions with use of warfarin.[36]

Application of the 2019 AGS Beers Criteria

The AGS Beers Criteria can assist clinicians in making safer therapeutic decisions during patient evaluations. Its recommendations and rationales help clinicians determine if a medication or group of medications is appropriate for older adults. Use of the criteria in practice can help clinicians prioritize medications that may need to be eliminated or recommend an alternative medication.

PIMs List

The PIMs list can help clinicians determine which medications may be causing adverse effects in an older adult as well as which should be avoided, if possible. Clinicians can use this list when reviewing medications for a new patient or prescribing new medications. If an older adult is taking a medication that has a preferable alternative, clinicians can use the rationales provided as talking points when suggesting a safer alternative.

Patient case

An 82-year-old man with a medical history of atrial fibrillation, depression, heart failure with reduced ejection fraction, osteoarthritis, and type 2 diabetes is being seen for the first time in your clinic. He was recently hospitalized for a heart failure exacerbation, and you are reviewing his medications. He is taking 200 mg daily, aspirin 81 mg daily, duloxetine 60 mg daily, furosemide 40 mg tablet daily, glipizide 5 mg (one tablet twice daily), ibuprofen 200 mg (three tablets three times daily), lisinopril 40 mg daily, metformin 500 mg (two tablets twice daily), metoprolol succinate 25 mg daily, and warfarin 5 mg daily.

You refer to the PIMs list and recommend the following to the patient: "It looks like you use ibuprofen for your osteoarthritis. However, this medication can cause bleeding in your stomach if used for long periods of time. I would recommend an alternative medication, such as acetaminophen. Acetaminophen is effective for osteoarthritis and does not have the risk of bleeding."

Drug–Disease or Drug–Syndrome list

The Drug–Disease or Drug–Syndrome list provides recommendations on medications or medication classes in older adults with a specific disease or syndrome such as dementia or cognitive impairment, falls, and syncope. If these medications are used, the potential of exacerbating the disease or syndrome exists. The list is categorized by system, making it easier for clinicians to use in practice.

Using the Drug–Disease or Drug–Syndrome list, make the following recommendation to the provider (see Patient Case sidebar): "The patient's ibuprofen likely contributed to his heart failure exacerbation by promoting fluid retention. I would consider an alternative agent, such as acetaminophen, for his osteoarthritis."

Use with Caution list

The Use with Caution list contains medications or medication classes that do not have the same "avoid" recommendation as the previous lists. This list can be used as guidance for medication monitoring, for example, hyponatremia or hyperkalemia. In addition, the Use with Caution list has recommendations for older adults based on their age and may not apply to all adults ages 65 years and older.

Using the Use with Caution list, make the following recommendation to the provider (see Patient Case sidebar): "The patient is at an increased risk of bleeding due to aspirin therapy. Evidence suggests there is a lack of benefit for use of aspirin for primary prevention of cardiovascular disease and colorectal cancer."

Drug–Drug Interactions list

The Drug–Drug Interactions list provides recommendations on medication combinations to avoid. If combinations are unavoidable, the list provides additional monitoring to avoid ADEs.

Using the Drugs–Drug Interactions list, make the following recommendation to the provider (see Patient Case sidebar): "I recommend close monitoring of the patient's INR to avoid a drug–drug interaction between warfarin and amiodarone that would increase the risk of bleeding. If the patient is unable to have regular INR checks, I would consider an alternative, such as apixaban."

Medications to Avoid or Dose Reduced list

The Medications to Avoid or Dose Reduced list provides recommendations to clinicians when action is required. The list also provides the adverse effect that may occur if the medication is used below the suggested CrCL. In clinical practice, many patients have fluctuating renal function. This tool assists with recommendations for increased monitoring for these patients.

The provider (see Patient Case sidebar) checks the patient's renal function, and his CrCL is 23 mL/min. The provider would like to know if any of the medications should be dose reduced or avoided. Using the Medications to Avoid or Dose Reduced list, make the following recommendation: "Because his CrCL is less than 30 mL/min, the patient is at an increased risk of GI adverse effects from duloxetine. I would recommend an alternative agent."

Summary

The 2019 AGS Beers Criteria provide new evidence-based recommendations to the 2015 criteria. The criteria are meant to be used as a tool for practicing clinicians to help reduce adverse events in older adults and are not meant to be punitive. Use of the five different lists can assist clinicians during medication reviews. In some circumstances, medications included in the AGS Beers Criteria cannot be avoided. For these scenarios, the AGS Beers Criteria offer a rationale for why the medication or medication class should not be used, providing insight on additional monitoring for clinicians. Practicing clinicians should be aware of updates to the AGS Beers Criteria to ensure appropriate medication use when caring for older adults.

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CPE assessment

This assessment must be taken online; please see "CPE information" in the sidebar below 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.

[The following patient case applies to question 1.] You are evaluating the medications of a 91-year-old man. His past medical history includes BPH, dementia, depression, hypertension, and pain. His medications are amlodipine 5-mg tablet by mouth daily, aspirin 81-mg tablet by mouth daily, diclofenac sodium 1% gel applied topically as needed, donepezil 5-mg tablet by mouth daily, escitalopram 10-mg tablet by mouth daily, and tamsulosin 0.4-mg tablet by mouth daily. Pertinent labs are BP = 134/78 mm Hg, HR = 70 bpm, and SCr = 0.8 mg/dL.

1. **According to the 2019 AGS Beers Criteria, which statement is correct?**
   a. Aspirin should not be considered for primary prevention because of the increased risk of major bleeding.
   b. The combination of donepezil and amlodipine causes syncopal episodes and should be avoided.
   c. Tamsulosin should be avoided because of the risk of orthostatic hypotension.
   d. The combination of diclofenac gel and escitalopram increases the risk of bleeding and should be avoided.

2. **Which medication and dose are inappropriate for a 75-year-old woman with a CrCL of 25 mL/min?**
   a. Ciprofloxacin 500-mg tablet every 24 hours
   b. Gabapentin 300-mg capsule nightly
   c. Nitrofurantoin 100-mg capsule twice daily
   d. Ranitidine 150-mg tablet daily

[The following patient case applies to questions 3 and 4.] You are reviewing medications for an 82-year-old woman with a medical history of atrial fibrillation, type 2 diabetes, dyslipidemia, gastroesophageal reflux disease, hypertension, and osteoporosis. Her estimated CrCL is approximately 45 mL/min. Her medications are alendronate 70-mg tablet by mouth once weekly, apixaban 5-mg tablet by mouth twice daily, atorvastatin 20-mg tablet by mouth daily, calcium carbonate 600-mg tablet by mouth twice daily, digoxin 0.25-mg tablet by mouth daily, vitamin D_2 2,000-unit tablet by mouth daily, gabapentin 600-mg capsule by mouth nightly, glipizide 5-mg tablet by mouth every morning, lisinopril 20-mg tablet by mouth daily, metformin 500-mg tablet by mouth twice daily, and ranitidine 150-mg tablet by mouth daily.

3. **According to the 2019 AGS Beers Criteria, which of the following medications is matched with the correct "inappropriate use" statement?**
   a. Apixaban: not recommended in older adults because of the increased risk of bleeding
   b. Digoxin: not recommended as a first-line agent for atrial fibrillation
   c. Gabapentin: dose should be reduced to 300 mg nightly because CrCL is less than 50 mL/min
   d. Glipizide: use should be avoided because of prolonged hypoglycemia

4. **Which statement and drug–drug interaction are correct?**
   a. Gabapentin and hydrocodone–acetaminophen: increased risk of respiratory depression
   b. Lisinopril and losartan: increased risk of renal failure
   c. Naproxen and prednisone: increased risk of declining bone mineral density
   d. Oxybutynin and diphenhydramine: increased risk of sialorrhea

[The following patient case applies to question 5.] A 79-year-old man is admitted to the hospital because of confusion and a recent fall. His medications are gabapentin 600-mg capsule by mouth twice daily, lisinopril 10-mg tablet by mouth daily, metoprolol tartrate 25-mg tablet by mouth twice daily, venlafaxine extended release 37.5-mg capsule by mouth daily, and warfarin 5-mg tablet by mouth daily. His pertinent labs are BP = 128/79 mm Hg; HR = 65 bpm; SCr = 1.3 mg/dL; CrCL = 23 mL/min; K = 4.5 mEq/L; Na = 137 mEq/L; and INR = 2.1.

CPE information

To obtain the 2.0 contact hours (0.2 CEUs) of CPE credit for this activity, you must complete the online assessment with a passing grade of 70% or better, complete the evaluation, and CLAIM CREDIT at http://bit.ly/APhAPT_CPE1119. You will have two opportunities to successfully complete the assessment, and the questions will be in randomized order. The current policy of the APhA Education Department is not to release the correct answers to any of our CPE tests.

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5. Which medication adjustment is necessary?

a. Decrease dose of warfarin to 2.5 mg daily.
b. Discontinue venlafaxine.
c. Decrease dose of gabapentin to 600 mg daily.
d. Discontinue lisinopril.

[The following patient case applies to questions 6 through 8.] You are providing medication recommendations for an 85-year-old woman with a medical history of anxiety, atrial fibrillation, Barrett's esophagus, depression, heart failure with reduced ejection fraction, hypertension, and insomnia. Her medications are amiodarone 200-mg tablet by mouth daily, apixaban 5-mg tablet by mouth twice daily, calcium carbonate 600-mg tablet by mouth twice daily, cholecalciferol 1,000-unit tablet by mouth daily, duloxetine 60-mg capsule by mouth daily, furosemide 20-mg tablet by mouth twice daily, lisinopril 20-mg tablet by mouth daily, lorazepam 0.5-mg tablet by mouth nightly, metoprolol succinate 50-mg tablet by mouth daily, mirtazapine 15-mg tablet by mouth nightly, omeprazole 20-mg capsule by mouth every morning, and zolpidem 5-mg tablet by mouth nightly as needed.

6. According to the 2019 AGS Beers Criteria, which recommendation and rationale are correct?

a. Amiodarone should be discontinued given the patient's heart failure.
b. Duloxetine should be discontinued because of the interaction with apixaban, increasing the bleeding risk.
c. Omeprazole should be discontinued if the patient has been using it for longer than 8 weeks.
d. Zolpidem should be discontinued because of the interaction between duloxetine and lorazepam, increasing fall risk.

7. Which statement is correct?

a. The patient's sodium levels should be closely monitored because of the use of furosemide, duloxetine, and mirtazapine.
b. Rivaroxaban is the preferred anticoagulant in patients ages 75 years and older.
c. The patient's omeprazole should be switched to ranitidine to decrease the risk of renal impairment.
d. The patient's duloxetine should be switched to venlafaxine if her CrCL is less than 50 mL/min.

8. Her primary care provider would like to start sulfamethoxazole–trimethoprim (TMP-SMX) to treat a potential urinary tract infection. You provide the following information to the provider:

a. TMP-SMX may cause hypokalemia when used in combination with furosemide.
b. TMP-SMX may cause hyperkalemia when used in combination with lisinopril.
c. TMP-SMX may decrease the effects of apixaban.
d. TMP-SMX may decrease the effects of amiodarone.

[The following patient case applies to questions 9 and 10.] You are providing medication recommendations for a 76-year-old man with a medical history of atrial fibrillation, depression, heart failure with reduced ejection fraction, hypertension, insomnia, and osteoarthritis has a CrCL of 21 mL/min. Her medications are acetaminophen 500-mg tablet, take one to two tablets every 8 hours as needed; dabigatran 75-mg capsule by mouth twice daily; furosemide 40-mg tablet by mouth daily; lisinopril 20-mg tablet by mouth daily; metoprolol succinate 100-mg tablet by mouth daily; venlafaxine extended release 75-mg tablet by mouth daily; and zolpidem 5-mg tablet by mouth nightly.

9. Which medication recommendation is correct?

a. The patient's dabigatran should be switched to rivaroxaban 20-mg tablet by mouth daily.
b. The patient's venlafaxine should be switched to duloxetine 30-mg capsule by mouth daily.
c. The patient's dabigatran should be switched to rivaroxaban 15-mg tablets by mouth daily.
d. The patient's venlafaxine should be dose reduced to 37.5-mg tablet daily.

10. Which drug–drug interaction and recommendation are correct?

a. Prazosin and furosemide: Avoid in women because of increased risk of urinary incontinence.
b. Lithium and lisinopril: Avoid because of increased risk of hyperkalemia.
c. Hydrocortisone cream and naproxen: Avoid because of increased risk of GI bleeding.
d. Phenytoin and TMP-SMX: Avoid because of increased risk of renal failure.

[The following patient case applies to questions 11 through 13.] You are providing medication recommendations for a 77-year-old woman with a medical history of atrial fibrillation, depression, diabetes, hypertension, hypothyroidism, osteoporosis, and urinary incontinence. Her medications are alendronate 70-mg tablet by mouth once weekly; amlodipine 10-mg tablet by mouth daily; aspirin 81-mg tablet by mouth daily; escitalopram 10-mg tablet by mouth daily; estradiol 0.025-mg patch weekly; glimeperide 2-mg tablet by mouth daily; levothyroxine 88-mcg tablet by mouth daily; losartan 50-mg tablet by mouth daily; metformin 500-mg tablet, take by mouth twice daily; oxybutynin 5-mg tablet by mouth twice daily; and rivaroxaban 20-mg tablet by mouth daily. Her labs are BP = 133/78 mm Hg, HR = 78 bpm, weight = 70 kg, SCr = 0.93 mg/dL, TSH = 4.1 mU/l, and A1C = 7.9 %.

11. Which medication recommendation is appropriate?

a. Switch escitalopram to duloxetine to decrease the risk of falls.
b. Add omeprazole to decrease the risk of GI bleeding.
c. Discontinue estradiol due to lack of evidence.
d. Decrease oxybutynin to 5-mg tablet by mouth daily to decrease risk of confusion.

12. The patient recently fell because of lightheadedness when she got out of bed. Which medication recommendation is appropriate?

a. Switch glimeperide to glipizide 5-mg tablet by mouth daily.
b. Increase levothyroxine to 100-mcg tablet by mouth daily.
c. Discontinue losartan.
d. Decrease escitalopram to 5-mg tablet by mouth daily.

13. Two weeks later, the patient went to the emergency department because of bloody stools. Which statement is correct?

a. Dabigatran is preferred over rivaroxaban in patients 75 years and older.
b. Aspirin is not recommended for primary prevention in patients 70 years and older.
c. Rivaroxaban's dose should be decreased to 15-mg tablet by mouth daily.
d. The patient should be on lifelong PPI therapy.

14. Which medication may increase the risk of delirium?

a. Pantoprazole
b. Fluticasone
c. Sertraline
d. Ranitidine

15. Which statement is correct?

a. SSRIs can increase the risk of syncopal episodes and falls.
b. Vaginal estrogens may be appropriate for recurrent lower urinary tract infections.
c. Meloxicam is more likely than other NSAIDs to have adverse CNS effects.
d. Dextromethorphan/quinidine is not recommended for adults 80 years and older with pseudobulbar affect.

16. The risk of hyponatremia is increased with use of escitalopram in combination with which of the following?

a. Tramadol
b. TMP-SMX
c. Bupropion
d. Alprazolam

17. Which medication recommendation is appropriate?

a. Discontinue tramadol in a patient with a CrCL less than 30 mL/min.
b. Decrease ranitidine 150 mg daily to 75 mg daily with a CrCL less than 50 mL/min.
c. Discontinue apixaban in a patient with a CrCL less than 25 mL/min.
d. Decrease duloxetine 60-mg daily to 30-mg daily with a CrCL less than 20 mL/min.

18. An 81-year-old man was recently hospitalized because of a fall that resulted in a hip fracture. The patient's CrCL was 42 mL/min. Which medication likely contributed to the patient's fall and should be adjusted?

a. Duloxetine 60-mg capsule by mouth daily
b. Gabapentin 300-mg capsule, take two by mouth three times daily
c. Ranitidine 150-mg tablet by mouth daily
d. Spironolactone 25-mg tablet, take one by mouth twice daily

[The following patient case applies to questions 19 and 20.] You are newly managing a 77-year-old man with type 2 diabetes. His A1C is 10.1%. He is currently on metformin extended-release 750-mg tablet by mouth twice daily. You would like to initiate another medication to reduce his A1C.

19. Which statement is correct?

a. All sulfonylureas should be avoided because of their risk of prolonged hypoglycemia
b. Humalog 5 units before meals is preferred over lantus 10 units daily.
c. Glimeperide and glipizide are preferred over glyburide.
d. Short- or rapid-acting insulins are recommended to be used in regimens with a long-acting insulin

20. Which medication combination is matched with the correct disease or syndrome?

a. Donepezil and olanzapine increase the risk of syncope.
b. Diphenhydramine and citalopram may cause dementia.
c. Dihydropyridine calcium channel blockers and cilostazol should be avoided in patients with heart failure because of exacerbation of fluid retention.
d. Metoclopramide and pimavanserin should be avoided because of worsening symptoms of Parkinson's disease.