

**Table 2. 2012 AGS Beers Criteria for Potentially Inappropriate Medication Use in Older Adults**

Organ System/ Therapeutic Category/Drug(s)	Rationale	Recommendation	Quality of Evidence	Strength of Recommendation	References
<i>Anticholinergics (excludes TCAs)</i>					
First-generation antihistamines (as single agent or as part of combination products) <ul style="list-style-type: none"> <li>• Brompheniramine</li> <li>• Carbinoxamine</li> <li>• Chlorpheniramine</li> <li>• Clemastine</li> <li>• Cyproheptadine</li> <li>• Dexbrompheniramine</li> <li>• Dexchlorpheniramine</li> <li>• Diphenhydramine (oral)</li> <li>• Doxylamine</li> <li>• Hydroxyzine</li> <li>• Promethazine</li> <li>• Triprolidine</li> </ul>	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.	Avoid	Hydroxyzine and promethazine: high; All others: moderate	Strong	<a href="#">Agostini 2001</a> <a href="#">Boustani 2007</a> <a href="#">Guaiana 2010</a> <a href="#">Han 2001</a> <a href="#">Rudolph 2008</a>
Antiparkinson agents <ul style="list-style-type: none"> <li>• Benztropine (oral)</li> <li>• Trihexyphenidyl</li> </ul>	Not recommended for prevention of extrapyramidal symptoms with antipsychotics; more effective agents available for treatment of Parkinson disease.	Avoid	Moderate	Strong	<a href="#">Rudolph 2008</a>
Antispasmodics <ul style="list-style-type: none"> <li>• Belladonna alkaloids</li> <li>• Clidinium-chlordiazepoxide</li> <li>• Dicyclomine</li> <li>• Hyoscyamine</li> <li>• Propantheline</li> <li>• Scopolamine</li> </ul>	Highly anticholinergic, uncertain effectiveness.	Avoid except in short-term palliative care to decrease oral secretions.	Moderate	Strong	<a href="#">Lechevallier-Michel 2005</a> <a href="#">Rudolph 2008</a>
<i>Antithrombotics</i>					
Dipyridamole, oral short-acting* (does not apply to the extended-release combination with aspirin)	May cause orthostatic hypotension; more effective alternatives available; IV form acceptable for use in cardiac stress testing.	Avoid	Moderate	Strong	<a href="#">De Schryver 2010</a> <a href="#">Dipyridamole Package Insert</a>
Ticlopidine*	Safer, effective alternatives available.	Avoid	Moderate	Strong	<a href="#">Ticlopidine Package Insert</a>
<i>Anti-infective</i>					
Nitrofurantoin	Potential for pulmonary toxicity; safer alternatives	Avoid for long-term suppression;	Moderate	Strong	<a href="#">Felts 1971</a> <a href="#">Hardak 2010</a> <a href="#">Holmberg</a>

	available; lack of efficacy in patients with CrCl <60 mL/min due to inadequate drug concentration in the urine.	avoid in patients with CrCl <60 mL/min.			<a href="#">1980</a>
<i>Cardiovascular</i>					
Alpha <sub>1</sub> blockers <ul style="list-style-type: none"> <li>• Doxazosin</li> <li>• Prazosin</li> <li>• Terazosin</li> </ul>	High risk of orthostatic hypotension; not recommended as routine treatment for hypertension; alternative agents have superior risk/benefit profile.	Avoid use as an antihypertensive.	Moderate	Strong	<a href="#">ALLHAT 2000</a> <a href="#">Aronow2011</a>
Alpha blockers, central <ul style="list-style-type: none"> <li>• Clonidine</li> <li>• Guanabenz*</li> <li>• Guanfacine*</li> <li>• Methyldopa*</li> <li>• Reserpine (&gt;0.1 mg/day)*</li> </ul>	High risk of adverse CNS effects; may cause bradycardia and orthostatic hypotension; not recommended as routine treatment for hypertension.	Avoid clonidine as a first-line antihypertensive.  Avoid others as listed.	Low	Strong	<a href="#">Aronow 2011</a> <a href="#">Methyldopa Package Insert</a> <a href="#">Reserpine Package Insert</a>
Antiarrhythmic drugs (Class Ia, Ic, III) <ul style="list-style-type: none"> <li>• Amiodarone</li> <li>• Dofetilide</li> <li>• Dronedarone</li> <li>• Flecainide</li> <li>• Ibutilide</li> <li>• Procainamide</li> <li>• Propafenone</li> <li>• Quinidine</li> <li>• Sotalol</li> </ul>	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.	Avoid antiarrhythmic drugs as first-line treatment of atrial fibrillation.	High	Strong	<a href="#">Roy 2008</a> <a href="#">Doyle 2009</a> <a href="#">Fuster 2006</a> <a href="#">Van Gelder 2002</a> <a href="#">Wann 2011a</a> <a href="#">Wyse 2002</a>
Disopyramide*	Disopyramide is a potent negative inotrope and therefore may induce heart failure in older adults; strongly anticholinergic; other antiarrhythmic drugs preferred.	Avoid	Low	Strong	<a href="#">Fuster 2006</a> <a href="#">Disopyramide Package Insert</a>
Dronedarone	Worse outcomes have been reported in patients taking dronedarone who have permanent atrial fibrillation or heart	Avoid in patients with permanent atrial fibrillation	Moderate	Strong	<a href="#">Connolly 2011</a> <a href="#">FDA Drug Safety 2011</a> <a href="#">Hohnloser 2009</a> <a href="#">Korber 2008</a>

	failure. In general, rate control is preferred over rhythm control for atrial fibrillation.	or heart failure			<a href="#">Dronedaron Package Insert – revised Dec2011</a>
Digoxin >0.125 mg/day	In heart failure, higher dosages associated with no additional benefit and may increase risk of toxicity; decreased renal clearance may lead to increased risk of toxic effects.	Avoid	Moderate	Strong	<a href="#">Adams 2002</a> <a href="#">Ahmed 2007</a> <a href="#">Rathore 2003</a>
Nifedipine, immediate release*	Potential for hypotension; risk of precipitating myocardial ischemia.	Avoid	High	Strong	<a href="#">Furberg 1995</a> <a href="#">Nifedipine Package Insert</a> <a href="#">Pahor1995</a> <a href="#">Psaty1995a</a> <a href="#">Psaty1995b</a>
Spirolactone >25 mg/day	In heart failure, the risk of hyperkalemia is higher in older adults if taking >25 mg/day.	Avoid in patients with heart failure or with a CrCl <30 mL/min.	Moderate	Strong	<a href="#">Juurlink 2004</a>
<i>Central Nervous System</i>					
Tertiary TCAs, alone or in combination: <ul style="list-style-type: none"> <li>• Amitriptyline</li> <li>• Chlordiazepoxide-amitriptyline</li> <li>• Clomipramine</li> <li>• Doxepin &gt;6 mg/day</li> <li>• Imipramine</li> <li>• Perphenazine-amitriptyline</li> <li>• Trimipramine</li> </ul>	Highly anticholinergic, sedating, and cause orthostatic hypotension; the safety profile of low-dose doxepin (≤6 mg/day) is comparable to that of placebo.	Avoid	High	Strong	<a href="#">Coupland 2011</a> <a href="#">Nelson 2011</a> <a href="#">Scharf 2008</a>
Antipsychotics, first- (conventional) and second- (atypical) generation (see <b>Table 8</b> for full list)	Increased risk of cerebrovascular accident (stroke) and mortality in persons with dementia.	Avoid use for behavioral problems of dementia unless non-pharmacologic options have failed and patient is threat to self or others.	Moderate	Strong	<a href="#">Dore 2009</a> <a href="#">Maher 2011</a> <a href="#">Schneider 2005</a> <a href="#">Schneider 2006a</a> <a href="#">Schneider 2006b</a> <a href="#">Vigen 2011</a>
Thioridazine Mesoridazine	Highly anticholinergic and greater risk of QT-	Avoid	Moderate	Strong	<a href="#">Goldstein 1974</a> <a href="#">Ray 2001</a>

	interval prolongation.				<a href="#">Stollberger 2005</a>
Barbiturates <ul style="list-style-type: none"> <li>• Amobarbital*</li> <li>• Butabarbital*</li> <li>• Butalbital</li> <li>• Mephobarbital*</li> <li>• Pentobarbital*</li> <li>• Phenobarbital</li> <li>• Secobarbital*</li> </ul>	High rate of physical dependence; tolerance to sleep benefits; greater risk of overdose at low dosages.	Avoid	High	Strong	<a href="#">Cumbo 2010</a> <a href="#">McLean 2000</a> <a href="#">Messina 2005</a>
Benzodiazepines <i>Short- and intermediate-acting:</i> <ul style="list-style-type: none"> <li>• Alprazolam</li> <li>• Estazolam</li> <li>• Lorazepam</li> <li>• Oxazepam</li> <li>• Temazepam</li> <li>• Triazolam</li> </ul> <i>Long-acting:</i> <ul style="list-style-type: none"> <li>• Chlorazepate</li> <li>• Chlordiazepoxide</li> <li>• Chlordiazepoxide-amitriptyline</li> <li>• Clidinium-chlordiazepoxide</li> <li>• Clonazepam</li> <li>• Diazepam</li> <li>• Flurazepam</li> <li>• Quazepam</li> </ul>	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.	Avoid benzodiazepines (any type) for treatment of insomnia, agitation, or delirium.	High	Strong	<a href="#">Allain 2005</a> <a href="#">Cotroneo 2007</a> <a href="#">Finkle 2011</a> <a href="#">Paterniti 2002</a>
Chloral hydrate*	Tolerance occurs within 10 days and risk outweighs the benefits in light of overdose with doses only 3 times the recommended dose.	Avoid	Low	Strong	<a href="#">Bain 2006</a> <a href="#">Goldstein 1978</a> <a href="#">Miller 1979</a>
Meprobamate	High rate of physical dependence; very sedating.	Avoid	Moderate	Strong	<a href="#">Keston 1974</a> <a href="#">Rhalimi 2009</a>
Nonbenzodiazepine hypnotics <ul style="list-style-type: none"> <li>• Eszopiclone</li> <li>• Zolpidem</li> <li>• Zaleplon</li> </ul>	Benzodiazepine-receptor agonists that have adverse events similar to those of benzodiazepines in older adults (e.g.,	Avoid chronic use (>90 days)	Moderate	Strong	<a href="#">Allain 2005</a> <a href="#">Cotroneo 2007</a> <a href="#">Finkle 2011</a> <a href="#">McCrae 2007</a> <a href="#">Orriols 2011</a> <a href="#">Rhalimi 2009</a>

	delirium, falls, fractures); minimal improvement in sleep latency and duration.				<a href="#">Wang 2001b</a> <a href="#">Yang 2011</a>
Ergot mesylates* Isoxsuprine*	Lack of efficacy.	Avoid	High	Strong	<a href="#">Isoxsuprine Package Insert</a>
<i>Endocrine</i>					
Androgens <ul style="list-style-type: none"> <li>• Methyltestosterone*</li> <li>• Testosterone</li> </ul>	Potential for cardiac problems and contraindicated in men with prostate cancer.	Avoid unless indicated for moderate to severe hypogonadism.	Moderate	Weak	<a href="#">Basaria 2010</a> <a href="#">Jones 2011</a>
Desiccated thyroid	Concerns about cardiac effects; safer alternatives available.	Avoid	Low	Strong	<a href="#">Baskin2002</a> <a href="#">Rees-Jones1977</a> <a href="#">Rees-Jones1980</a> <a href="#">Sawin1978</a> <a href="#">Sawin1989</a>
Estrogens with or without progestins	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.	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.	Oral and patch: high  Topical: moderate	Oral and patch: strong  Topical: weak	<a href="#">Bath 2005</a> <a href="#">Cho 2005</a> <a href="#">Epp 2010</a> <a href="#">Hendrix 2005</a> <a href="#">Perrotta 2008</a> <a href="#">Sare 2008</a>
Growth hormone	Impact on body composition is small and associated with edema, arthralgia, carpal tunnel syndrome, gynecomastia, impaired fasting glucose.	Avoid, except as hormone replacement following pituitary gland removal.	High	Strong	<a href="#">Liu 2007</a>

Insulin, sliding scale	Higher risk of hypoglycemia without improvement in hyperglycemia management regardless of care setting.	Avoid	Moderate	Strong	<a href="#">Queale 1997</a>
Megestrol	Minimal effect on weight; increases risk of thrombotic events and possibly death in older adults.	Avoid	Moderate	Strong	<a href="#">Bodenner 2007</a> <a href="#">Reuben 2005</a> <a href="#">Simmons 2005</a> <a href="#">Yeh 2000</a>
Sulfonylureas, long-duration <ul style="list-style-type: none"> <li>Chlorpropamide</li> <li>Glyburide</li> </ul>	Chlorpropamide: prolonged half-life in older adults; can cause prolonged hypoglycemia; causes SIADH Glyburide: higher risk of severe prolonged hypoglycemia in older adults.	Avoid	High	Strong	<a href="#">Clarke 1975</a> <a href="#">Gangji 2007</a> <a href="#">Shorr 1996</a>
<i>Gastrointestinal</i>					
Metoclopramide	Can cause extrapyramidal effects including tardive dyskinesia; risk may be further increased in frail older adults.	Avoid, unless for gastroparesis.	Moderate	Strong	<a href="#">Bateman 1985</a> <a href="#">Ganzini 1993</a> <a href="#">Miller 1989</a>
Mineral oil, given orally	Potential for aspiration and adverse effects; safer alternatives available.	Avoid	Moderate	Strong	<a href="#">Marchiori 2010a</a> <a href="#">Marchiori 2010b</a> <a href="#">Meltzer 2006</a> <a href="#">Simmons 2007</a>
Trimethobenzamide	One of the least effective antiemetic drugs; can cause extrapyramidal adverse effects.	Avoid	Moderate	Strong	<a href="#">Bardfeld 1966</a> <a href="#">Moertel 1963</a>
<i>Pain Medications</i>					
Meperidine	Not an effective oral analgesic in dosages commonly used; may cause neurotoxicity; safer alternatives available.	Avoid	High	Strong	<a href="#">Kaiko 1982</a> <a href="#">Szeto 1977</a> <a href="#">Meperidine Package Insert</a>

<p>Non-COX-selective NSAIDs, oral</p> <ul style="list-style-type: none"> <li>• Aspirin &gt;325 mg/day</li> <li>• Diclofenac</li> <li>• Diflunisal</li> <li>• Etodolac</li> <li>• Fenoprofen</li> <li>• Ibuprofen</li> <li>• Ketoprofen</li> <li>• Meclofenamate</li> <li>• Mefenamic acid</li> <li>• Meloxicam</li> <li>• Nabumetone</li> <li>• Naproxen</li> <li>• Oxaprozin</li> <li>• Piroxicam</li> <li>• Sulindac</li> <li>• Tolmetin</li> </ul>	<p>Increases risk of GI bleeding/peptic ulcer disease in high-risk groups, including those &gt;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.</p>	<p>Avoid chronic use unless other alternatives are not effective and patient can take gastroprotective agent (proton-pump inhibitor or misoprostol)</p>	<p>All others: moderate</p>	<p>Strong</p>	<p><a href="#">AGS Pain Guideline 2009</a>  <a href="#">Langman 1994</a>  <a href="#">Lanas 2006</a>  <a href="#">Llorente</a>  <a href="#">Melero 2002</a>  <a href="#">Pilotto 2003</a>  <a href="#">Piper 1991</a></p>
<p>Indomethacin Ketorolac, includes parenteral</p>	<p>Increases risk of GI bleeding/peptic ulcer disease in high-risk groups (See above Non-COX selective NSAIDs) Of all the NSAIDs, indomethacin has most adverse effects.</p>	<p>Avoid</p>	<p>Indomethacin: moderate  Ketorolac: high;</p>	<p>Strong</p>	<p><a href="#">Onder2004</a></p>
<p>Pentazocine*</p>	<p>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.</p>	<p>Avoid</p>	<p>Low</p>	<p>Strong</p>	<p><a href="#">AGS Pain Guideline 2009</a>  <a href="#">Pentazocine Package Insert</a></p>
<p>Skeletal muscle relaxants</p> <ul style="list-style-type: none"> <li>• Carisoprodol</li> <li>• Chlorzoxazone</li> <li>• Cyclobenzaprine</li> <li>• Metaxalone</li> <li>• Methocarbamol</li> <li>• Orphenadrine</li> </ul>	<p>Most muscle relaxants poorly tolerated by older adults, because of anticholinergic adverse effects, sedation, increased risk of fractures; effectiveness at</p>	<p>Avoid</p>	<p>Moderate</p>	<p>Strong</p>	<p><a href="#">Billups2011</a>  <a href="#">Rudolph 2008</a></p>

	dosages tolerated by older adults is questionable.				
<p>*Infrequently used drugs  <i>Abbreviations:</i> 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; TCAs, tricyclic antidepressants</p> <p><i>The primary target audience is the practicing clinician. The intentions of the criteria include: 1) improving the selection of prescription drugs by clinicians and patients; 2) evaluating patterns of drug use within populations; 3) educating clinicians and patients on proper drug usage; and 4) evaluating health-outcome, quality of care, cost, and utilization data.</i></p>					

**Table 3. 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)	Rationale	Recommendation	Quality of Evidence	Strength of Recommendation	References
<i>Cardiovascular</i>						
Heart failure	NSAIDs and COX-2 inhibitors  Nondihydropyridine CCBs (avoid only for systolic heart failure) <ul style="list-style-type: none"> <li>Diltiazem</li> <li>Verapamil</li> </ul> Pioglitazone, rosiglitazone  Cilostazol Dronedarone	Potential to promote fluid retention and/or exacerbate heart failure.	Avoid	NSAIDs: moderate; CCBs: moderate; Thiazolidinediones (glitazones): high; Cilostazol: low; Dronedarone: moderate	Strong	<a href="#">Cilostazol Package Insert</a> <a href="#">Connolly 2011</a> <a href="#">Dronedarone Package Insert – revised Dec2011</a> <a href="#">Heerdink 1998</a> <a href="#">Goldstein 1991</a> <a href="#">Jessup 2009</a> <a href="#">Korber 2009</a> <a href="#">Loke 2011</a> <a href="#">Pioglitazone Package Insert</a> <a href="#">Rosiglitazone Package Insert</a>
Syncope	Acetylcholinesterase inhibitors (AChEIs) Peripheral alpha blockers <ul style="list-style-type: none"> <li>Doxazosin</li> <li>Prazosin</li> <li>Terazosin</li> </ul> Tertiary TCAs  Chlorpromazine, thioridazine, and olanzapine	Increases risk of orthostatic hypotension or bradycardia.	Avoid	AChEIs and alpha blockers: high  TCAs and antipsychotics: Moderate	AChEIs and TCAs: strong  Alpha blockers and antipsychotics: weak	<a href="#">Bordier 2005</a> <a href="#">Davidson1989</a> <a href="#">French 2006</a> <a href="#">Gaggioli1997</a> <a href="#">Gill 2009</a> <a href="#">Kim 2011</a> <a href="#">Litvinenko 2008</a> <a href="#">Nickel 2008</a> <a href="#">Schneider 2006a</a> <a href="#">Schneider 2006b</a> <a href="#">Wild 2010</a>
<i>Central Nervous System</i>						
Chronic seizures or epilepsy	Bupropion Chlorpromazine Clozapine	Lowers seizure threshold; may be acceptable in	Avoid	Moderate	Strong	<a href="#">Pisani 2002</a>

	Maprotiline Olanzapine Thioridazine Thiothixene Tramadol	patients with well-controlled seizures in whom alternative agents have not been effective.				
Delirium	All TCAs Anticholinergics (see <b>Table 9</b> for full list) Benzodiazepines Chlorpromazine Corticosteroids H <sub>2</sub> -receptor antagonist Meperidine Sedative hypnotics Thioridazine	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.	Avoid	Moderate	Strong	<a href="#">Clegg 2011</a> <a href="#">Gaudreau 2005</a> <a href="#">Laurila 2008</a> <a href="#">Marcantonio 1994</a> <a href="#">Moore 1999</a> <a href="#">Morrison 2003</a> <a href="#">Ozbolt 2008</a> <a href="#">Panharipande 2006</a> <a href="#">Rudolph 2008</a> <a href="#">Stockl 2010</a>
Dementia and cognitive impairment	Anticholinergics (see <b>Table 9</b> for full list) Benzodiazepines H <sub>2</sub> -receptor antagonists Zolpidem Antipsychotics, chronic and as-needed use	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 increased risk of cerebrovascular accident (stroke) and mortality in persons with dementia.	Avoid	High	Strong	<a href="#">Boustani 2007</a> <a href="#">Hanlon2004</a> <a href="#">Finkle 2011</a> <a href="#">Frey 2011</a> <a href="#">Paterniti 2002</a> <a href="#">Rasmussen 1999</a> <a href="#">Rudolph 2008</a> <a href="#">Schneider 2005</a> <a href="#">Schneider 2006a</a> <a href="#">Schneider 2006b</a> <a href="#">Seitz 2011</a> <a href="#">Vigen 2011</a> <a href="#">Wright 2009</a>
History of falls or fractures	Anticonvulsants Antipsychotics Benzodiazepines Nonbenzodiazepine hypnotics <ul style="list-style-type: none"> <li>• Eszopiclone</li> <li>• Zaleplon</li> <li>• Zolpidem</li> </ul>	Ability to produce ataxia, impaired psychomotor function, syncope, and additional falls; shorter-acting benzodiazepines	Avoid unless safer alternatives are not available; avoid anticonvulsants except	High	Strong	<a href="#">Allain 2005</a> <a href="#">Berdot 2009</a> <a href="#">Deandrea 2010</a> <a href="#">Ensrud 2003</a> <a href="#">Hartikainen 2007</a> <a href="#">Jalbert 2010</a> <a href="#">Liperoti 2007</a>

	TCAs/SSRIs	are not safer than long-acting ones.	for seizure			<a href="#">Mets 2010</a> <a href="#">Sterke 2008</a> <a href="#">Turner 2011</a> <a href="#">van der Hoof 2008</a> <a href="#">Vestergaard 2008</a> <a href="#">Wagner 2004</a> <a href="#">Wang 2001a</a> <a href="#">Wang 2001b</a> <a href="#">Zint 2010</a>
Insomnia	Oral decongestants <ul style="list-style-type: none"> <li>• Pseudoephedrine</li> <li>• Phenylephrine</li> </ul> Stimulants <ul style="list-style-type: none"> <li>• Amphetamine</li> <li>• Methylphenidate</li> <li>• Pemoline</li> </ul> Theobromines <ul style="list-style-type: none"> <li>• Theophylline</li> <li>• Caffeine</li> </ul>	CNS stimulant effects	Avoid	Moderate	Strong	<a href="#">Foral 2011</a>
Parkinson disease	All antipsychotics (see <b>Table 8</b> for full list, except for quetiapine and clozapine)  Antiemetics <ul style="list-style-type: none"> <li>• Metoclopramide</li> <li>• Prochlorperazine</li> <li>• Promethazine</li> </ul>	Dopamine receptor antagonists with potential to worsen parkinsonian symptoms.  Quetiapine and clozapine appear to be less likely to precipitate worsening of Parkinson disease.	Avoid	Moderate	Strong	<a href="#">Bateman 1985</a> <a href="#">Dore 2009</a> <a href="#">Ganzini 1993</a> <a href="#">Morgan 2005</a> <a href="#">Thanvi 2009</a>
<i>Gastrointestinal</i>						
Chronic constipation	Oral antimuscarinics for urinary incontinence <ul style="list-style-type: none"> <li>• Darifenacin</li> <li>• Fesoterodine</li> <li>• Oxybutynin (oral)</li> <li>• Solifenacin</li> <li>• Tolterodine</li> <li>• Trospium</li> </ul> Nondihydropyridine CCB <ul style="list-style-type: none"> <li>• Diltiazem</li> <li>• Verapamil</li> </ul> First-generation	Ability to worsen constipation; agents for urinary incontinence: antimuscarinics overall differ in incidence of constipation; response variable; consider alternative agent if constipation develops.	Avoid unless no other alternatives	For urinary incontinence: high  All others: Moderate/low	Weak	<a href="#">Glass 2008</a> <a href="#">Meek 2011</a>

	<p>antihistamines as single agent or part of combination products</p> <ul style="list-style-type: none"> <li>• Brompheniramine (various)</li> <li>• Carbinoxamine</li> <li>• Chlorpheniramine</li> <li>• Clemastine (various)</li> <li>• Cyproheptadine</li> <li>• Dexbrompheniramine</li> <li>• Dexchlorpheniramine (various)</li> <li>• Diphenhydramine</li> <li>• Doxylamine</li> <li>• Hydroxyzine</li> <li>• Promethazine</li> <li>• Triprolidine</li> </ul> <p>Anticholinergics/antispasmodics (see <b>Table 9</b> for full list of drugs with strong anticholinergic properties)</p> <ul style="list-style-type: none"> <li>• Antipsychotics</li> <li>• Belladonna alkaloids</li> <li>• Clidinium-chlordiazepoxide</li> <li>• Dicyclomine</li> <li>• Hyoscyamine</li> <li>• Propantheline</li> <li>• Scopolamine</li> <li>• Tertiary TCAs (amitriptyline, clomipramine, doxepin, imipramine, and trimipramine)</li> </ul>					
History of gastric or duodenal ulcers	Aspirin (>325 mg/day) Non-COX-2 selective NSAIDs	May exacerbate existing ulcers or cause new/additional ulcers.	Avoid unless other alternatives are not effective and patient can take gastroprotective agent (proton-pump inhibitor or	Moderate	Strong	<a href="#">Gabriel 1991</a> <a href="#">Laine 2010</a>

			misoprostol)			
<i>Kidney/Urinary Tract</i>						
Chronic kidney disease stages IV and V	NSAIDs  Triamterene (alone or in combination)	May increase risk of kidney injury.  May increase risk of acute kidney injury.	Avoid  Avoid	NSAIDs: moderate  Triamterene: low	NSAIDs: strong  Triamterene: weak	<a href="#">Farge 1986</a> <a href="#">Favre 1982</a> <a href="#">Gooch 2007</a> <a href="#">Griffin 2000</a> <a href="#">Lafrance 2009</a> <a href="#">Murray 1995</a> <a href="#">Perazella 1999</a> <a href="#">Schneider 2006</a> <a href="#">Sica 1989</a> <a href="#">Winkelmayer 2008</a>
Urinary incontinence (all types) in women	Estrogen oral and transdermal (excludes intravaginal estrogen)	Aggravation of incontinence.	Avoid in women	High	Strong	<a href="#">Dew 2003</a> <a href="#">Epp 2010</a> <a href="#">Grodstein 2004</a> <a href="#">Hartmann 2009</a> <a href="#">Hendrix 2005</a> <a href="#">Perrotta 2008</a> <a href="#">Ruby 2010</a>
Lower urinary tract symptoms, benign prostatic hyperplasia	Inhaled anticholinergic agents  Strongly anticholinergic drugs, except antimuscarinics for urinary incontinence (see Table 9 for complete list).	May decrease urinary flow and cause urinary retention.	Avoid in men	Moderate	Inhaled agents: strong All others: weak	<a href="#">Afonso 2011</a> <a href="#">Athanasopoulos 2003</a> <a href="#">Barkin 2004</a> <a href="#">Blake-James 2006</a> <a href="#">Chapple 2005</a> <a href="#">Griebing 2009</a> <a href="#">Kaplan 2006</a> <a href="#">Kraus 2010</a> <a href="#">Malone-Lee 2001</a> <a href="#">Martin Merino 2009</a> <a href="#">Spigset 1999</a> <a href="#">Uher 2009</a> <a href="#">Verhamme 2008</a> <a href="#">Wuerstle 2011</a>
Stress or mixed urinary incontinence	Alpha-blockers <ul style="list-style-type: none"> <li>• Doxazosin</li> <li>• Prazosin</li> <li>• Terazosin</li> </ul>	Aggravation of incontinence.	Avoid in women	Moderate	Strong	<a href="#">Marshall 1996</a> <a href="#">Ruby 2010</a>
<i>Abbreviations:</i> CCBs, calcium channel blockers; AChEIs, acetylcholinesterase inhibitors; CNS, central nervous system; COX, cyclooxygenase; NSAIDs, nonsteroidal anti-inflammatory drugs; SSRIs, selective serotonin reuptake inhibitors; TCAs, tricyclic antidepressants						
<i>The primary target audience is the practicing clinician. The intentions of the criteria include: 1) improving the selection of prescription drugs by clinicians and patients; 2) evaluating patterns of drug use within populations; 3) educating clinicians and patients on proper drug usage; and 4) evaluating health-outcome, quality of care, cost, and utilization data.</i>						

**Table 4. 2012 AGS Beers Criteria for Potentially Inappropriate Medications to Be Used with Caution in Older Adults**

Drug(s)	Rationale	Recommendation	Quality of Evidence	Strength of Recommendation	References
Aspirin for primary prevention of cardiac events	Lack of evidence of benefit versus risk in individuals ≥80 years old.	Use with caution in adults ≥80 years old.	Low	Weak	<a href="#">McQuaid 2006</a> <a href="#">Wolff 2009</a>
Dabigatran	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	Use with caution in adults ≥75 years old or if CrCl <30 mL/min.	Moderate	Weak	<a href="#">Connolly 2009</a> <a href="#">Diener 2010</a> <a href="#">Eikelboom 2011</a> <a href="#">Legrand 2011</a> <a href="#">Wann 2011b</a> <a href="#">Dabigatran Package Insert</a>
Prasugrel	Increased 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).	Use with caution in adults ≥75 years old.	Moderate	Weak	<a href="#">Hochholzer 2011</a> <a href="#">Wiviott 2007</a> <a href="#">Prasugrel Package Insert</a>
Antipsychotics Carbamazepine Carboplatin Cisplatin Mirtazapine SNRIs SSRIs TCAs Vincristine	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.	Use with caution.	Moderate	Strong	<a href="#">Bouman 1998</a> <a href="#">Coupland 2011</a> <a href="#">Liamis 2008</a> <a href="#">Liu 1996</a>
Vasodilators	May exacerbate episodes of syncope in individuals with history of syncope.	Use with caution.	Moderate	Weak	<a href="#">Davidson1989</a> <a href="#">Gaggioli1997</a>

*Abbreviations:* CrCl, creatinine clearance; SIADH, syndrome of inappropriate antidiuretic hormone secretion; SSRIs, selective serotonin reuptake inhibitors; SNRIs, serotonin–norepinephrine reuptake inhibitors; TCAs, tricyclic antidepressants

*The primary target audience is the practicing clinician. The intentions of the criteria include: 1) improving the selection of prescription drugs by clinicians and patients; 2) evaluating patterns of drug use within populations; 3) educating clinicians and patients on proper drug usage; and 4) evaluating health-outcome, quality of care, cost, and utilization data.*

**Table 8. First- and Second-Generation Antipsychotics**

First-Generation (Conventional) Agents	Second-Generation (Atypical) Agents
Chlorpromazine	Aripiprazole
Fluphenazine	Asenapine
Haloperidol	Clozapine
Loxapine	Iloperidone
Molindone	Lurasidone
Perphenazine	Olanzapine
Pimozide	Paliperidone

Promazine	Quetiapine
Thioridazine	Risperidone
Thiothixene	Ziprasidone
Trifluoperazine	
Triflupromazine	

**Table 9. Drugs with Strong Anticholinergic Properties**

<p>Antihistamines</p> <ul style="list-style-type: none"> <li>• Brompheniramine</li> <li>• Carbinoxamine</li> <li>• Chlorpheniramine</li> <li>• Clemastine</li> <li>• Cyproheptadine</li> <li>• Dimenhydrinate</li> <li>• Diphenhydramine</li> <li>• Hydroxyzine</li> <li>• Loratadine</li> <li>• Meclizine</li> </ul>	<p>Antiparkinson agents</p> <ul style="list-style-type: none"> <li>• Benztropine</li> <li>• Trihexyphenidyl</li> </ul>	<p>Skeletal Muscle Relaxants</p> <ul style="list-style-type: none"> <li>• Carisoprodol</li> <li>• Cyclobenzaprine</li> <li>• Orphenadrine</li> <li>• Tizanidine</li> </ul>
<p>Antidepressants</p> <ul style="list-style-type: none"> <li>• Amitriptyline</li> <li>• Amoxapine</li> <li>• Clomipramine</li> <li>• Desipramine</li> <li>• Doxepin</li> <li>• Imipramine</li> <li>• Nortriptyline</li> <li>• Paroxetine</li> <li>• Protriptyline</li> <li>• Trimipramine</li> </ul>	<p>Antipsychotics</p> <ul style="list-style-type: none"> <li>• Chlorpromazine</li> <li>• Clozapine</li> <li>• Fluphenazine</li> <li>• Loxapine</li> <li>• Olanzapine</li> <li>• Perphenazine</li> <li>• Pimozide</li> <li>• Prochlorperazine</li> <li>• Promethazine</li> <li>• Thioridazine</li> <li>• Thiothixene</li> <li>• Trifluoperazine</li> </ul>	
<p>Antimuscarinics (urinary incontinence)</p> <ul style="list-style-type: none"> <li>• Darifenacin</li> <li>• Fesoterodine</li> <li>• Flavoxate</li> <li>• Oxybutynin</li> <li>• Solifenacin</li> <li>• Tolterodine</li> <li>• Trospium</li> </ul>	<p>Antispasmodics</p> <ul style="list-style-type: none"> <li>• Atropine products</li> <li>• Belladonna alkaloids</li> <li>• Dicyclomine</li> <li>• Homatropine</li> <li>• Hyoscyamine products</li> <li>• Loperamide</li> <li>• Propantheline</li> <li>• Scopolamine</li> </ul>	