“Potentially inappropriate medications continue to be prescribed and used as first-line treatment for the most vulnerable of our older adults, despite evidence of poor outcomes from the use of PIMs in older adults.”

“Beer’s List

Mark H. Beers, MD, revolutionized the way medications are prescribed for the elderly. The list that bears his name, the “Beers criteria,” became the watchword for practitioners, particularly consultant pharmacists, who oversee drug therapy for the elderly in nursing facilities and in outpatient settings. An honorary lifetime member of the American Society of Consultant Pharmacists, his cross-disciplinary approach was crucial to the success of his efforts.

Mark H Beers MD

Dr. Mark Beers, past editor-in-chief of The Merck Manuals, died in Miami on Saturday, February 28, of complications of his longstanding diabetes. He was 54 years old. After an early career as a scientist and geriatrician, during which he developed the well-known Beers criteria regarding drugs particularly problematic for the elderly, Mark came to The Manuals in 1992 as associate editor. He served as co-editor of The Merck Manual of Geriatrics and played a key role in developing the first Merck Manual—Home Edition and the first online versions of The Manuals. In 2000, Mark became Editor-in-Chief of The Manuals, a position he maintained until his retirement for medical reasons in 2006. In addition to his work at Merck, Mark remained active in the field of Geriatrics before and after his retirement. He served on the Board of Directors of the National Council on Aging, the Alliance for Aging Research, and the American Federation for Aging Research, of which he was president from 2003 to 2006. Mark held professorships at many medical schools, including UCLA, The University of Pennsylvania, MCP-Hahnemann, Drexel, and most recently, the University of Miami.

Disclosure

- No financial disclosures
- Educational content is sourced from multiple geriatric educators
Objectives

- Recognize the risk of potentially inappropriate medications
- Recognize and avoid common medications that are potentially inappropriate
- Better use the Beers criteria to guide safe and effective prescribing in the elderly

Beer’s Criteria

- Published 1991

Authors of 2015 Update

- Eleven experts in geriatric care and pharmacology
- Peer review by

<table>
<thead>
<tr>
<th>AAFP</th>
<th>ACOG</th>
<th>AMDA</th>
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<tbody>
<tr>
<td>GAPNA</td>
<td>ACP</td>
<td>ASA</td>
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<tr>
<td>AAN</td>
<td>ACS</td>
<td>ASCP</td>
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<tr>
<td>ACCP</td>
<td>SGIM</td>
<td>Multiple Others</td>
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</tbody>
</table>

Explicit Criteria for Determining Inappropriate Medication Use in Nursing Home Residents

Archives of Internal Medicine, 1991

Mark H Beers, Joseph G Ouslander et al

Sir William Osler (late 1800’s)

- “But know also, man has an inborn craving for medicine . . . The desire to take medicine is one feature which distinguishes man, the animal, from his fellow creatures.”
- “The doctor’s visit is not thought to be complete without the prescription.”
**Adverse Drug Events**
- Defined as an injury resulting from the use of a drug
- ADE’s are responsible for 5%-25% of acute geriatric medical admissions
- In the ECF, for every dollar spent on medication, $1.33 is consumed in the treatment of drug related morbidity and mortality
- Errors occur most often at the time of prescribing or were related to inadequate monitoring

**Adverse Drug Events in the Elderly**
- Adverse drug reactions (ADRs) cause over 100,000 deaths per year in the United States, making ADRs the fourth leading cause of death in the United States
  - JAMA 1998; 279:1200-1205
- 10.7% of hospital admissions in older adults are associated with adverse drug reactions.
- About one in three older persons taking at least five medications will experience and adverse drug event each year, and about two thirds of these patients will require medical attention.
  - J AM Geriatr Soc. 1997; 45: 945-8

**Prescribing Cascade**
- Medication A is prescribed which causes an ADE
- Medication B is prescribed to treat the ADE
  - e.g. metoclopramide causes Parkinsonism
  - e.g. CaCB causes edema
  - e.g. diphenhydramine causes urinary retention

**“Medication related problems are common, costly, and often preventable in older adults and lead to poor outcomes.”**

**“Estimates from past studies in ambulatory and long-term care settings found that 27% of adverse drug events (ADEs) in primary care and 42% of ADEs in long-term care were preventable.”**
Since 1990, over 500 studies have been performed on potentially inappropriate medications.

95% of Adverse Drug Events are considered predictable (AGS-GPS).

Potentially Inappropriate Medications (PIMs) now form an integral part of policy and practice for CMS and are used in Medicare Part D.

Polypharmacy ("Many Drugs")
- Negative connotation
- Inappropriate polypharmacy
  - Risk outweighs benefits
  - Focus of presentation
- Appropriate polypharmacy
  - Benefit outweighs risk
  - Evidence of underuse of medications in elderly

Screening Tools for Appropriate Polypharmacy
- ACOVE - 3: Assessing Care of Vulnerable Elders
- START: Screening Tool to Alert Doctors to the Right Treatment
- STOPP: Screening Tool of Older Persons’ (Potentially Inappropriate) Prescriptions
Risks of Polypharmacy in Older Individuals

- Adverse Drug Reactions
  - Reduced metabolism & excretion
- Drug Interactions
- Preventable Medication Errors
- Non-adherence to necessary medications
  - Medication costs
  - Intolerable side effects or fear of side effects
- Lack of perceived benefit
- Economic Hardship
- Prescribing Cascade
- Hospitalization

What is in the Beer’s Criteria?

- Medications to avoid in older adults
- Medications to avoid in older adults with certain diseases
- Medications that should be used with caution
- Potentially clinically important Drug-Drug interactions
- Medications needing renal dosing
- Drugs with strong anticholinergic properties

Anticholinergic side effects

- CNS-confusion, disorientation, hallucinations, sedation
- Ophthalmologic – mydriasis, cycloplegia
- Cardiac – tachycardia
- Pulmonary – decreased bronchial secretions
- Urologic – urinary retention
- Gastrointestinal – constipation, dry mouth

Factors Associated with Inappropriate Prescribing or Overprescribing

- Patient Factors
  - Advanced age
  - Female gender
  - Lower educational level
  - Rural residence
  - Belief in using “a pill for every ill”
  - Multiple health problems
  - Use of multiple medications
  - Use of multiple pharmacies

Factors Associated with Inappropriate Prescribing or Overprescribing

- System Factors
  - Multiple prescribers for individual patient
  - Poor record keeping
  - Failure to review a patient’s medication regimen at every visit
  - Faulty transitions in care
  - Faulty medication reconciliation

Risk Factors for Adverse Drug Events

- Age > 85 yr
- Low body weight or body mass index
- Six or more concurrent chronic diagnoses
- An estimated creatinine clearance <50 mL/min
- Nine or more medications
- Twelve or more doses of medications per day
- A prior adverse drug event
Beers Criteria is only Part of Quality Prescribing

- Quality prescribing includes
  - Correct drug for correct diagnosis
  - Appropriate dose (dose adjustments for comorbidity, drug-drug interactions)
  - Avoiding underuse of potentially important medications (e.g., bisphosphonates for osteoporosis)
  - Avoiding overuse (e.g., antibiotics)
  - Avoiding potentially inappropriate drugs
  - Avoiding withdrawal effects with discontinuation
  - Consideration of cost

Perceived Barriers to Appropriate Prescribing

- Polypharmacy, can’t review such a long list
- “Best” drugs may cost too much
- Worrying about drug interactions if making drug changes
- Time involved
- Difficulty communicating with pt’s other prescribing clinicians
- Lack of knowledge re Beers
- Lack of therapeutic alternatives
- Patient unwillingness to change
- Discomfort changing a med another clinician prescribed

Table 2.

2015 American Geriatrics Society Beers Criteria for Potentially Inappropriate Medication Use in Older Adults

<table>
<thead>
<tr>
<th>Organ System or Therapeutic Category or Drug</th>
<th>Rationale</th>
<th>Recommen-dation</th>
<th>Quality of Evidence</th>
<th>Strength of Recommendation</th>
</tr>
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<tbody>
<tr>
<td>Anticholinergics (excludes TCA) First-generation antihistamines (as single agent or as part of combination products)</td>
<td>Highly anticholinergic; clearance reduced with advanced age, and tolerance develops when used as hypnotic; greater risk of confusion, dry mouth, constipation, and other anticholinergic effects and toxicity. Use of diphenhydramine in special situations such as acute treatment of severe allergic reaction may be appropriate</td>
<td>Avoid Hydroxyzine and promethazine: High; All others: moderate</td>
<td>Strong</td>
<td></td>
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</tbody>
</table>

Notable New Additions to Potentially Inappropriate Medications, 2012 & 2015

- Megestrol
- Glyburide
- Sliding scale of insulin
- Nonbenzo-, benzo-receptor agonists
- PPI over 8 weeks
- Antipsychotics for delirium
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<td>Anticholinergics (excludes TCAs)</td>
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<tr>
<td>Antispasmodics</td>
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<td>Clidinium-chlordiazepoxide (Librax)</td>
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<td>Dicyclomine (Bentyl)</td>
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<td>Hyoscyamine (Levsin)</td>
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<td>Propantheline</td>
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<td>Scopolamine</td>
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<tr>
<td>Highly anticholinergic, uncertain effectiveness</td>
<td>Avoid except in short-term palliative care to decrease oral secretions</td>
<td>Moderate</td>
<td>Strong</td>
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**Antithrombotics**

- Dipyridamole, oral short acting (Persantine)
  - Avoid
  - Moderate
  - Strong

- Ticlopidine (Ticlid)
  - Safer effective alternatives available
  - Avoid
  - Moderate
  - Strong

Clopidogrel (Plavix) replaces Ticlopidine

**Anti-infective**

- Nitrofurantoin (Macrodantin, Macrobid)
  - Potential for pulmonary toxicity, hepatotoxicity, and peripheral neuropathy, especially with long-term use; safer alternatives available
  - Avoid in individuals with creatinine clearance <30 mL/min or for long-term suppression of bacteria
  - Low
  - Strong

**Cardiovascular**

- Alpha1 blockers
  - Droxazosin (Cardura)
  - Prazosin (Minipres)
  - Terazosin (Hytrin)
  - 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
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<tr>
<td>Cardiovascular Alpha agonists, central Clonidine Guanabenz* Guanfacine* Metyldopa* Reserpine (&gt; 0.1 mg/d)*</td>
<td>High risk of adverse CNS effects; may cause bradycardia and orthostatic hypotension; not recommended as routine treatment for hypertension</td>
<td>Avoid clonidine as a first-line antihypertensive Avoid others as listed</td>
<td>Low</td>
<td>Strong</td>
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<td>Disopyramide (Norpace)</td>
<td>Disopyramide is a potent negative inotrope and therefore may induce heart failure in older adults; strongly anticholinergic; other antiarrhythmic drugs preferred</td>
<td>Avoid</td>
<td>Low</td>
<td>Strong</td>
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<td>Digoxin</td>
<td>Use in atrial fibrillation should not be used as a first-line agent in atrial fibrillation, because more-effective alternatives exist and it may be associated with increased mortality</td>
<td>Avoid as first-line therapy for atrial fibrillation</td>
<td>Atrial fibrillation: moderate</td>
<td>Low</td>
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<td>Use in heart failure questionarable effects on risk of hospitalization and may be associated with increased mortality in older adults with heart failure; in heart failure, higher doses not associated with additional benefit and may increase risk of toxicity</td>
<td>Avoid in heart failure</td>
<td>Heart failure: low</td>
<td>Atrial fibrillation: strong</td>
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<td>Decreased renal clearance of digoxin may lead to increased risk of toxic effects; further dose reduction may be necessary in patients with stage 4 or 5 chronic kidney disease</td>
<td>Avoid dosages &gt; 0.125 mg/d</td>
<td>Dosage &gt; 0.125 mg/d: moderate</td>
<td>Dose &gt; 0.125 mg/d: strong</td>
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<td>Dronedarone (Multaq)</td>
<td>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</td>
<td>Avoid in patients with permanent atrial fibrillation or heart failure</td>
<td>Moderate</td>
<td>Strong</td>
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<td>Nifedipine, immediate release*</td>
<td>Potential for hypotension; risk of precipitating myocardial ischemia</td>
<td>Avoid</td>
<td>High</td>
<td>Strong</td>
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<td>Spironolactone &gt; 25 mg/d</td>
<td>In heart failure, the risk of hyperkalemia is higher in older adults especially if taking &gt; 25 mg/d or taking concomitant NSAID, angiotensin converting-enzyme inhibitor, angiotensin receptor blocker, or potassium supplement.</td>
<td>Avoid in patients with heart failure or with a CrCl &lt; 30 mL/min</td>
<td>Moderate</td>
<td>Strong</td>
</tr>
<tr>
<td>Central nervous system</td>
<td>Increased risk of CVA and greater rate of cognitive decline and mortality in persons with dementia. Avoid antipsychotics for behavioral problems of dementia 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.</td>
<td>Avoid except for schizophrenic, bipolar disorder, or short-term use as antiemetic during chemotherapy</td>
<td>Moderate</td>
<td>Strong</td>
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<tr>
<td>Barbiturates</td>
<td>High rate of physical dependence; tolerance to sleep benefits; risk of overdose at low dosages</td>
<td>Avoid</td>
<td>High</td>
<td>Strong</td>
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<tr>
<td>Central nervous system Tertiary TCAs, alone or in combination:</td>
<td>Amitriptyline (Elavil) Chlordiazepoxide-amitriptyline Clomipramine (Anafranil) Doxepin &gt; 6 mg/d Imipramine (Tofranil) Perphenazine-amitriptyline Trimipramine</td>
<td>Highly anticholinergic, sedating, and cause orthostatic hypotension; safety profile of low-dose doxepin (6 mg/d) is comparable with that of placebo.</td>
<td>Avoid</td>
<td>High</td>
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<tr>
<td>Central nervous system Antipsychotics, first (conventional) and second (atypical) generation</td>
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### Benzodiazepines

**Short and intermediate acting:**
- Alprazolam (Xanax)
- Estazolam
- Lorazepam (Ativan)
- Oxazepam (Serax)
- Temazepam (Restoril)
- Triazolam (Halcion)

**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 crashes in older adults.**

**Recommendation:** Avoid

**Quality of Evidence:** Moderate

**Strength of Recommendation:** Strong

### Benzodiazepines

- Long acting:
  - Clorazepate (Tranxene)
  - Chlordiazepoxide (Librium)
  - Diazepam (Valium)
  - Flurazepam (Dalmane)
  - Quazepam

**Maybe appropriate for seizure disorders, rapid eye movement sleep disorders, benzodiazepine withdrawal, ethanol withdrawal, severe generalized anxiety disorder, and periprocedural anesthesia.**

**Recommendation:** Avoid

**Quality of Evidence:** Moderate

**Strength of Recommendation:** Strong

### Nonbenzodiazepine, benzodiazepine receptor agonist hypnotics

- Eszopiclone (Lunesta)
- Zolpidem (Ambien)
- Zaleplon (Sonata)

**Benzodiazepine-receptor agonists have adverse events similar to those of benzodiazepines in older adults (e.g., delirium, falls, fractures); increased emergency department visits and hospitalizations; motor vehicle crashes; minimal improvement in sleep latency and duration.**

**Recommendation:** Avoid

**Quality of Evidence:** Moderate

**Strength of Recommendation:** Strong

### Ergot mesylates*

- Lack of efficacy

**Recommendation:** Avoid

**Quality of Evidence:** High

**Strength of Recommendation:** Strong

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"At your age, people get anxious about taking so many pills, but I can prescribe something for that."
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<tr>
<td>Androgens</td>
<td>Potential for cardiac problems and contraindicated in men with prostate cancer</td>
<td>Avoid unless indicated for moderate to severe hypogonadism</td>
<td>Moderate</td>
<td>Weak</td>
</tr>
<tr>
<td>Desiccated thyroid</td>
<td>Concerns about cardiac effects; safer alternatives available</td>
<td>Avoid</td>
<td>Low</td>
<td>Strong</td>
</tr>
<tr>
<td>Estrogens with or without progestins</td>
<td>Evidence of carcinogenic potential (breast and endometrium); lack of cardioprotective effect and cognitive protection in older women</td>
<td>Oral and topical patch; acceptable to use low-dose intravaginal estrogen for the management of dyspareunia, lower urinary tract infections, and other vaginal symptoms</td>
<td>Oral and patch: high; Topical: moderate</td>
<td>Oral and patch: strong; Topical: weak</td>
</tr>
<tr>
<td>Growth hormone</td>
<td>Effect on body composition is small and associated with edema, arthralgia, carpal tunnel syndrome, gynecomastia, impaired fasting glucose</td>
<td>Avoid, except as hormone replacement after pituitary gland removal</td>
<td>High</td>
<td>Strong</td>
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<tr>
<td>Insulin, sliding scale</td>
<td>Higher risk of hypoglycemia without improvement in hyperglycemia management regardless of care setting; refers to sole use of short- or rapid-acting insulin to manage or avoid hyperglycemia in absence of basal or long-acting insulin; does not apply to titration of basal insulin or use of additional short- or rapid-acting insulin in conjunction with scheduled insulin (i.e., correction insulin)</td>
<td>Avoid</td>
<td>Moderate</td>
<td>Strong</td>
</tr>
<tr>
<td>Megestrol</td>
<td>Minimal effect on weight; increases risk of thrombotic events and possibly death in older adults</td>
<td>Avoid</td>
<td>Moderate</td>
<td>Strong</td>
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<tr>
<td>Sulfonylureas, long duration</td>
<td>Chlorpropamide: prolonged half-life in older adults; can cause prolonged hypoglycemia; causes syndrome of inappropriate antidiuretic hormone secretion. Glyburide: greater risk of severe prolonged hypoglycemia in older adults</td>
<td>Avoid</td>
<td>High</td>
<td>Strong</td>
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<tr>
<td>Glyburide (Diabeta, Micronase)</td>
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<tr>
<td>Gastrointestinal</td>
<td>Metoclopramide (Reglan)</td>
<td>Can cause extrapyramidal effects including tardive dyskinesia; risk may be even greater in frail older adults</td>
<td>Avoid, unless for gastroparesis</td>
<td>Moderate</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>Mineral oil, oral</td>
<td>Potential for aspiration and adverse effects; safer alternatives available</td>
<td>Avoid</td>
<td>Moderate</td>
</tr>
<tr>
<td>Proton-pump inhibitors</td>
<td>Risk of Clostridium difficile infection and bone loss and fractures</td>
<td>Avoid scheduled use for &gt;8 weeks unless for high-risk patients (e.g., oral corticosteroids or chronic NSAID use), evolve esophagitis, Barrett’s esophagitis, pathological hypersecretory condition, or demonstrated need for maintenance treatment (e.g., due to failure of drug discontinuation trial or H2 blockers)</td>
<td>High</td>
<td>Strong</td>
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<tr>
<td>Pain</td>
<td>Meperidine</td>
<td>Not an effective oral analgesic in dosages commonly used; may cause neurotoxicity; safer alternatives available</td>
<td>Avoid</td>
<td>High</td>
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<td>Increases risk of GI bleeding and peptic ulcer disease in high-risk groups, including those aged &gt; 75 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 approximately 2–4% of patients treated for 1 year. These trends continue with longer duration of use.</td>
<td>Avoid chronic use unless other alternatives are not effective and patient can take gastroprotective agent (proton pump inhibitor or misoprostol).</td>
<td>Moderate</td>
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<td>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</td>
<td>Avoid</td>
<td>Low</td>
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<td>Most muscle relaxants are poorly tolerated by older adults because of anticholinergic adverse effects, sedation, risk of fracture; effectiveness at dosages tolerated by older adults is questionable</td>
<td>Avoid</td>
<td>Moderate</td>
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<tbody>
<tr>
<td>Not effective oral analgesic in dosages commonly used; may cause neurotoxicity; safer alternatives available</td>
<td>Avoid</td>
<td>High</td>
</tr>
</tbody>
</table>
Highlights

- Table 3. 2012 American Geriatrics Society 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

Heart Failure

- NSAIDs and COX-2 inhibitors
- Nondihydropyridine CCBs (avoid only for systolic heart failure)
  - Diltiazem, Verapamil
- Pioglitazone (Actos), Rosiglitazone (Avandia)
- Cilostazol (Pletal)
- Dronedarone (Multaq)

Syncope

- AChEIs
- Peripheral alpha blockers
  - Doxazosin
  - Prazosin
  - Terazosin
- Tertiary TCAs
  - Chlorpromazine, Thioridazine, and Olanzapine (Zyprexa)

Chronic Seizures or Epilepsy

- Bupropion (Wellbutrin)
- Chlorpromazine
- Clozapine
- Maprotiline
- Olanzapine (Zyprexa)
- Thiordazine
- Thiothixene
- Tramadol (Ultram)

Delirium

- Anticholinergics
- Antipsychotics
- Benzodiazepines
- Chlorpromazine
- Corticosteroids
- H2-receptor antagonists
  - Cimetidine (Tagamet)
  - Famotidine (Pepcid)
  - Nizatidine (Axid)
  - Ranitidine (Zantac)
- Meperidine
- Sedative hypnotics

Dementia or Cognitive Impairment

- Anticholinergics
- Benzodiazepines
- H2-receptor antagonists
- Nonbenzodiazepine, benzodiazepine receptor agonist hypnotics
  - Eszopiclone
  - Zolpidem
  - zaleplon
- Antipsychotics, chronic and as needed use
History of falls or fractures
- Anticonvulsants
- Antipsychotics
- Benzodiazepines
- Nonbenzodiazepine hypnotics
  - Eszopiclone
  - Zaleplon
  - Zolpidem
- TCAs and selective serotonin reuptake inhibitors
- Opioids

Insomnia
- Oral decongestants
  - Pseudoephedrine (Sudafed)
- Phenylephrine
- Stimulants
  - Amphetamine
  - Armodafinil
  - Methylphenidate (Ritalin)
  - Modafinil (Provigil)
- Theobromines
  - Theophylline
  - Caffeine

Parkinson Disease
- All antipsychotics (except aripiprazole (Abilify), quetiapine (Seroquel), clozapine (Clozaril))
  - Metoclopramide (Reglan)
  - Prochlorperazine (Compazine)
  - Promethazine (Phenergan)

History of Gastric or Duodenal Ulcers
- Aspirin (>325 mg/d)
- Non-COX-2 selective NSAIDs

Kidney and Urinary Tract
- Chronic kidney disease Stages IV or less (creatinine clearance <30 mL/min)
- NSAIDs (non-COX and COX-selective, oral and parenteral)

Urinary incontinence (all types) in Women
- Estrogen oral and transdermal (excludes intravaginal estrogen)
- Peripheral alpha-1 blockers
  - Doxazosin (Cardura)
  - Prazosin (Minipres)
  - Terazosin (Hytrin)
Lower Urinary Tract Symptoms, Benign Prostatic Hyperplasia

- Strongly anticholinergic drugs, except antimuscarinics for urinary incontinence

Under-prescribed Medications
AGS Geriatrics Review Syllabus

- ACEI/ARB for patients with diabetes and proteinuria
- Anticoagulants
- Antihypertensives and diuretics as evidenced by uncontrolled hypertension
- B-blockers for patients after myocardial infarction or with heart failure
- Bronchodilators
- Proton-pump inhibitors or misoprostol for GI protection from NSAIDs
- Statins
- Vitamin D and calcium for patients with or at risk of osteoporosis

Pharmacologic Debridement

- Review every medication every visit
- Review OTC medications
- Look for duplicate therapy
- Look for medications treating a SE of another med
- Look for an active diagnosis for every medication