AGS BEERS CRITERIA
FOR POTENTIALLY INAPPROPRIATE MEDICATION USE IN OLDER ADULTS

FROM THE AMERICAN GERIATRICS SOCIETY

This clinical tool, based on T*he AGS 2012 Updated Beers Criteria for Potentially Inappropriate Medication Use in Older Adults (AGS 2012 Beers Criteria)*, has been developed to assist healthcare providers in improving medication safety in older adults. Our purpose is to inform clinical decision-making concerning the prescribing of medications for older adults in order to improve safety and quality of care.

Originally conceived of in 1991 by the late Mark Beers, MD, a geriatrician, the *Beers Criteria* catalogues medications that cause adverse drug events in older adults due to their pharmacologic properties and the physiologic changes of aging. In 2011, the AGS undertook an update of the criteria, assembling a team of experts and funding the development of the AGS 2012 *Beers Criteria* using an enhanced, evidence-based methodology. Each criterion is rated (quality of evidence and strength of evidence) using the American College of Physicians' Guideline Grading System, which is based on the GRADE scheme developed by Guyatt et al.

The full document together with accompanying resources can be viewed online at www.americangeriatrics.org.

INTENDED USE

The goal of this clinical tool is to improve care of older adults by reducing their exposure to Potentially Inappropriate Medications (PIMs).

- This should be viewed as a guide for identifying medications for which the risks of use in older adults outweigh the benefits.
- These criteria are not meant to be applied in a punitive manner.
- This list is not meant to supersede clinical judgment or an individual patient's values and needs. Prescribing and managing disease conditions should be individualized and involve shared decision-making.
- These criteria also underscore the importance of using a team approach to prescribing and the use of non-pharmacological approaches and of having economic and organizational incentives for this type of model.
- Implicit criteria such as the STOPP/START criteria and Medication Appropriateness Index should be used in a complementary manner with the 2012 AGS *Beers Criteria* to guide clinicians in making decisions about safe medication use in older adults.

The criteria are not applicable in all circumstances (eg, patient's receiving palliative and hospice care). If a clinician is not able to find an alternative and chooses to continue to use a drug on this list in an individual patient, designation of the medication as potentially inappropriate can serve as a reminder for close monitoring so that the potential for an adverse drug effect can be incorporated into the medical record and prevented or detected early.

TABLE 1: 2012 AGS Beers Criteria for Potentially Inappropriate Medication Use in Older Adults

Organ System/ Therapeutic Category/Drug(s)	**Recommendation**, Rationale, *Quality of Evidence (QE) & Strength of Recommendation (SR)*
Anticholinergics (excludes TCAs)	
First-generation antihistamines (as single agent or as part of combination products) ■ Brompheniramine ■ Carbinoxamine ■ Chlorpheniramine ■ Clemastine ■ Cyproheptadine ■ Dexbrompheniramine ■ Dexchlorpheniramine ■ Diphenhydramine (oral) ■ Doxylamine ■ Hydroxyzine ■ Promethazine ■ Triprolidine	**Avoid.** Highly anticholinergic; clearance reduced with advanced age, and tolerance develops when used as hypnotic; increased risk of confusion, dry mouth, constipation, and other anticholinergic effects/ toxicity. Use of diphenhydramine in special situations such as acute treatment of severe allergic reaction may be appropriate. *QE = High (Hydroxyzine and Promethazine), Moderate (All others); SR = Strong*
Antiparkinson agents ■ Benztropine (oral) ■ Trihexyphenidyl	**Avoid.** Not recommended for prevention of extrapyramidal symptoms with antipsychotics; more effective agents available for treatment of Parkinson disease. *QE = Moderate; SR = Strong*

Table 1 (continued on page 2)

Table 1 (continued from page 1)

TABLE 1: 2012 AGS Beers Criteria for Potentially Inappropriate Medication Use in Older Adults

Organ System/ Therapeutic Category/Drug(s)	**Recommendation**, Rationale, *Quality of Evidence (QE) & Strength of Recommendation (SR)*
Antispasmodics ■ Belladonna alkaloids ■ Clidinium-chlordiazepoxide ■ Dicyclomine ■ Hyoscyamine ■ Propantheline ■ Scopolamine	**Avoid except in short-term palliative care to decrease oral secretions.** Highly anticholinergic, uncertain effectiveness. *QE = Moderate; SR = Strong*
Antithrombotics	
Dipyridamole, oral short-acting* *(does not apply to the extended-release combination with aspirin)*	**Avoid.** May cause orthostatic hypotension; more effective alternatives available; IV form acceptable for use in cardiac stress testing. *QE = Moderate; SR = Strong*
Ticlopidine*	**Avoid.** Safer, effective alternatives available. *QE = Moderate; SR = Strong*
Anti-infective	
Nitrofurantoin	**Avoid for long-term suppression; avoid in patients with CrCl <60 mL/min.** Potential for pulmonary toxicity; safer alternatives available; lack of efficacy in patients with CrCl <60 mL/min due to inadequate drug concentration in the urine. *QE = Moderate; SR = Strong*
Cardiovascular	
Alpha$_1$ blockers ■ Doxazosin ■ Prazosin ■ Terazosin	**Avoid use as an antihypertensive.** High risk of orthostatic hypotension; not recommended as routine treatment for hypertension; alternative agents have superior risk/ benefit profile. *QE = Moderate; SR = Strong*
Alpha agonists ■ Clonidine ■ Guanabenz* ■ Guanfacine* ■ Methyldopa* ■ Reserpine (>0.1 mg/day)*	**Avoid clonidine as a first-line antihypertensive. Avoid others as listed.** High risk of adverse CNS effects; may cause bradycardia and orthostatic hypotension; not recommended as routine treatment for hypertension. *QE = Low; SR = Strong*
Antiarrhythmic drugs (Class Ia, Ic, III) ■ Amiodarone ■ Dofetilide ■ Dronedarone ■ Flecainide ■ Ibutilide ■ Procainamide ■ Propafenone ■ Quinidine ■ Sotalol	**Avoid antiarrhythmic drugs as first-line treatment of atrial fibrillation.** Data suggest that rate control yields better balance of benefits and harms than rhythm control for most older adults. Amiodarone is associated with multiple toxicities, including thyroid disease, pulmonary disorders, and QT interval prolongation. *QE = High; SR = Strong*
Disopyramide*	**Avoid.** Disopyramide is a potent negative inotrope and therefore may induce heart failure in older adults; strongly anticholinergic; other antiarrhythmic drugs preferred. *QE = Low; SR = Strong*
Dronedarone	**Avoid in patients with permanent atrial fibrillation or heart failure.** Worse outcomes have been reported in patients taking dronedarone who have permanent atrial fibrillation or heart failure. In general, rate control is preferred over rhythm control for atrial fibrillation. *QE = Moderate; SR = Strong*
Digoxin >0.125 mg/day	**Avoid.** In heart failure, higher dosages associated with no additional benefit and may increase risk of toxicity; decreased renal clearance may increase risk of toxicity. *QE = Moderate; SR = Strong*

Table 1 (continued on page 3)

Table 1 (continued from page 2)

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Organ System/ Therapeutic Category/Drug(s)	**Recommendation**, Rationale, *Quality of Evidence (QE) & Strength of Recommendation (SR)*
Nifedipine, immediate release*	**Avoid.** Potential for hypotension; risk of precipitating myocardial ischemia. *QE = High; SR = Strong*
Spironolactone >25 mg/day	**Avoid in patients with heart failure or with a CrCl <30 mL/min.** In heart failure, the risk of hyperkalemia is higher in older adults if taking >25 mg/day. *QE = Moderate; SR = Strong*
Central Nervous System	
Tertiary TCAs, alone or in combination: ■ Amitriptyline ■ Chlordiazepoxide-amitriptyline ■ Clomipramine ■ Doxepin >6 mg/day ■ Imipramine ■ Perphenazine-amitriptyline ■ Trimipramine	**Avoid.** Highly anticholinergic, sedating, and cause orthostatic hypotension; the safety profile of low-dose doxepin (≤6 mg/day) is comparable to that of placebo. *QE = High; SR = Strong*
Antipsychotics, first- (conventional) and second- (atypical) generation *(see online for full list)*	**Avoid use for behavioral problems of dementia unless non-pharmacologic options have failed and patient is threat to self or others.** Increased risk of cerebrovascular accident (stroke) and mortality in persons with dementia. *QE = Moderate; SR = Strong*
Thioridazine Mesoridazine	**Avoid.** Highly anticholinergic and greater risk of QT-interval prolongation. *QE = Moderate; SR = Strong*
Barbiturates ■ Amobarbital* ■ Butabarbital* ■ Butalbital ■ Mephobarbital* ■ Pentobarbital* ■ Phenobarbital ■ Secobarbital*	**Avoid.** High rate of physical dependence; tolerance to sleep benefits; greater risk of overdose at low dosages. *QE = High; SR = Strong*
Benzodiazepines *Short- and intermediate-acting:* ■ Alprazolam ■ Estazolam ■ Lorazepam ■ Oxazepam ■ Temazepam ■ Triazolam *Long-acting:* ■ Chlorazepate ■ Chlordiazepoxide ■ Chlordiazepoxide-amitriptyline ■ Clidinium-chlordiazepoxide ■ Clonazepam ■ Diazepam ■ Flurazepam ■ Quazepam	**Avoid benzodiazepines (any type) for treatment of insomnia, agitation, or delirium.** Older adults have increased sensitivity to benzodiazepines and decreased metabolism of long-acting agents. In general, all benzodiazepines increase risk of cognitive impairment, delirium, falls, fractures, and motor vehicle accidents in older adults. May be appropriate for seizure disorders, rapid eye movement sleep disorders, benzodiazepine withdrawal, ethanol withdrawal, severe generalized anxiety disorder, periprocedural anesthesia, end-of-life care. *QE = High; SR = Strong*
Chloral hydrate*	**Avoid.** Tolerance occurs within 10 days and risk outweighs the benefits in light of overdose with doses only 3 times the recommended dose. *QE = Low; SR = Strong*
Meprobamate	**Avoid.** High rate of physical dependence; very sedating. *QE = Moderate; SR = Strong*

Table 1 (continued on page 4)

Table 1 (continued from page 3)

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Organ System/ Therapeutic Category/Drug(s)	**Recommendation**, Rationale, *Quality of Evidence (QE) & Strength of Recommendation (SR)*
Nonbenzodiazepine hypnotics ■ Eszopiclone ■ Zolpidem ■ Zaleplon	**Avoid chronic use (>90 days)** Benzodiazepine-receptor agonists that have adverse events similar to those of benzodiazepines in older adults (e.g., delirium, falls, fractures); minimal improvement in sleep latency and duration. *QE = Moderate; SR = Strong*
Ergot mesylates* Isoxsuprine*	**Avoid.** Lack of efficacy. *QE = High; SR = Strong*
Endocrine	
Androgens ■ Methyltestosterone* ■ Testosterone	**Avoid unless indicated for moderate to severe hypogonadism.** Potential for cardiac problems and contraindicated in men with prostate cancer. *QE = Moderate; SR = Weak*
Desiccated thyroid	**Avoid.** Concerns about cardiac effects; safer alternatives available. *QE = Low; SR = Strong*
Estrogens with or without progestins	**Avoid oral and topical patch. Topical vaginal cream: Acceptable to use low-dose intravaginal estrogen for the management of dyspareunia, lower urinary tract infections, and other vaginal symptoms.** Evidence of carcinogenic potential (breast and endometrium); lack of cardioprotective effect and cognitive protection in older women. Evidence that vaginal estrogens for treatment of vaginal dryness is safe and effective in women with breast cancer, especially at dosages of estradiol <25 mcg twice weekly. *QE = High (Oral and Patch), Moderate (Topical); SR = Strong (Oral and Patch), Weak (Topical)*
Growth hormone	**Avoid, except as hormone replacement following pituitary gland removal.** Effect on body composition is small and associated with edema, arthralgia, carpal tunnel syndrome, gynecomastia, impaired fasting glucose. *QE = High; SR = Strong*
Insulin, sliding scale	**Avoid.** Higher risk of hypoglycemia without improvement in hyperglycemia management regardless of care setting. *QE = Moderate; SR = Strong*
Megestrol	**Avoid.** Minimal effect on weight; increases risk of thrombotic events and possibly death in older adults. *QE = Moderate; SR = Strong*
Sulfonylureas, long-duration ■ Chlorpropamide ■ Glyburide	**Avoid.** Chlorpropamide: prolonged half-life in older adults; can cause prolonged hypoglycemia; causes SIADH Glyburide: higher risk of severe prolonged hypoglycemia in older adults. *QE = High; SR = Strong*
Gastrointestinal	
Metoclopramide	**Avoid, unless for gastroparesis.** Can cause extrapyramidal effects including tardive dyskinesia; risk may be further increased in frail older adults. *QE = Moderate; SR = Strong*
Mineral oil, given orally	**Avoid.** Potential for aspiration and adverse effects; safer alternatives available. *QE = Moderate; SR = Strong*
Trimethobenzamide	**Avoid.** One of the least effective antiemetic drugs; can cause extrapyramidal adverse effects. *QE = Moderate; SR = Strong*

Table 1 (continued on page 5)

Table 1 (continued from page 4)

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Organ System/ Therapeutic Category/Drug(s)	**Recommendation**, Rationale, *Quality of Evidence (QE) & Strength of Recommendation (SR)*
Pain Medications	
Meperidine	**Avoid.** Not an effective oral analgesic in dosages commonly used; may cause neurotoxicity; safer alternatives available. *QE = High; SR = Strong*
Non-COX-selective NSAIDs, oral ■ Aspirin >325 mg/day ■ Diclofenac ■ Diflunisal ■ Etodolac ■ Fenoprofen ■ Ibuprofen ■ Ketoprofen ■ Meclofenamate ■ Mefenamic acid ■ Meloxicam ■ Nabumetone ■ Naproxen ■ Oxaprozin ■ Piroxicam ■ Sulindac ■ Tolmetin	**Avoid chronic use unless other alternatives are not effective and patient can take gastroprotective agent (proton-pump inhibitor or misoprostol).** Increases risk of GI bleeding/peptic ulcer disease in high-risk groups, including those ≥75 years old or taking oral or parenteral corticosteroids, anticoagulants, or antiplatelet agents. Use of proton pump inhibitor or misoprostol reduces but does not eliminate risk. Upper GI ulcers, gross bleeding, or perforation caused by NSAIDs occur in approximately 1% of patients treated for 3–6 months, and in about 2%–4% of patients treated for 1 year. These trends continue with longer duration of use. *QE = Moderate; SR = Strong*
Indomethacin Ketorolac, includes parenteral	**Avoid.** Increases risk of GI bleeding/peptic ulcer disease in high-risk groups *(See Non-COX selective NSAIDs)* Of all the NSAIDs, indomethacin has most adverse effects. *QE = Moderate (Indomethacin), High (Ketorolac); SR = Strong*
Pentazocine*	**Avoid.** Opioid analgesic that causes CNS adverse effects, including confusion and hallucinations, more commonly than other narcotic drugs; is also a mixed agonist and antagonist; safer alternatives available. *QE = Low; SR = Strong*
Skeletal muscle relaxants ■ Carisoprodol ■ Chlorzoxazone ■ Cyclobenzaprine ■ Metaxalone ■ Methocarbamol ■ Orphenadrine	**Avoid.** Most muscle relaxants poorly tolerated by older adults, because of anticholinergic adverse effects, sedation, increased risk of fractures; effectiveness at dosages tolerated by older adults is questionable. *QE = Moderate; SR = Strong*

*Infrequently used drugs. Table 1 Abbreviations: ACEI, angiotensin converting-enzyme inhibitors; ARB, angiotensin receptor blockers; CNS, central nervous system; COX, cyclooxygenase; CrCl, creatinine clearance; GI, gastrointestinal; NSAIDs, nonsteroidal anti-inflammatory drugs; SIADH, syndrome of inappropriate antidiuretic hormone secretion; SR, Strength of Recommendation; TCAs, tricyclic antidepressants; QE, Quality of Evidence

TABLE 2: 2012 AGS Beers Criteria for Potentially Inappropriate Medication Use in Older Adults Due to Drug-Disease or Drug-Syndrome Interactions That May Exacerbate the Disease or Syndrome

Disease or Syndrome	Drug(s)	**Recommendation**, Rationale, *Quality of Evidence (QE) & Strength of Recommendation (SR)*
Cardiovascular		
Heart failure	NSAIDs and COX-2 inhibitors Nondihydropyridine CCBs (avoid only for systolic heart failure) ■ Diltiazem ■ Verapamil Pioglitazone, rosiglitazone Cilostazol Dronedarone	**Avoid.** Potential to promote fluid retention and/or exacerbate heart failure. *QE = Moderate (NSAIDs, CCBs, Dronedarone), High (Thiazolidinediones (glitazones)), Low (Cilostazol); SR = Strong*

Table 2 (continued on page 6)

Table 2 (continued from page 5)

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Disease or Syndrome	Drug(s)	**Recommendation**, Rationale, *Quality of Evidence (QE) & Strength of Recommendation (SR)*
Syncope	Acetylcholinesterase inhibitors (AChEIs) Peripheral alpha blockers ■ Doxazosin ■ Prazosin ■ Terazosin Tertiary TCAs Chlorpromazine, thioridazine, and olanzapine	**Avoid.** Increases risk of orthostatic hypotension or bradycardia. *QE = High (Alpha blockers), Moderate (AChEIs, TCAs and antipsychotics); SR = Strong (AChEIs and TCAs), Weak (Alpha blockers and antipsychotics)*
Central Nervous System		
Chronic seizures or epilepsy	Bupropion Chlorpromazine Clozapine Maprotiline Olanzapine Thioridazine Thiothixene Tramadol	**Avoid.** Lowers seizure threshold; may be acceptable in patients with well-controlled seizures in whom alternative agents have not been effective. *QE = Moderate; SR = Strong*
Delirium	All TCAs Anticholinergics *(see online for full list)* Benzodiazepines Chlorpromazine Corticosteroids H_2-receptor antagonist Meperidine Sedative hypnotics Thioridazine	**Avoid.** Avoid in older adults with or at high risk of delirium because of inducing or worsening delirium in older adults; if discontinuing drugs used chronically, taper to avoid withdrawal symptoms. *QE = Moderate; SR = Strong*
Dementia & cognitive impairment	Anticholinergics *(see online for full list)* Benzodiazepines H_2-receptor antagonists Zolpidem Antipsychotics, chronic and as-needed use	**Avoid.** Avoid due to adverse CNS effects. Avoid antipsychotics for behavioral problems of dementia unless non-pharmacologic options have failed and patient is a threat to themselves or others. Antipsychotics are associated with an increased risk of cerebrovascular accident (stroke) and mortality in persons with dementia. *QE = High; SR = Strong*
History of falls or fractures	Anticonvulsants Antipsychotics Benzodiazepines Nonbenzodiazepine hypnotics ■ Eszopiclone ■ Zaleplon ■ Zolpidem TCAs/SSRIs	**Avoid unless safer alternatives are not available; avoid anticonvulsants except for seizure.** Ability to produce ataxia, impaired psychomotor function, syncope, and additional falls; shorter-acting benzodiazepines are not safer than long-acting ones. *QE = High; SR = Strong*
Insomnia	Oral decongestants ■ Pseudoephedrine ■ Phenylephrine Stimulants ■ Amphetamine ■ Methylphenidate ■ Pemoline Theobromines ■ Theophylline ■ Caffeine	**Avoid.** CNS stimulant effects. *QE = Moderate; SR = Strong*
Parkinson's disease	All antipsychotics (see online publication for full list, except for quetiapine and clozapine) Antiemetics ■ Metoclopramide ■ Prochlorperazine ■ Promethazine	**Avoid.** Dopamine receptor antagonists with potential to worsen parkinsonian symptoms. Quetiapine and clozapine appear to be less likely to precipitate worsening of Parkinson disease. *QE = Moderate; SR = Strong*

Table 2 (continued on page 7)

Table 2 (continued from page 6)

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Disease or Syndrome	Drug(s)	Recommendation, Rationale, *Quality of Evidence (QE) & Strength of Recommendation (SR)*
Gastrointestinal		
Chronic constipation	Oral antimuscarinics for urinary incontinence ■ Darifenacin ■ Fesoterodine ■ Oxybutynin (oral) ■ Solifenacin ■ Tolterodine ■ Trospium Nondihydropyridine CCB ■ Diltiazem ■ Verapamil First-generation antihistamines as single agent or part of combination products ■ Brompheniramine (various) ■ Carbinoxamine ■ Chlorpheniramine ■ Clemastine (various) ■ Cyproheptadine ■ Dexbrompheniramine ■ Dexchlorpheniramine (various) ■ Diphenhydramine ■ Doxylamine ■ Hydroxyzine ■ Promethazine ■ Triprolidine Anticholinergics/antispasmodics *(see online for full list of drugs with strong anticholinergic properties)* ■ Antipsychotics ■ Belladonna alkaloids ■ Clidinium-chlordiazepoxide ■ Dicyclomine ■ Hyoscyamine ■ Propantheline ■ Scopolamine ■ Tertiary TCAs (amitriptyline, clomipramine, doxepin, imipramine, and trimipramine)	**Avoid unless no other alternatives.** Can worsen constipation; agents for urinary incontinence: antimuscarinics overall differ in incidence of constipation; response variable; consider alternative agent if constipation develops. *QE = High (For Urinary Incontinence), Moderate/Low (All Others); SR = Strong*
History of gastric or duodenal ulcers	Aspirin (>325 mg/day) Non–COX-2 selective NSAIDs	**Avoid unless other alternatives are not effective and patient can take gastroprotective agent (proton-pump inhibitor or misoprostol).** May exacerbate existing ulcers or cause new/additional ulcers. *QE = Moderate; SR = Strong*
Kidney/Urinary Tract		
Chronic kidney disease stages IV and V	NSAIDs Triamterene (alone or in combination)	**Avoid.** May increase risk of kidney injury. May increase risk of acute kidney injury. *QE = Moderate (NSAIDs), Low (Triamterene); SR = Strong (NSAIDs), Weak (Triamterene)*
Urinary incontinence (all types) in women	Estrogen oral and transdermal (excludes intravaginal estrogen)	**Avoid in women.** Aggravation of incontinence. *QE = High; SR = Strong*

Table 2 (continued on page 8)

Table 2 (continued from page 7)

TABLE 2: 2012 AGS Beers Criteria for Potentially Inappropriate Medication Use in Older Adults Due to Drug-Disease or Drug-Syndrome Interactions That May Exacerbate the Disease or Syndrome

Disease or Syndrome	Drug(s)	Recommendation, Rationale, *Quality of Evidence (QE) & Strength of Recommendation (SR)*
Lower urinary tract symptoms, benign prostatic hyperplasia	Inhaled anticholinergic agents Strongly anticholinergic drugs, except antimuscarinics for urinary incontinence (see Table 9 for complete list).	**Avoid in men.** May decrease urinary flow and cause urinary retention. *QE = Moderate; SR = Strong (Inhaled agents), Weak (All others)*
Stress or mixed urinary incontinence	Alpha-blockers ■ Doxazosin ■ Prazosin ■ Terazosin	**Avoid in women.** Aggravation of incontinence. *QE = Moderate; SR = Strong*

Table 2 Abbreviations: CCBs, calcium channel blockers; AChEIs, acetylcholinesterase inhibitors; CNS, central nervous system; COX, cyclooxygenase; NSAIDs, nonsteroidal anti-inflammatory drugs; SR, Strength of Recommendation; SSRIs, selective serotonin reuptake inhibitors; TCAs, tricyclic antidepressants; QE, Quality of Evidence

TABLE 3: 2012 AGS Beers Criteria for Potentially Inappropriate Medications to Be Used with Caution in Older Adults

Drug(s)	Recommendation, Rationale, *Quality of Evidence (QE) & Strength of Recommendation (SR)*
Aspirin for primary prevention of cardiac events	**Use with caution in adults ≥80 years old.** Lack of evidence of benefit versus risk in individuals ≥80 years old. *QE = Low; SR = Weak*
Dabigatran	**Use with caution in adults ≥75 years old or if CrCl <30 mL/min.** Increased risk of bleeding compared with warfarin in adults ≥75 years old; lack of evidence for efficacy and safety in patients with CrCl <30 mL/min *QE = Moderate; SR = Weak*
Prasugrel	**Use with caution in adults ≥75 years old.** Greater risk of bleeding in older adults; risk may be offset by benefit in highest-risk older patients (eg, those with prior myocardial infarction or diabetes). *QE = Moderate; SR = Weak*
Antipsychotics Carbamazepine Carboplatin Cisplatin Mirtazapine SNRIs SSRIs TCAs Vincristine	**Use with caution.** May exacerbate or cause SIADH or hyponatremia; need to monitor sodium level closely when starting or changing dosages in older adults due to increased risk. *QE = Moderate; SR = Strong*
Vasodilators	**Use with caution.** May exacerbate episodes of syncope in individuals with history of syncope. *QE = Moderate; SR = Weak*

Table 3 Abbreviations: CrCl, creatinine clearance; SIADH, syndrome of inappropriate antidiuretic hormone secretion; SSRIs, selective serotonin reuptake inhibitors; SNRIs, serotonin–norepinephrine reuptake inhibitors; SR, Strength of Recommendation; TCAs, tricyclic antidepressants; QE, Quality of Evidence

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