Beers List and the impact of Polypharmacy on the older adult

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Associate Professor Pharmacy Practice
University of Buffalo School of Pharmacy and Pharmaceutical Sciences
Objectives

1. Recognize key evidence used to establish the new 2019 American Geriatric Society (AGS) Beers Criteria
2. Identify the medications that are considered to be potentially inappropriate if used in older adults
3. Recognize opportunities to mitigate risk when using medications on the Beers list based on recommendations made by the interdisciplinary panel
What about polypharmacy?

- Polypharmacy is a common issue in older adults in all settings.
- Consequences of polypharmacy include ADRs, PIMs, nonadherence, drug interactions, functional decline, and geriatric syndromes (falls, cognitive impairment).
- Can increase risk of ADEs, emergency care, and hospitalization.
- Treatment failure due to non-adherence.
- Deprescribing can help to reduce polypharmacy and PIMs.
- Adverse drug withdrawal effects (ADWEs) are a risk of deprescribing and planning should be taken into account on how each medication will be withdrawn.
What about polypharmacy? What is the definition?

• Masnoon et al: systematic review to identify and summarize polypharmacy definitions in existing literature

• **Multimorbidity** and the associated use of multiple medicines (polypharmacy), is common in the older population. Despite this, there is no consensus definition for polypharmacy.

• Published between 1st January 2000 and 30th May 2016

• Definitions were categorized as
  i. numerical only (using the number of medications to define polypharmacy)
  ii. numerical with an associated duration of therapy or healthcare setting (such as during hospital stay)
  iii. descriptive (using a brief description to define polypharmacy)

A total of 1156 articles were identified and 110 articles met the inclusion criteria. Articles not only defined polypharmacy but associated terms such as minor and major polypharmacy. As a result, a total of 138 definitions of polypharmacy and associated terms were obtained.

<table>
<thead>
<tr>
<th>Definitions n=138</th>
<th>% of all definitions</th>
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<tr>
<td>numerical only definitions</td>
<td>111 (80.4%)</td>
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<td>numerical definitions which incorporated a duration of therapy or healthcare setting</td>
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<td>• numerical definition of five or more medications daily (n = 51, 46.4% of articles), with definitions ranging from two or more to 11 or more medicines.</td>
<td></td>
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<tr>
<td>• distinction classified between appropriate and inappropriate polypharmacy, using descriptive definitions to make this distinction (6.4%)</td>
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Concluded:

- Polypharmacy definitions were variable.
- Numerical definitions of polypharmacy did not account for specific comorbidities present and make it difficult to assess safety and appropriateness of therapy in the clinical setting.

- What about psychiatric medication management?

• The presence of multiple chronic conditions increases the **complexity of therapeutic management** for both health professionals and patients, and impacts negatively on health outcomes

• Multimorbidity is associated with decreased quality of life, self-rated health, mobility and functional ability as well as increases in hospitalizations, physiological distress, use of health care resources, mortality and costs

• Globally, the health burden of multimorbidity is expected to rise significantly as a result of the growing number of older people and increasing numbers of people living with multimorbidity


Polypharmacy is associated with adverse outcomes including mortality, falls, adverse drug reactions, increased length of stay in hospital and readmission to hospital soon after discharge.

The risk of adverse effects and harm increases with increasing numbers of medications.

Harm can result due to a multitude of factors including drug-drug interactions and drug-disease interactions.

Older patients are at even greater risk of adverse effects due to decreased renal and hepatic function, lower lean body mass, reduced hearing, vision, cognition and mobility.


• Prevalence of Polypharmacy: Outpatient
• Design: Cross-sectional analysis of the National Health & Nutrition Examination Survey (NHANES 1988–2010)
• Sample: Civilian, non-institutionalized older adults
• Results:

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<tr>
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</tr>
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• Tools we can use to detect when a medication where the risk outweighs the benefit of use

• Medication Appropriateness Index (MAI)
• Screening Tool of Older People's Prescriptions (STOPP criteria)
• Screening Tool to alert doctors to the right treatment (START)
• 2019 Beers criteria
• Tools we can use to detect when a medication where the risk outweighs the benefit of use

• Medication Appropriateness Index (MAI)

10 questions to determine appropriateness

1. Is there an indication for the medication?
2. Is the medication effective for the condition?
3. Is the dosage correct?
4. Are the directions correct?
5. Are the directions practical?
6. Are there clinically significant drug-drug interactions?
7. Are there clinically significant drug-disease interactions?
8. Is there unnecessary duplication with other medications?
9. Is the duration of therapy acceptable?
10. Is this medication the least expensive alternative compared with others of equal utility?

• Tools we can use to detect when a medication where the risk outweighs the benefit of use
• STOPP Criteria

European based criteria

General concepts
—Drug prescribed without evidence based clinical indication
—Drug prescribed without recommended duration
—Therapeutic duplication
Organized by physiological system
—Drugs to avoid
—Drug–drug interactions
—Dosing considerations for reduced renal function
—Drug–disease interactions

• Tools we can use to detect when a medication where the risk outweighs the benefit of use

• START Criteria

European based criteria
• Drug therapies that should be considered to treat different disease states
  – Unless end of life or contraindication
• Organized by physiological system

• Tools we can use to detect when a medication where the risk outweighs the benefit of use

• START Criteria

  European based criteria
  • Drug therapies that should be considered to treat different disease states
    – Unless end of life or contraindication
  • Organized by physiological system

• Tools we can use to detect when a medication where the risk outweighs the benefit of use
• 2019 Beers Criteria

U.S. based criteria

Table 2: PIMs for all older adults
• Organized according to organ system and therapeutic category
Table 3: Drug-disease or drug-syndrome interactions
Table 4: PIMs to be used with caution
Table 5: Drug-drug interactions
Table 6: Medication considerations for reduced kidney function
Table 7: PIMS with strong anticholinergic properties
Tables 8 & 9: additions, deletions

Objective #1

Recognize key evidence used to establish the new 2019 American Geriatric Society (AGS) Beers Criteria
Background

Intent of criteria

• The American Geriatrics Society (AGS) developed the AGS Beers Criteria with the intention of improving medication selection, reducing adverse drug events and to serve as a tool to educate clinicians and patients by reducing exposure to potentially inappropriate medications (PIMS) that pose higher risk when used in older adults.

• Since 2011, the AGS introduced a scheduled triennial update with the latest having been released in 2019. This update will provide opportunities to translate criteria into practice and address some of the controversy and myths that continue to prevail.
Background

Intent of criteria
Panel composition
Literature review
Development process
  • Designations of quality of evidence and strength of recommendations (table 1)
  • Comprehensive summary of PIMS in older adults (table 2)
Results
  • Noteworthy changes to PIMS in older adults (Table 10)
1. Medication on the Beers list are considered **potentially inappropriate** but **not definitely inappropriate**

2. **Read the rationale and recommendations** statements for each. The caveats and guidance listed there are important

3. Understand **why medications are included** in the Beers Criteria and **adjust approach** to using those medications accordingly

4. Optimal application of Beers Criteria involves **identifying** potentially inappropriate medication and where appropriate **offering safer** non-drug and drug therapy

5. The Beers Criteria should be considered as the **starting point** for comprehensive process of identifying and improving medication appropriateness and safety

6. Access to medications included in the Beers Criteria **should not be excessively restricted** by prior authorization and/or health plan coverage policies

7. The Beers Criteria are **not equally applicable** to all countries (or patients)

Objective #2

Identify the medications that are considered to be potentially inappropriate if used in older adults
Objective #2

Identify the medications that are considered to be potentially inappropriate if used in older adults

QE=quality of evidence (high=H, medium=M, low=Low)
SR=strength of recommendations (strong=S, weak=W)
### Table 1: Designations of Quality of Evidence and Strength of Recommendations

#### Quality of Evidence

Quality of evidence ratings for each criterion are based on synthetic assessment of two complementary approaches to evaluating the quality of evidence.

<table>
<thead>
<tr>
<th>High-quality evidence</th>
<th>ACP-based approach⁹</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Evidence...obtained from 1 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.”</td>
<td></td>
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</tbody>
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<tr>
<th>Moderate-quality evidence</th>
<th>ACP-based approach⁹</th>
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<tr>
<td>“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.”</td>
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<tr>
<th>Low-quality evidence</th>
<th>ACP-based approach⁹</th>
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<td>“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.”</td>
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</tbody>
</table>

<table>
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<tr>
<th>GRADE-based approach⁴</th>
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<tbody>
<tr>
<td>Consider the following five factors for the studies that comprise the best-available evidence for a given criterion:</td>
<td></td>
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<tr>
<td>1. Risk of bias: Severity of threats to studies’ internal validity (e.g., randomized vs observational design, potential for confounding, bias in measurement)</td>
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<tr>
<td>2. Inconsistency: Do different studies provide similar or different estimates of effect size</td>
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<td>3. Indirectness: How relevant are the studies to the clinical question at hand (e.g., nature of study of population, comparison group, type of outcomes measured)</td>
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<td>4. Imprecision: Precision of estimates of effect</td>
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<tr>
<td>5. Publication bias: Risk of bias due to selective publication of results</td>
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#### Strength of Evidence

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.

<table>
<thead>
<tr>
<th>Strong</th>
<th>Weak</th>
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<tbody>
<tr>
<td>Harms, adverse events, and risks clearly outweigh benefits.</td>
<td>Harms, adverse events, and risks may not outweigh benefits.</td>
</tr>
<tr>
<td>Drug category</td>
<td>Rationale</td>
</tr>
<tr>
<td>---------------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Anticholinergics</td>
<td>Highly anticholinergic&lt;br&gt;Diphenhydramine for acute severe allergic reaction is appropriate</td>
</tr>
<tr>
<td>Antiparkinsonian agents</td>
<td>More effective Parkinson’s disease treatments&lt;br&gt;Not recommended for EPS with APS&lt;br&gt;&lt;strong&gt;Benztropine PO/trihexyphenidyl&lt;/strong&gt;</td>
</tr>
<tr>
<td>Antispasmodics</td>
<td>Highly anticholinergic and questionable effectiveness&lt;br&gt;&lt;strong&gt;Scopolamine, dicyclomine&lt;/strong&gt;</td>
</tr>
<tr>
<td>Antithrombotics</td>
<td>Dipyridamole without ASA: more effective alternatives available and may cause orthostatic hypotension</td>
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<tr>
<td>Anti-infectives</td>
<td>Nitrofurantoin: Pulmonary toxicity, hepatotoxicity and peripheral neuropathy</td>
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Table 2. (PIMS)

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<th>S</th>
<th>R</th>
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<tr>
<td>Cardiovascular*</td>
<td>High risk of orthostatic hypotension; Doxazosin, prazosin, terazosin</td>
<td>Avoid for routine treatment for HTN use alternative</td>
<td>M</td>
<td>S</td>
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<tr>
<td>Peripheral alpha-1 blockers</td>
<td>High risk of CNS effects, bradycardia, orthostatic hypotension</td>
<td>Avoid</td>
<td>L</td>
<td>S</td>
<td></td>
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<tr>
<td>Central alpha-agonists &amp; other</td>
<td>May induce HF due to negative ionotropic action</td>
<td>Avoid</td>
<td>L</td>
<td>S</td>
<td></td>
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<tr>
<td>Disopyramide</td>
<td>Worse outcomes for patients with permanent AFib or severe or recently decompensated HF</td>
<td>Avoid</td>
<td>H</td>
<td>S</td>
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<tr>
<td>Dronedarone</td>
<td>AFib: not first line; safer alternatives exist HF: most concerns for HFrEF</td>
<td>Avoid</td>
<td>L</td>
<td>L</td>
<td>S</td>
<td>S</td>
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<tr>
<td>Drug category</td>
<td>Change 2015 to 2019</td>
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<tr>
<td>Cardiovascular</td>
<td>High risk of orthostatic hypotension and associated harms, especially in older adults; not recommended as routine treatment for hypertension; alternative agents have superior risk/benefit profile</td>
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<tr>
<td>• Peripheral alpha-1 blockers</td>
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<tr>
<td>Cardiovascular</td>
<td>Use in atrial fibrillation; should not be used as a first-line agent in atrial fibrillation, because there are safer and more-effective alternatives exist and it may be associated with increased mortality for rate control supported by high quality evidence.</td>
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<tr>
<td>• Digoxin</td>
<td>Use in 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. Questionable effects on risk of hospitalization and may be associated with increased mortality in older adults with heart failure. In heart failure, higher dosages not are not associated with additional benefit and may increase risk of toxicity.</td>
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<td></td>
<td>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.</td>
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<tr>
<td>• Amiodarone</td>
<td>Greater toxicities than alternatives</td>
<td>Avoid</td>
<td>H</td>
<td>S</td>
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<td></td>
<td>May be reasonable first line for patients with concomitant HF or LVH if <em>rhythm control</em> is preferred over rate control</td>
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<tr>
<td>Central Nervous System</td>
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<tr>
<td>• TCA Antidepressants</td>
<td>Alone or in combination</td>
<td>Avoid</td>
<td>H</td>
<td>S</td>
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<td></td>
<td>Highly anticholinergic, sedating and risk of OH</td>
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<tr>
<td>• Antipsychotics</td>
<td>Increased risk of CVA (stroke), cognitive decline and mortality in patients with dementia</td>
<td>Avoid</td>
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<td>• Barbiturates</td>
<td>Increased sensitivity, risk of falls, fractures, etc.</td>
<td>Avoid</td>
<td></td>
<td>M</td>
<td>S</td>
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<tr>
<td>• Benzodiazepines</td>
<td>May be appropriate for some disorders</td>
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<tr>
<td>• Z-drugs</td>
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<tr>
<td>• Meprobamate</td>
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# Potentially inappropriate medication use in older adults

## Table 2. (PIMS)

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<td>Central Nervous System • Ergoloid Mesylates</td>
<td>Lack of efficacy</td>
<td>Avoid</td>
<td>H</td>
<td>S</td>
<td></td>
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</tr>
<tr>
<td>Endocrine • Androgens</td>
<td>Potential for cardiac problems and Cl in men with prostate cancer</td>
<td>Avoid</td>
<td>M</td>
<td>W</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Endocrine • Desiccated thyroid</td>
<td>Concerns about cardiac effects; safer alternatives available</td>
<td>Avoid</td>
<td>L</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Endocrine* • Estrogen +/- progestin</td>
<td>Evidence of carcinogenic potential &amp; lack of cardioprotective and cognitive protection</td>
<td>Avoid systemic Intravaginal (limited use)</td>
<td>H</td>
<td>M</td>
<td>S</td>
<td>W</td>
</tr>
<tr>
<td>Endocrine • Growth hormone</td>
<td>Risk exceeds benefit</td>
<td>Avoid</td>
<td>H</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Endocrine* • Insulin</td>
<td>Sliding scale and regimens that contain only short or rapid acting insulin without concurrent use of basal or long acting</td>
<td>Avoid</td>
<td>M</td>
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<td>Endocrine*</td>
<td>Evidence of carcinogenic potential (breast and endometrium); lack of cardioprotective effect and cognitive protection in older women. Evidence indicates that vaginal estrogens for the treatment of vaginal dryness are safe and effective; women with a history of breast cancer who do not respond to nonhormonal therapies are advised to discuss the risks and benefits of low-dose vaginal estrogen (dosages of estradiol less than 35mcg twice weekly) with their healthcare provider</td>
<td>Avoid systemic estrogen (e.g. oral and topical patch) Vaginal cream or <strong>vaginal</strong> tablets: acceptable to use low dose intravaginal estrogen for management of dyspareunia, <strong>recurrent</strong> lower urinary tract infections and other vaginal symptoms</td>
</tr>
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<td></td>
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<td>---------------</td>
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<td></td>
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<tr>
<td>Endocrine*</td>
<td>Higher risk of hypoglycemia without improvement in hyperglycemia management regardless of care setting (refers to sole use of short or rapid acting insulins 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). <strong>Avoid insulin regimens that include only short or rapid acting insulin dosed according to current blood glucose levels without concurrent use of basal or long-acting insulin.</strong> This recommendations does not apply to regimens that contain basal insulin or long acting insulin.</td>
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### Potentially inappropriate medication use in older adults

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<th>Recommendation</th>
<th>QE</th>
<th>S</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Nervous System</td>
<td>Risk exceeds benefit</td>
<td>Avoid</td>
<td>H</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>• Megestrol</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gastrointestinal*</td>
<td>Can cause EPS</td>
<td>Avoid</td>
<td>M</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>• Metoclopramide</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>Risk of aspiration</td>
<td>Avoid</td>
<td>M</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>• Mineral oil (oral)</td>
<td>Safer alternatives exist</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>Risk of bone loss and fractures</td>
<td>Avoid scheduled use for more than 8 weeks (unless exception)</td>
<td>H</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>• Proton Pump inhibitors</td>
<td>Risk of Clostridium difficile</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain medications*</td>
<td>Risk exceeds benefit</td>
<td>Avoid</td>
<td>M</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>• Meperidine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>Drug category</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastrointestinal*</td>
<td>Can cause extrapyramidal effects, including tardive dyskinesia; risk may be greater in frail older adults and with prolonged exposure</td>
</tr>
<tr>
<td>• Metoclopramide</td>
<td>Avoid, unless for gastroparesis with duration of use not to exceed 12 weeks except in rare cases.</td>
</tr>
<tr>
<td>Pain medications*</td>
<td><strong>Oral analgesic</strong> not oral effective in dosages commonly used; may have higher risk of neurotoxicity, including delirium, than other opioids; safer alternatives available</td>
</tr>
<tr>
<td>• Meperidine</td>
<td>Avoid especially in individuals with chronic kidney disease</td>
</tr>
</tbody>
</table>
## Potentially inappropriate medication use in older adults

### Table 2. (PIMS)

<table>
<thead>
<tr>
<th>Drug category</th>
<th>Rationale</th>
<th>Recommendation</th>
<th>QE</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain medications</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Non-COX selective NSAIDS (oral)</td>
<td>Increased of GI bleeding in high risk groups</td>
<td>Avoid chronic use</td>
<td>M</td>
<td>S</td>
</tr>
<tr>
<td>• Indomethacin &amp; ketorolac</td>
<td>Can increase BP and risk of kidney injury</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain medications</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Skeletal muscle relaxants</td>
<td>Poorly tolerated by older adults and questionable effectiveness at lower doses</td>
<td>Avoid</td>
<td>M</td>
<td>S</td>
</tr>
<tr>
<td>Genitourinary</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Desmopressin</td>
<td>High risk of hyponatremia-safer alternatives available</td>
<td>Avoid for nocturia or nocturnal polyuria</td>
<td>M</td>
<td>S</td>
</tr>
</tbody>
</table>

Poll Question #1

Which of the following statements is true relative to the use of medications listed as potentially inappropriate (PIMS) for use in older adults according to Beers criteria?

1. PIMS are designated exclusively as drugs that interact with each other
2. PIMS are inappropriate and should not be used under any circumstance
3. PIMS are considered potentially inappropriate, but can be used if no alternatives exist
4. PIMS are designated exclusively as drugs to avoid certain disease states
Poll Question #1

Which of the following statements is true relative to the use of medications listed as potentially inappropriate (PIMS) for use in older adults according to Beers criteria?

1. PIMS are designated exclusively as drugs that interact with each other
2. PIMS are inappropriate and should not be used under any circumstance
3. PIMS are considered potentially inappropriate, but can be used if no alternatives exist
4. PIMS are designated exclusively as drugs to avoid certain disease states
Cardiovascular-heart failure

### 2019

- **Avoid**: Cilostazol
- **Avoid in HF with reduced EF**: Non-dihydropyridine CCB (diltiazem, verapamil)
- **Use with caution** in patients with HR who are asymptomatic and
- **Avoid in patients** with symptomatic HF:
  - NSAIDS and COX-2 inhibitors
  - Thiazolidinediones (TZD)
  - Dronedarone

Potential to promote fluid retention and/or exacerbate heart failure (NSAIDs and COX-2 inhibitors, non-dihydropyridine CCBs, TZDs); potential to increased mortality in older adults with HR (cilostazol and dronedarone)

### 2015

- **NSAID and COX-2 inhibitors**
- **Non-dihydropyridine CCBs** (diltiazem, verapamil)
  - Avoid only for heart failure with reduced ejection fraction
- Thiazolidinediones (pioglitazone, rosiglitazone)
- **Cilostazol**
- **Dronedarone** (severe or recently decompensated heart failure)
  - Potential to promote fluid retention and exacerbate heart failure

Potentially inappropriate medication use in older adults due to **drug-disease or drug-syndrome interactions**

Table 3. (PIMS)
AChEis cause bradycardia and should be avoided in older adults whose syncope may be due to bradycardia. Nonselective peripheral alpha-1 blockers cause orthostatic blood pressure changes and should be avoided in older adults whose syncope may be due to orthostatic hypotension. Tertiary TCAs and the APS listed increase the risk of orthostatic hypotension or bradycardia.
<table>
<thead>
<tr>
<th>Disease or syndrome</th>
<th>Drug(s)</th>
<th>Rationale</th>
<th>Recommendation</th>
<th>QE</th>
<th>SR</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNS: Delirium</td>
<td>Anticholinergics, antipsychotics, BZD, Z- hypnotics, corticosteroids H2 blockers, meperidine</td>
<td>Avoid due to potential to induce or worsen delirium</td>
<td>Avoid</td>
<td>H2B: L</td>
<td>S</td>
</tr>
<tr>
<td>CNS: Dementia/ Cognitive impairment</td>
<td>Anticholinergics, antipsychotics, BZD, Z- hypnotics</td>
<td>Avoid due to adverse CNS effects</td>
<td>Avoid</td>
<td>M</td>
<td>S</td>
</tr>
</tbody>
</table>
2019 from 2015 changes to delirium

Anticholinergics
Antipsychotics, Benzodiazepines
Corticosteroids (oral and parenteral)
H2-receptor antagonists
  • Cimetidine
  • Famotidine
  • Nizatidine
  • Ranitidine
Meperidine
Sedative hypnotics
Nonbenzodiazepine, benzodiazepine receptor agonist hypnotics: eszopiclone, zaleplon, zolpidem

Both 2015 & 2019 criteria indicate the need to avoid use of APS for behavioral problems unless non-pharmacologic (behavioral) interventions have failed or are not possible and the older adults is threatening substantial harm to self or others.

APS are associated with greater risk of cerebral vascular accidents (stroke) and mortality in persons with dementia.
<table>
<thead>
<tr>
<th>Disease or syndrome</th>
<th>Drug(s)</th>
<th>Rationale</th>
<th>Recommendation</th>
<th>QE</th>
<th>SR</th>
</tr>
</thead>
</table>
| CNS: History of falls/fractures | **Antiepileptics** anticonvulsant, antipsychotics, BZD, Z-hypnotics, **antidepressants** (TCA, SSRI, **SNRI**), **opioids** | May cause ataxia, syncope, more falls | • Avoid unless safer alternatives are not available  
• AED to be used for seizure and mood disorders only  
• Opioids only for severe acute pain | Opioid: M | S |
<table>
<thead>
<tr>
<th>Disease or syndrome</th>
<th>Drug(s)</th>
<th>Rationale</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNS:* Parkinson’s Disease</td>
<td>• Antiemetics &lt;br&gt;   • Metoclopramide &lt;br&gt;   • Prochlorperazine &lt;br&gt;   • promethazine &lt;br&gt;   • All Antipsychotics (except aripiprazole, quetiapine, clozapine and pimavanserin)</td>
<td>• Dopamine-receptor antagonists with potential to worsen PD symptoms &lt;br&gt; • <strong>APS exceptions:</strong> quetiapine, aripiprazole, pimavanserin and clozapine appear to be less likely to precipitate worsening of PD. <strong>Quetiapine has only been studied in low-quality clinical trials with efficacy comparable to that of placebo in five trials and to that of clozapine in 2 others</strong></td>
<td>Avoid</td>
</tr>
<tr>
<td>Disease or syndrome</td>
<td>Drug(s)</td>
<td>Rationale</td>
<td>Recommendation</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>----------------------------------------------</td>
<td>---------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Gastrointestinal: History of gastric or duodenal ulcers | • Aspirin doses greater than 325mg/day  
• Non-COX-2 selective NSAID | May exacerbate current ulcers or precipitate new ulcers | Avoid unless other alternatives are not effective & patient is able to take GI protection (ie PPI, misoprostol) | M | S |    |    |
| Kidney/urinary tract: Chronic kidney disease stage 4 or higher (CrCl < 30ml) | NSAIDs (non-COX and COX selective) | May increase risk of AKI and further decline of renal function | Avoid  
Minor wording change and criterion title was previously kidney/ AND urinary tract  
Had stage IV or less NOW stage 4 or HIGHER | M | S |    |    |
<table>
<thead>
<tr>
<th>Disease or syndrome</th>
<th>Drug(s)</th>
<th>Rationale</th>
<th>Recommendation</th>
<th>QE</th>
<th>SR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kidney/urinary tract: Urinary incontinence (all types) women</td>
<td>• Estrogen • Peripheral alpha-1 blockers</td>
<td>Lack of efficacy Aggravation of incontinence</td>
<td>Avoid in women</td>
<td>H</td>
<td>S</td>
</tr>
<tr>
<td>Kidney/urinary tract: lower urinary tract symptoms, BPH</td>
<td>Strongly anticholinergic drugs</td>
<td>May decrease urinary flow and cause urinary retention</td>
<td>Avoid in men</td>
<td>M</td>
<td>S</td>
</tr>
</tbody>
</table>
### Potentially inappropriate medication use in older adults due to **drug-drug interactions**

**Table 5. (PIMS)**

<table>
<thead>
<tr>
<th>Drug or class of drugs</th>
<th>Interacting Drug(s)</th>
<th>Rationale</th>
<th>Recommendation</th>
<th>Q</th>
<th>E</th>
<th>S</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAS inhibitors (ACEIs/ARBS, aliskiren) or K+ sparing diuretics</td>
<td>Use with another (ACEIs/ARBS, aliskiren)</td>
<td>Increased risk of hyperkalemia</td>
<td>Avoid routine use in those with CKI stage</td>
<td>M</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opioids</td>
<td>Use with BZD, gabapentin, pregabalin</td>
<td>Increased risk of severe sedation, respiratory depression/death</td>
<td>Avoid Rare exception when converting from opiate to gabapentin</td>
<td>M</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anticholinergic agents</td>
<td>Additional anticholinergic agents</td>
<td>Increased risk of cognitive decline</td>
<td>Avoid and minimize number of anticholinergic agent</td>
<td>M</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drug or class of drugs</td>
<td>Interacting Drug(s)</td>
<td>Rationale</td>
<td>Recommendation</td>
<td>QE</td>
<td>SR</td>
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<td>------------------------------------------------</td>
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<td>--------------------------------------------------------------------------------</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Antidepressants, Antipsychotics, AED, BZDs, “Z” drugs, opioids</td>
<td>Any combination of these agents</td>
<td>Increased risk of falls (all), fractures (BZD and “Z drugs”)</td>
<td>Avoid total of 3 or more CNS active drugs, minimize CNS active drugs</td>
<td>H</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corticosteroids</td>
<td>NSAIDS</td>
<td>Increased risk of GI bleeding PUD</td>
<td>Avoid if not possible provide GI protection</td>
<td>M</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lithium</td>
<td>ACEIs, loop diuretics</td>
<td>Increased risk of toxicity</td>
<td>Avoid; monitor lithium concentrations</td>
<td>M</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peripheral alpha blockers</td>
<td>Loop diuretics</td>
<td>Increased risk of urinary incontinence in women</td>
<td>Avoid in older women unless combination is required</td>
<td>M</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drug or class of drugs</td>
<td>Interacting Drug(s)</td>
<td>Rationale</td>
<td>Recommendation</td>
<td>QE</td>
<td>SR</td>
<td></td>
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<td>------------------------</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Phenytoin</td>
<td>TMP-SMX</td>
<td>Increased risk of phenytoin toxicity</td>
<td>Avoid</td>
<td>M</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Theophylline</td>
<td>Cimetidine OR Ciprofloxacin</td>
<td>Increased risk of theophylline toxicity</td>
<td>Avoid</td>
<td>M</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warfarin</td>
<td>Amiodarone OR Ciprofloxacin OR Macrolides (excludes azithromycin) OR Trimethoprim-sulfa OR NSAIDS</td>
<td>Increased risk of bleeding</td>
<td>Avoid when possible; monitor INR closely if used together</td>
<td>M</td>
<td>S</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Objective #3

Recognize opportunities to mitigate risk when using medications on the Beers list based on recommendations made by the interdisciplinary panel.
### Drugs to be used with caution in older adults

**Table 4. (PIMS)**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Rationale</th>
<th>Recommendation</th>
<th>QE</th>
<th>SR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspirin for primary prevention of CVD and CRC*</td>
<td>Generally <em>indicated for secondary prevention</em> in older adults with established CVD</td>
<td>Use with caution in adults 70 years of age or older</td>
<td>M</td>
<td>S</td>
</tr>
<tr>
<td>Dabigatran and Rivaroxaban*</td>
<td>Increased risk of GI bleeding versus warfarin and other DOACs when used long term for treatment VTE or AFib in adults 70 years of age or older.</td>
<td>Use with caution for treatment VTE or AFib in adults 70 years of age or older.</td>
<td>M</td>
<td>S</td>
</tr>
<tr>
<td>Prasugrel*</td>
<td>Increased risk of bleeding in older adults; benefit in highest risk older adults (those with prior MI or DM) may offset risk when used for its approved indication of ACS to be managed with PCI</td>
<td>Use with caution in adults 75 years of age or older.</td>
<td>M</td>
<td>W</td>
</tr>
<tr>
<td>Drug</td>
<td>Rationale</td>
<td>Recommendation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>---------------------------------------------------------------------------</td>
<td>-----------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aspirin for primary prevention (PP) of CVD and CRC*</td>
<td>Lack of evidence of benefit versus risk in adults aged ≥ 80. Risk of major bleeding from ASA increases markedly in older age. Several studies suggest lack of net benefit when used for PP in older adults with CV risk factors, but evidence is not conclusive. ASA is generally indicated for secondary prevention in older adults with established CVD.</td>
<td>Use with caution in adults aged ≥ 80 - 70 years of age or older.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dabigatran and Rivaroxaban*</td>
<td>Increased risk of GI bleeding versus warfarin and other target-specific direct oral anticoagulants when used long term for treatment VTE or AFib in adults ≥70 years. Lack of evidence of efficacy and safety in individuals with CrCl &lt;30ml/min.</td>
<td>Use with caution for treatment VTE or AFib in adults 70 years of age or older and in patients with CrCl &lt;30ml/min.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 4. (PIMS)

<table>
<thead>
<tr>
<th>Drug</th>
<th>Rationale</th>
<th>Recommendation</th>
<th>QE</th>
<th>SR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prasugrel*</td>
<td>Increased risk of bleeding in older adults; benefit in highest risk older adults (those with prior MI or DM) may offset risk when used for its approved indication of ACS to be managed with PCI</td>
<td>Use with caution in adults 75 years of age or older.</td>
<td>M</td>
<td>W</td>
</tr>
</tbody>
</table>
### Drugs to be used with caution in older adults

**Table 4. (PIMS)**

<table>
<thead>
<tr>
<th>Drug</th>
<th>Rationale</th>
<th>Recommendation</th>
<th>QE</th>
<th>SR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antipsychotics</td>
<td>May exacerbate or cause SIADH or hyponatremia</td>
<td>Use with caution, monitor sodium closely when starting or changing dosages in older adults</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antidepressant SNRIs, SSRIs, TCAs,</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mirtazapine</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AED: Carbamazepine, Oxcarbazepine</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diuretics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tramadol</td>
<td>May exacerbate or cause SIADH or hyponatremia</td>
<td>Use with caution, monitor sodium closely when starting or changing dosages in older adults</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dextromethorphan with quinidine</td>
<td>Limited efficacy in patients with behavioral symptoms of dementia (not applicable for PBA treatment) May increase risk of falls and concerns with clinically significant drug interactions.</td>
<td>Use with caution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trimethoprim/Sulfamethoxazole</td>
<td>Increased risk of hyperkalemia hen used concurrently with an ACEI or ARB in presence of decreased creatinine clearance</td>
<td>Use with caution in patients on ACEI or ARB &amp; decreased CrCl.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vasodilators</td>
<td>May exacerbate episodes of syncope in those with history of syncope</td>
<td>Use cautions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: **QE** = Qualitative Evaluation, **SR** = Safety Rating.
Poll Question #2

Which of the following is an appropriately matched pair of Beer’s criteria drug: rationale for caution: recommendation to mitigate risk?

1. Aspirin: hyponatremia: monitor sodium
2. Sertraline: hyponatremia: monitor sodium
3. Dabigatran: hyponatremia: monitor sodium
4. TMP-SMX: hyponatremia: monitor sodium
Poll Question #2
Which of the following is an appropriately matched pair of Beers criteria drug: rationale for caution: recommendation to mitigate risk?

1. Aspirin: hyponatremia: monitor sodium
2. **Sertraline: hyponatremia: monitor sodium**
3. Dabigatran: hyponatremia: monitor sodium
4. TMP-SMX: hyponatremia: monitor sodium
Medications that should be avoided or dose reduced based on kidney function in older adults

Table. 6 (PIMS)

- Anti-infectives
- Cardiovascular agents
- Central nervous system agents
- Gastrointestinal
- Hyperuricemia agents
Drugs with strong anticholinergic properties

Table. 7 (PIMS)

- Antiarrhythmics
- Antidepressants
- Antiemetics
- Antihistamines (first generation)
Clinically important Drug-Drug interactions (table 5.)

- The table title: dropped “non-anti-infective” and is now “clinically important drug-drug interactions that should be avoided in older adults”
- Changed to renin-angiotensin system (RAS) inhibitors from ACEIs/ARBs
- Consolidated CNS agents (AD, AED, APS, BZD, opioids) for increased risk of falls
- Also noted but not listed in Table 10
  - Opioids with BZD and/or gabapentin/pregabalin

Medications that should be avoided or have their dosage reduced with decreased kidney function (table 6.)

- Apixaban, dabigatran, edoxaban and rivaroxaban: revised CrCl at which action is required, rationale and recommendations to reflect current labeling, and CrCl exclusion parameters in clinical trials
<table>
<thead>
<tr>
<th>Added</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agents regardless of diagnosis</strong> (table 2.)</td>
<td></td>
</tr>
<tr>
<td>• Glimepiride</td>
<td>• Severe prolonged hypoglycemia in older adults</td>
</tr>
<tr>
<td>• Methscopolamine &amp; pyrilamine</td>
<td>• Strong anticholinergic</td>
</tr>
<tr>
<td><strong>Disease and syndrome interactions</strong> (table 3.)</td>
<td></td>
</tr>
<tr>
<td>• History of falls/fractures</td>
<td>• Associated with increased risk of falls in older adults</td>
</tr>
<tr>
<td>SNRI</td>
<td></td>
</tr>
<tr>
<td>• Parkinson’s Disease</td>
<td>• Unlike most other antipsychotics, pimavanserin is considered acceptable</td>
</tr>
<tr>
<td>Pimavanserin</td>
<td></td>
</tr>
<tr>
<td><strong>Use with caution</strong> (table 4.)</td>
<td></td>
</tr>
<tr>
<td>• Rivaroxaban</td>
<td>• Emerging evidence of increased risk of serious bleeding compared with</td>
</tr>
<tr>
<td>• Tramadol</td>
<td>other anticoagulant options</td>
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# Medications added to and removed from Beers 2019

## Tables 8 & 9

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START

**Gastrointestinal System**

PPI’s for chronic, severe GERD, or peptic stricture requiring dilation

NSAID’s with history of PUD or GI bleeding only with H2 receptor antagonist  PPI or misoprostol

H2 receptor antagonist or PPI with Aspirin and warfarin

STOPP

**Gastrointestinal System**

PPI for PUD at full therapeutic dose for greater than 8 weeks
AGA CLINICAL PRACTICE UPDATE: EXPERT REVIEWS

The Risks and Benefits of Long-term Use of Proton Pump Inhibitors: Expert Review and Best Practice Advice From the American Gastroenterological Association

Best Practice Advice 1: Patients with GERD and acid-related complications (i.e., erosive esophagitis or peptic stricture) should take a PPI for short-term healing and for long-term symptom control.

Best Practice Advice 2: Patients with uncomplicated GERD who respond to short-term PPIs should subsequently attempt to stop or reduce them. Patients who cannot reduce PPIs should consider ambulatory esophageal pH/impedance monitoring before committing to lifelong PPIs to help distinguish GERD from a functional syndrome. The best candidates for this strategy may be patients with predominantly atypical symptoms or those who lack an obvious predisposition to GERD (e.g., central obesity, large hiatal hernia).

The American Gastroenterological Association (AGA) has updated its clinical practice guidelines on the use of proton pump inhibitors (PPIs) for the treatment of gastroesophageal reflux disease (GERD). The updated guidelines include the following best practice advice:

**Best Practice Advice 1:** Patients with GERD and acid-related complications (i.e., erosive esophagitis or peptic stricture) should take a PPI for short-term healing and for long-term symptom control. 

*Rationale:* PPIs are highly effective in healing esophagitis and for GERD symptom control, and this benefit is likely to outweigh PPI-related risks. There is no evidence for or against PPIs in asymptomatic patients with healed esophagitis or for PPIs beyond 12 months.

**Best Practice Advice 2:** Patients with uncomplicated GERD who respond to short-term PPIs should subsequently attempt to stop or reduce them. Patients who cannot reduce PPIs should consider ambulatory esophageal pH/impedance monitoring before committing to lifelong PPIs to help distinguish GERD from a functional syndrome. The best candidates for this strategy may be patients with predominantly atypical symptoms or those who lack an obvious predisposition to GERD (e.g., central obesity, large hiatal hernia).

Best practice recommendations for PPI use

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**Best Practice Advice 2:** Patients with uncomplicated GERD who respond to short-term PPIs should subsequently attempt to stop or reduce them. Patients who cannot reduce PPIs should consider ambulatory esophageal pH/impedance monitoring before committing to lifelong PPIs to help **distinguish GERD from a functional syndrome.** The best candidates for this strategy may be patients with predominantly atypical symptoms or those who lack an obvious predisposition to GERD (e.g., central obesity, large hiatal hernia).

**Rationale:** Short-term PPIs are highly effective for uncomplicated GERD. Most patients with uncomplicated GERD respond to short-term PPIs and are subsequently able to reduce PPIs to less than daily dosing. Because patients who cannot reduce PPIs face lifelong therapy, we would consider testing for an acid-related disorder in this situation. However, there is no high-quality evidence on which to base this recommendation.

The Risks and Benefits of Long-term Use of Proton Pump Inhibitors: Expert Review and Best Practice Advice From the American Gastroenterological Association

Best Practice Advice 3: Patients with Barrett’s esophagus & symptomatic GERD should take long-term PPI.

Best Practice Advice 4: Asymptomatic patients with Barrett’s esophagus should consider a long-term PPI.

Best Practice Advice 5: Patients at high risk for ulcer-related bleeding from NSAIDs should take a PPI if they continue to take NSAIDs.

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**Best Practice Advice 3:** Patients with Barrett’s esophagus & symptomatic GERD should take long-term PPI.

*Rationale:* PPIs have a clear symptomatic benefit and a possible benefit in slowing progression of Barrett’s. There is likely to be a net benefit for long-term PPIs in these patients.

**Best Practice Advice 4:** Asymptomatic patients with Barrett’s esophagus should consider a long-term PPI.

**Best Practice Advice 5:** Patients at high risk for ulcer-related bleeding from NSAIDs should take a PPI if they continue to take NSAIDs.

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**Best Practice Advice 4:** Asymptomatic patients with Barrett’s esophagus should consider a long-term PPI.

*Rationale:* The evidence that PPIs slow progression of Barrett’s is low in quality but the evidence of PPI adverse effects is also low in quality. Because there is no high quality evidence on either side of this question, this is a weak recommendation and this decision should be individualized with patients.

**Best Practice Advice 5:** Patients at high risk for ulcer-related bleeding from NSAIDs should take a PPI if they continue to take NSAIDs.

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**Best Practice Advice 5**: Patients at high risk for ulcer-related bleeding from NSAIDs should take a PPI if they continue to take NSAIDs.  
*Rationale*: PPIs are highly effective in preventing ulcer-related bleeding in appropriately selected patients who take NSAIDs, and this benefit is likely to outweigh PPI-related risks.

Best Practice Advice 6: The dose of long-term PPIs should be periodically reevaluated so that the lowest effective PPI dose can be prescribed to manage the condition.

Best Practice Advice 7: Long-term PPI users should not routinely use probiotics to prevent infection.

Best Practice Advice 8: Long-term PPI users should not routinely raise their intake of calcium, vitamin B12 or magnesium beyond the Recommended Dietary Allowance (RDA).

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**Best Practice Advice 6:** The dose of long-term PPIs should be periodically reevaluated so that the lowest effective PPI dose can be prescribed to manage the condition.

*Rationale:* Long-term PPI users often receive PPIs at doses higher than necessary to manage their condition. Since PPI reduction is often successful, it is logical to periodically reevaluate PPI dosing so that the minimum necessary dose is prescribed.

**Best Practice Advice 7:** Long-term PPI users should not routinely use probiotics to prevent infection.

**Best Practice Advice 8:** Long-term PPI users should not routinely raise their intake of calcium, vitamin B12 or magnesium beyond the Recommended Dietary Allowance (RDA)

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*Rationale:* There is no evidence for or against use of vitamins or supplements beyond the RDA in long-term users of PPIs. Many adults fall below the RDA in several vitamins or minerals and, in these adults, it is reasonable to raise intake to meet the RDA regardless of PPI use.
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**Best Practice Advice 9:** Long-term PPI users should not routinely screen or monitor bone mineral density, serum creatinine, magnesium, or vitamin B12.

**Best Practice Advice 10:** Specific PPI formulations should not be selected based on potential risks.

**Best Practice Advice 9:** Long-term PPI users should not routinely screen or monitor bone mineral density, serum creatinine, magnesium, or vitamin B12.

*Rationale:* There is no evidence for or against dedicated testing for patients taking long-term PPIs. Such screening (e.g., for iron or vitamin B12 deficiency) can be offered but is of no proven benefit.

**Best Practice Advice 10:** Specific PPI formulations should not be selected based on potential risks.
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Best Practice Advice 10: Specific PPI formulations should not be selected based on potential risks.

Rationale: There is no convincing evidence to rank PPI formulations by risk.

Which of the following statements best describes the rationale regarding balancing the risks and benefits of PPI use?

A. Quality of evidence is low regarding the list of potential adverse effects
B. Quality of evidence is moderate regarding the list of potential adverse effects
C. Absolute risk increase for patients is low at once-daily dosing
D. Absolute risk increase for patients is moderate at twice-daily dosing
Which of the following statements best describes the rationale regarding balancing the risks and benefits of PPI use?

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BF is a 72-year-old female who is at her doctor’s office today to talk about her medications. She is hoping to discontinue pantoprazole. She said she is on this medicine to help with her heartburn, but this has not been a problem for 10 years. Her grandson told her that this medicine causes osteoporosis, and she is requesting a bone mineral density (BMD) scan because of this.

Which of the following regarding a BMD scan for the purposes of screening for PPI-induced osteoporosis would be the most appropriate response?

A. A BMD scan is appropriate, as she has been on this medication for 10 years
B. A BMD scan is indicated because PPIs can lead to malabsorption of calcium
C. BMD scan is not indicated because she is currently using a PPI
D. A BMD scan is not indicated because she is not old enough.

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C. **BMD scan is not indicated because she is currently using a PPI**
D. A BMD scan is not indicated because she is not old enough.
You have won the lottery and are now volunteering (just for fun) for an Accountable Care Organization (ACO) and have noticed a provider who is routinely screening and then monitoring vitamin B12, magnesium, and serum creatinine in his patients every year because they are on long-term PPIs.

Which of the following would you recommend to the provider in terms of appropriate monitoring in these patients?

A. Routinely monitor BMD due to PPI use alone
B. Add iron studies to the screening panel
C. Less frequent lab monitoring
D. Stop routinely monitoring these labs

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GH is a 79-year-old female asking you if there is anything that can be done to help reduce the potential adverse effects of her esomeprazole.

Which of the following would be your reply?

A. Increase your intake of calcium
B. Start a probiotic to reduce the risk of infections
C. Switch to a different PPI
D. Re-evaluate your dose and continued need periodically

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Which of the following tests is the gold standard for diagnosing peptic ulcer disease?

A. Endoscopy  
B. Rapid urease  
C. Urea breath  
D. Stool antigen

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JK is a 66-year-old male presenting to the clinic with complaints of nausea, weight loss, and postprandial abdominal pain that comes and goes over the past few months. His PMH is significant for type 2 diabetes mellitus, hypertension, hyperlipidemia, and seasonal allergies. He is currently on metformin, losartan, atorvastatin, and low-dose aspirin. Upon further investigation, you find that he periodically takes naproxen for acute knee pain.

Which of the following would be the most appropriate procedure to conduct?

A. Upper gastrointestinal endoscopy with biopsy
B. Lower gastrointestinal endoscopy with biopsy
C. Urea breath test
D. Stool antigen test

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Which of the following would be the most appropriate procedure to conduct?

A. **Upper gastrointestinal endoscopy with biopsy**
B. Lower gastrointestinal endoscopy with biopsy
C. Urea breath test
D. Stool antigen test

JK is a 67-year-old female with a history of stroke, diabetes, osteoarthritis and depression. She is currently taking rosuvastatin, low-dose aspirin, lisinopril, metformin, ibuprofen, and escitalopram. Which of the following explains how you would advise the provider wanting to know what their options are for reducing the risk of gastrointestinal complications?

A. The patient is at high cardiovascular risk and should be on naproxen and a PPI or low-dose celecoxib and a PPI
B. The patient is at high cardiovascular risk and should be on naproxen and a PPI or low-dose celecoxib.
C. The patient is at low cardiovascular risk and should be on a non-selective NSAID plus a PPI
D. The patient is at low cardiovascular risk and should be on celecoxib plus a PPI

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You are an ambulatory care population health pharmacist brainstorming disease-specific analytics that may help prevent ED visits and hospital admissions for GI bleeding. Which of the following data points could be used to search the electronic health record for patients at risk for peptic ulcer disease complications?

A. Patients treated for *H. pylori* for 14 days with a PPI, clarithromycin, amoxicillin, and metronidazole

B. Patients < 50 years of age with diabetes and low gastrointestinal risk on long-term naproxen

C. Patients ≥ 65 years of age on antiplatelet agents with corticosteroids or anticoagulants without a long-term PPI

D. Patients ≥ 80 years of age on daily aspirin, lisinopril, and atorvastatin discharged on an H$_2$-receptor antagonist

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Which of the following criteria could be used as data point to search for patients in your electronic health record with inappropriate use of PPIs or H$_2$-receptor antagonists?

A. Patients $> 50$ years of age with diabetes, hypertension, hyperlipidemia, and chronic pain on low-dose aspirin, naproxen, and a long-term PPI

B. Patients $< 65$ years of age on a long-term PPI for remote NSAID-related ulcers with an NSAID previously discontinued

C. Patients $\geq 65$ years of age on antiplatelet agents concomitantly with corticosteroids or anticoagulants on long-term PPI

D. Patients $\geq 80$ years of age on daily aspirin, valsartan, metoprolol, lovastatin, and furosemide discharged on an H$_2$-receptor antagonist

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D. Patients ≥ 80 years of age on daily aspirin, valsartan, metoprolol, lovastatin, and furosemide discharged on an H₂-receptor antagonist

Which of the following is true?

A. Once-daily dosing of PPIs was associated with a higher risk of CKD
B. Twice-daily dosing of PPIs was associated with a higher risk of CKD
C. Once-daily dosing of PPIs was associated with a higher risk of acute kidney injury
D. Twice-daily dosing of PPIs was associated with a lower risk of acute kidney injury
Which of the following is true?

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Patient is an 87-year-old African American male with a prior medical history of diabetes, hypertension, coronary artery disease, stroke, and gout. He is currently on daily esomeprazole for primary prevention of peptic ulcer disease complication while on routine aspirin. He read that PPIs can cause CKD and would like to know if he should be concerned, and if he should do anything about it.

Which of the following would be an appropriate response to his concern?

A. Extended PPI exposure can cause CKD so switching patient to an H2-receptor antagonist is appropriate
B. It is not known if PPIs cause CKD, but they may be associated with a higher risk but given his risk factors for kidney disease switching to an H2-receptor antagonist may be a good alternative
C. PPIs may be associated with a higher risk of CKD, but given he has no risk factors for kidney disease, he could consider remaining on the esomeprazole
D. PPIs may be associated with a higher risk of CKD, but his current regimen is the best option for him at this time given his risk factors for gastrointestinal bleeding.

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D. PPIs may be associated with a higher risk of CKD, but his current regimen is the best option for him at this time given his risk factors for gastrointestinal bleeding.

You decide your patient who is currently on pantoprazole orally twice daily would be a good candidate for a PPI taper, with the ultimate goal of cessation or on-demand therapy. You are only concerned that the patient has been on this medication for many years and does not like to make changes. The patient is 70 years old and is currently taking pantoprazole, lisinopril, metformin, glipizide, and metoprolol. Which of the following points could be made to explain to the patient the observed association of PPIs with specific adverse effects?

A. Twice-daily PPIs may be associated with an increased incidence of CKD; as a patient with known risk factors for kidney disease, taking a daily PPI would eliminate the potential risk while still controlling your symptoms

B. Continuing the PPI would require additional lab monitoring due to the associated risk of CKD

C. PPIs may be associated with an increased incidence of CKD; as a patient with known risk factors for kidney disease, limiting your exposure to PPIs may be beneficial while still controlling your symptoms

D. PPIs may cause CKD and have been shown to be associated with an increased risk in mortality from CKD and cardiovascular disease.

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D. PPIs may cause CKD and have been shown to be associated with an increased risk in mortality from CKD and cardiovascular disease.

Your institution is discussing implementing treatment guidelines to address the inappropriate prescribing of PPIs. Which of the following statements regarding PPI exposure and excess risk could be used in your educational outreach to support the need for PPI therapy protocols?

A. PPIs cause circulatory system diseases
B. PPIs are linked to cause-specific mortality
C. PPIs contribute to mortality in chronic kidney disease
D. PPIs promote mortality in upper gastrointestinal cancer

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An 82-year-old male is discharged from the hospital on low-dose aspirin after a recent transient ischemic attack. He has hypertension, hyperlipidemia, and a remote history of peptic ulcer disease (PUD).

Which of the following is the best treatment option to prevent PUD complications, such as gastrointestinal bleeding?
- Famotidine
- Pantoprazole
- Misoprostol
- Calcium carbonate

A 20-year-old female patient purchases over-the-counter omeprazole (Prilosec OTC®). How long should she take this medication before consulting with you, her medical provider?
- 14 days or less
- 30 days or less
- 3 months or less
- Until symptoms worsen

An 82-year-old male is discharged from the hospital on low-dose aspirin after a recent transient ischemic attack. He has hypertension, hyperlipidemia, and a remote history of peptic ulcer disease (PUD).

Which of the following is the best treatment option to prevent PUD complications, such as gastrointestinal bleeding?

- Famotidine
- Pantoprazole
- Misoprostol
- Calcium carbonate

A 20-year-old female patient purchases over-the-counter omeprazole (Prilosec OTC®). How long should she take this medication before consulting with you, her medical provider?

- 14 days or less
- 30 days or less
- 3 months or less
- Until symptoms worsen

THANK YOU!

Questions?