**Supplemental Table 2. 2015 American Geriatrics Society Beers Criteria for Potentially Inappropriate Medication (PIM) Use in Older Adults Due to Drug–Disease or Drug–Syndrome Interactions That May Exacerbate the Disease or Syndrome**

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| --- | --- | --- | --- | --- | --- |
| **Disease or Syndrome** | **Drug(s)** | **Rationale** | **Recommendation** | **Quality of Evidence** | **Strength of Recommendation** |
| **Cardiovascular** |
| Heart failure | NSAIDs and COX-2 inhibitorsNondihydropyridine CCBs (diltiazem, verapamil)—avoid only for heart failure with reduced ejection fractionThiazolidinediones (pioglitazone, rosiglitazone)CilostazolDronedarone (severe or recently decompensated heart failure) | Potential to promote fluid retention and/or exacerbate heart failure | Avoid | NSAIDs: moderateCCBs: moderateThiazolidinediones: highCilostazol: lowDronedarone: high | Strong |
| Syncope | AChEIsPeripheral alpha-1 blockersDoxazosinPrazosinTerazosinTertiary TCAs ChlorpromazineThioridazineOlanzapine | Increases risk of orthostatic hypotension or bradycardia | Avoid | Peripheral alpha-1 blockers: highTCAs, AChEIs, antipsychotics: moderate | AChEIs, TCAs: strongPeripheral alpha-1 blockers, antipsychotics: weak |
| **Central Nervous System** |
| Chronic seizures or epilepsy | BupropionChlorpromazineClozapineMaprotilineOlanzapineThioridazineThiothixeneTramadol | Lowers seizure threshold; may be acceptable in individuals with well-controlled seizures in whom alternative agents have not been effective | Avoid | Low | Strong |
| Delirium | Anticholinergics (see Table 7 in full criteria available on www.geriatricscareonline.org.)Antipsychotics BenzodiazepinesChlorpromazineCorticosteroidsaH2-receptor antagonists CimetidineFamotidineNizatidineRanitidineMeperidineSedative hypnoticsaexcludes inhaled and topical forms. Oral and parenteral corticosteroids may be required for conditions such as exacerbations of COPD but should be prescribed in the lowest effective dose and for the shortest possible duration. | Avoid in older adults with or at high risk of delirium because of potential of inducing or worsening deliriumAvoid antipsychotics for behavioral problems of dementia and/or delirium unless nonpharmacological options (e.g., behavioral interventions) 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 (stroke) and mortality in persons with dementia | Avoid | Moderate | Strong |
| Dementia or cognitive impairment | Anticholinergics (see Table 7 in full criteria available on www.geriatricscareonline.org)BenzodiazepinesH2-receptor antagonistsNonbenzodiazepine, benzodiazepine receptor agonist hypnoticsEszopicloneZolpidemZaleplonAntipsychotics, chronic and as-needed use | Avoid due to adverse CNS effectsAvoid antipsychotics for behavioral problems of dementia and/or delirium unless nonpharmacological options (e.g., behavioral interventions) 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 (stroke) and mortality in persons with dementia | Avoid | Moderate | Strong |
| History of falls or fractures | AnticonvulsantsAntipsychotics Benzodiazepines Nonbenzodiazepine, benzodiazepine receptor agonist hypnoticsEszopicloneZaleplonZolpidemTCAsSSRIsOpioids | May cause ataxia, impaired psychomotor function, syncope, additional falls; shorter-acting benzodiazepines are not safer than long-acting onesIf one of the drugs must be used, consider reducing use of other CNS-active medications that increase risk of falls and fractures (i.e., anticonvulsants, opioid-receptor agonists, antipsychotics, antidepressants, benzodiazepine-receptor agonists, other sedatives/hypnotics) and implement other strategies to reduce fall risk | Avoid unless safer alternatives are not available; avoid anticonvulsants except for seizure and mood disordersOpioids: avoid, excludes pain management due to recent fractures or joint replacement | HighOpioids: moderate | StrongOpioids: strong |
| Insomnia | Oral decongestantsPseudoephedrinePhenylephrineStimulantsAmphetamineArmodafinilMethylphenidateModafinilTheobrominesTheophyllineCaffeine | CNS stimulant effects | Avoid | Moderate | Strong |
| Parkinson disease | All antipsychotics (except aripiprazole, quetiapine, clozapine)AntiemeticsMetoclopramideProchlorperazinePromethazine | Dopamine-receptor antagonists with potential to worsen parkinsonian symptomsQuetiapine, aripiprazole, clozapine appear to be less likely to precipitate worsening of Parkinson disease | Avoid | Moderate | Strong |
| Gastrointestinal |
| History of gastric or duodenal ulcers | Aspirin (>325 mg/d)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 (i.e., proton-pump inhibitor or misoprostol) | Moderate | Strong |
| **Kidney/Urinary Tract** |
| Chronic kidney disease Stages IV or less (creatinine clearance <30 mL/min) | NSAIDs (non-COX and COX-selective, oral and parenteral) | May increase risk of acute kidney injury and further decline of renal function | Avoid | Moderate | Strong |
| Urinary incontinence (all types) in women | Estrogen oral and transdermal (excludes intravaginal estrogen)Peripheral alpha-1 blockersDoxazosinPrazosinTerazosin | Aggravation of incontinence | Avoid in women | Estrogen: highPeripheral alpha-1 blockers: moderate | Estrogen: strongPeripheral alpha-1 blockers: strong |
| Lower urinary tract symptoms, benign prostatic hyperplasia | Strongly anticholinergic drugs, except antimuscarinic for urinary incontinence (see Table 7 in full criteria available on www.geriatricscareonline.org). | May decrease urinary flow and cause urinary retention | Avoid in men | Moderate | Strong |

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.

*Note:* AChEI = acetylcholinesterase inhibitor; CCB = calcium channel blocker; CNS = central nervous system; COPD = chronic obstructive pulmonary disease; COX = cyclooxygenase; NSAIDs = nonsteroidal anti-inflammatory drugs; SSRIs = selective serotonin reuptake inhibitors; TCAs = tricyclic antidepressants.

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