ENHANCING TEAMS, COORDINATING THE WORK:

Enough Is Enough - Defining And Reducing Polypharmacy And Risk In Primary Care
Special Focus: The Older Adult And The Beers Criteria

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OBJECTIVES

• Explore the number and nature of medications prescribed for a given patient and ways to identify patient risks
• Develop a process to conduct a review of medication list at least annually and before refills
• Consider some special needs of the older adult, the updated Beers list
POLYPHARMACY BY THE NUMBERS

• Half of people 65 and older use 5 or more RX, OTC, and complementary medicines every day

• 1 in 5 prescriptions for community dwellers may be inappropriate

• 8 meds = 34% chance of an adverse reaction and 28 possible drug-drug interactions
DEFINE POLYPHARMACY

- It’s not just a numbers game
- More medications than medically necessary
- Medications do not match diagnosis
- “Hyperpharmacotherapy”
WHO HAS POLYPHARMACY?

• Patient #1: Has depression and hypertension. Taking sertraline, losartan, and Ativan.

• Patient #2: Has COPD, diabetes, and heart failure. Taking ProAir, Spiriva, metformin, Lantus, furosemide, lisinopril, and metoprolol.
ANNUAL WELLNESS VISITS

• Opportunity to engage many members of the team in combatting polypharmacy

• Ask the patient to “Brown Bag” it, explaining that an annual medication checkup is just as important as a physical
ANNUAL MEDICATION REVIEWS

Goals:
• Check for indication, efficacy, and safety
• Create a positive culture around de-prescribing
• Keep Cyndi Lauper away from the med list—break the cycle of prescribing time after time
INDICATION: PLAY THE MATCHING GAME

Disease States
- Diabetes
- Atrial fibrillation
- Hypertension
- Hyperlipidemia
- Constipation

Medications
- Glyburide
- Digoxin
- Metoprolol
- Warfarin
- Docusate
- Gabapentin
- Multivitamin
SAFETY

Take the guilty until proven innocent stance:

“Any symptom in an older patient should be considered a drug side effect until proven otherwise”
SAFETY AND EFFICACY

• Utilize team members’ various strengths
• Pharmacist: safety review (interactions and adverse reactions)
• Pharmacist, Care Manager, or MA: compare med list to labs and patient symptoms to assess efficacy
BREAKING DOWN BARRIERS TO DE-PRESCRIBING

• Fear of unknown consequences
• Patient resists change
• Devolving responsibility
  • “The specialist/hospitalist/last PCP prescribed it, so it should stay.”
WHO HAS POLYPHARMACY? (REVISITED)

• Patient #1: Has depression and hypertension. Taking sertraline, losartan, and Ativan.

  Yes. No indication for Ativan.

• Patient #2: Has COPD, diabetes, and heart failure. Taking ProAir, Spiriva, metformin, Lantus, furosemide, lisinopril, and metoprolol.

  Maybe. All are indicated, but are they necessary? Dig deeper for efficacy and safety.
REFERENCES


CONSEQUENCES OF POLYPHARMACY

• Increased healthcare costs
  • Medical costs increased by 30%
  • >5 drugs – 6.2% increase out of pocket expenditure
  • >10 drugs – 7.3% increase out of pocket expenditure

• Adverse Drug Events (ADEs)
  • Occur in 35% of outpatients and 40% of hospitalized elderly
  • Account for 10% of ED visits
  • >5 medications associated with 88% increased risk of ADEs
    • And 4 times the risk of hospitalization due to ADEs
  • NH patients on >9 medications have 2 times greater risk of ADEs

The Culprits...
Anticoagulants, NSAIDs, cardiovascular medications, diuretics, Antibiotics, anticonvulsants, benzodiazepines, hypoglycemic agents
CONSEQUENCES OF POLYPHARMACY

- Drug interactions
  - 50% probability with 5–9 medications
  - 100% if ≥20 medications
  - 50% of community dwelling elders

- Medication non-adherence
  - 43–100%
  - 35% if ≥4 medications
CONSEQUENCES OF POLYPHARMACY

• Functional status
  • >5 medications impairs ability to perform IADLs
  • >10 medications reduces functional capacity and ability to perform daily tasks

• Cognitive impairment
  • Dementia and delirium
    • 22% of patients on ≤5 medications vs. 33% on 6-9 medications
    • 54% of patients on >10 medications
CONSEQUENCES OF POLYPHARMACY

• Falls
  • ≥4 medications associated with increased falls and risk of recurrent falls

• Urinary incontinence
  • Increased risk of lower urinary tract symptoms

• Nutrition
  • ≥10 medications associated with risk of or actual malnourishment
RESOURCES TO REDUCE POLYPHARMACY

  • Updated 2015

• Screening Tool of Older Persons’ Potentially Inappropriate Prescriptions (STOPP) Criteria
  • http://ageing.oxfordjournals.org/content/suppl/2008/10/01/afn197.DC1/afn197_suppl_data.pdf

BEERS CRITERIA
2015 UPDATE

• Potentially inappropriate medications (PIMS) to be avoided in all adults aged 65 in ambulatory, hospital, and institutionalized settings
  • Except hospice and palliative care patients

• Primary target audience is practicing clinicians

• Aim of criteria includes: improving medication selection; educating clinicians and patients; reducing ADEs; and serving as a tool for evaluating quality of care, cost, and patterns of drug use in older adults
BEERS CRITERIA 2015 UPDATE

• Two major components have been added:
  1. Drugs requiring dose adjustment for impaired kidney function
  2. Drug-drug interactions

• Methods
  • 13 member interdisciplinary expert panel
  • Systematic literature review and evaluation of the evidence
    • August 1, 2011 to July 1, 2014
    • Search terms: drugs, drug classes, conditions from 2012 – focus on ADEs and adverse drug reactions
    • Included: systematic reviews and meta-analyses (60), RCTs (49), and observational studies (233)
  • Employment of the IOMs 2011 report on developing practice guidelines
CHANGES TO PIMS

• Nitrofurantoin
  • Used with relative safety and efficacy with a creatinine clearance of ≥30mL/min
    • Previous recommendation was ≤60mL/min
  • AVOID long term use
    • Risk of irreversible pulmonary fibrosis, liver toxicity, peripheral neuropathy

• Antiarrhythmic drugs (Classes 1a, 1c, III)
  • Recommendation to avoid as first line treatment for atrial fibrillation (AF) has been removed
    • Outcomes with rhythm control are as good or better than those with rate control

• Exceptions – AVOID the following:
  • Amiodarone in the absence of CHF or severe LVH
  • Dronedarone with permanent AF or decompensated CHF
  • Digoxin (for AF or CHF) and if used do not exceed >0.125mg daily for ANY indication
  • Disopyramide as highly anticholinergic
CHANGES TO PIMS

• AVOID Nonbenzodiazepine, benzodiazpine receptor agonist hypnotics given significant harms and limited efficacy
  • Eszopiclone, zaleplon, zolpidem


CHANGES TO PIMS

• Minimal benefits – Nonbenzodiazepine hypnotics

<table>
<thead>
<tr>
<th>Primary outcome - sleep latency</th>
<th>No*</th>
<th>Treatment</th>
<th>Control</th>
<th>No*</th>
<th>Treatment vs control</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSG</td>
<td>14</td>
<td>-42 (-60 to -23)</td>
<td>-20 (-28 to -11)</td>
<td>14</td>
<td>-22 (-33.00 to -11.00)</td>
</tr>
<tr>
<td>Subjective</td>
<td>2</td>
<td>-24.99 (-30.06 to -19.92)</td>
<td>-19.43 (-26.61 to -12.25)</td>
<td>2</td>
<td>-6.90 (-26.00 to 12.37)</td>
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</tbody>
</table>

Secondary outcomes

<table>
<thead>
<tr>
<th></th>
<th>No*</th>
<th>Treatment</th>
<th>Control</th>
<th>No*</th>
<th>Treatment vs control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wake after sleep onset (PSG)</td>
<td>2</td>
<td>-20 (-59 to 18)</td>
<td>-13 (-34 to 7.89)</td>
<td>2</td>
<td>-7.14 (-33.00 to 18.23)</td>
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<tr>
<td>No of awakenings (PSG)</td>
<td>2</td>
<td>1.24 (-6.34 to 3.89)</td>
<td>-0.94 (-12 to 9.99)</td>
<td>2</td>
<td>-0.47 (-5.12 to 4.17)</td>
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<tr>
<td>No awakenings (subjective)</td>
<td>2</td>
<td>2.88 (-7.15 to 1.39)</td>
<td>-1.05 (-4.86 to 2.76)</td>
<td>2</td>
<td>-1.77 (-4.61 to 1.07)</td>
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<tr>
<td>Total sleep time (PSG)</td>
<td>2</td>
<td>49.15 (-60 to 16)</td>
<td>35.10 (-34 to 10)</td>
<td>2</td>
<td>14.05 (-31.00 to 58.72)</td>
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<tr>
<td>Sleep efficiency (PSG)</td>
<td>1</td>
<td>4.27 (2.01 to 6.52)</td>
<td>0 (-2.52 to 2.52)</td>
<td>1</td>
<td>4.47 (2.08 to 6.86)</td>
</tr>
</tbody>
</table>

CHANGES TO PIMS

• Significant harms
  • 3.04% fall rate among adult inpatients who received zolpidem vs. 0.71% among those who did not (OR 4.27 [95% CI 3.34-5.76])
  • Use of zolpidem significantly increases risk of nonvertebral and hip fractures among patients older than 65 (OR 2.55 [95% CI 1.78-3.65])

BENZODIAZEPINES AND SLEEP

• Minimal benefits
  • Decrease sleep latency by 4.2 min (95% CI, -0.7 to 9.2)
  • Participants estimated 14.3 min decrease (95% CI, 10.6 to 18)
  • Increase total sleep duration by 61.8 min (95% CI, 37.4 to 86.2)

• Significant harms
  • 23% of participants aged 65-83 who took BZD reported an ADEs vs. 10% who took placebo (OR 3.07 [95% CI 2.03-4.63]); ARR 14% (NNH = 7)
  • Most common ADEs: Drowsiness, weakness, dizziness, confusion, insomnia, tremor, accidental injury

CHANGES TO PIMS

• Avoid sliding scale insulin coverage
  • “refers to the 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”
  • Higher risk of hypoglycemia without improvement in hyperglycemia management

• Avoid proton pump inhibitors (PPIs) beyond 8 weeks without justification
  • Associated with Clostridium difficile infection, bone loss, and fractures

• Avoid desmopression for the treatment of nocturia or nocturnal polyuria
  • Risk of hyponatremia
CHANGES TO DRUG-DISEASE AND DRUG-SYNDROME PIMS

• Avoid nonbenzodiazepine, benzodiazepine receptor agonist hypnotics in dementia or cognitive impairment

• Avoid opioids if there is a history of falls or fractures

• Avoid antipsychotics as first-line treatment of delirium
  • Conflicting evidence about effectiveness and potential ADEs
  • Delirium is secondary to something else so evaluate for reversible causes – ADEs, pain, infection, urinary retention, constipation, immobility, dehydration, electrolyte abnormalities, unnecessary tubes/lines
USE WITH CAUTION UNCHANGED

• Aspirin for primary prevention of cardiac events
  • Use with caution in adults aged ≥80

• Dabigatran
  • Use with caution in adults aged >75 (increased bleeding risk) and in patients with CrCl <30mL/min (lack of evidence for efficacy and safety)

• Prasugrel
  • Use with caution in adults aged ≥75 though benefit may exceed bleeding risk for patients with DM or previous MI

• Antipsychotics, diuretics, carbamazepine, carboplatin, cyclophosphamide, cisplatin, mirtazapine, oxcarbazepine, SNRIs, SSRIs, TCAs, vinicristine, vasodilators
  • May exacerbate or cause SIADH or hyponatremia
  • Check baseline sodium and monitor with dose adjustments
DRUG-DRUG INTERACTIONS
(EXCLUDES ANTI-INFECTIVES)

• ACEIs and amiloride or triamterene
  • Increased risk of hyperkalemia
  • Avoid routine use

• Anticholinergic with anticholinergic
  • Increased risk of cognitive decline
  • Minimize number of anticholinergic drugs

  More to come....

• Antidepressants (i.e., TCAs and SSRIs) with ≥2 other CNS active drugs
  • Increased risk of falls
  • avoid ≥3 other CNS active drugs
DRUG-DRUG INTERACTIONS
(EXCLUDES ANTI-INFECTIVES)

• Antipsychotics with ≥2 other CNS active drugs
  • Increased risk of falls
  • avoid ≥3 other CNS active drugs

• Benzodiazepines and nonbenzodiazepine receptor agonist hypnotics with ≥2 other CNS active drugs
  • Increased risk of falls and fractures
  • Avoid ≥3 other CNS active drugs

• Corticosteroids, oral or parenteral with NSAIDs
  • Increased risk of peptic ulcer disease or GIB
  • Avoid and if not possible add GI protection

• Lithium with ACEIs or loop diuretics
  • Increased lithium toxicity
  • Avoid, monitor lithium levels
DRUG-DRUG INTERACTIONS
(EXCLUDES ANTI-INFECTIVES)

• Opioid receptor agonist analgesics $\geq 2$ other CNS active drugs
  • Increased risk of falls and fractures
  • Avoid $\geq 3$ other CNS active drugs

• Peripheral Alpha-1 blockers with loop diuretics
  • Increased risk of urinary incontinence in women
  • Avoid, unless condition warrants both

• Theophylline with cimetidine
  • Increased risk of theophylline toxicity
  • Avoid

• Warfarin with amiodarone or NSAIDs
  • Increased risk of bleeding
  • Avoid when possible and closely monitor INR
PIMS AND KIDNEY FUNCTION

Cardiovascular or hemostasis

- Risk of increased potassium
  - Spironolactone (<30mL/min) - avoid

- Risk of increased potassium and decreased sodium
  - trimaterene (<30mL/min) – avoid
  - Amiloride (<30mL/min) - avoid

- Risk of increased risk of bleeding
  - Apixaban (<25 mL/min) – avoid
  - Dabigatran (<30mL/min) – avoid
  - Edoxaban – reduce dose (30-50mL/min), avoid (<30mL/min)
  - Enoxaparin (<30mL/min) – reduce dose
  - Fondaparinux (<30mL/min) – avoid
  - Rivaroxaban – reduce dose (30-50mL/min), avoid (<30mL/min)
PIMS AND KIDNEY FUNCTION

Central nervous system

• Risk of increased GI effects
  • Duloxetine (<30mL/min) – avoid

• Risk of CNS adverse effects
  • Gabapentin (<60mL/min) – reduce dose
  • Levetiracetam (≤80mL/min) – reduce dose
  • Pregabalin (<60mL/min) – reduce dose
  • Tramadol (<30mL/min) – avoid extended release and reduce dose with immediate release
PIMS AND KIDNEY FUNCTION

Gastrointestinal

• Risk of mental status changes
  • Cimetidine (<50mL/min) reduce dose
  • Famotidine (<50mL/min) reduce dose
  • Nizatidine (<50mL/min) reduce dose
  • Ranitidine (<50mL/min) reduce dose

Hyperuricemia

• Risk of reduced efficacy
  • probenecid (<30mL/min) - avoid

• Risk of GI, neuromuscular, bone marrow toxicity
  • Colchicine (<30mL/min) – reduce dose
DRUGS WITH STRONG ANTICHOLINERGIC PROPERTIES

• Decrease cholinergic neurons and receptors
  • Direct antagonism muscarinic receptors $\rightarrow$ cognitive decline
  • $M_1$ blockade $\rightarrow$ progression of Alzheimer’s pathology

• Adverse effects
  • Delirium
  • Cognitive impairment
  • Over-sedation
  • Orthostatic hypotension
  • Falls
  • Urinary retention
  • Constipation
  • Dry mouth/lips affecting speech and appetite
DRUGS WITH STRONG ANTICHOLINERGIC PROPERTIES

• Antihistamines
  • Brompheniramine
  • Carbinoxamine
  • Chlorpheniramine
  • Clemastine
  • Cyproheptadine
  • Dexamfetamine
  • Dextropheniramine
  • Dextrochlorpheniramine

• Antiparkinsonian agents
  • Benztropine
  • Trihexyphenyldyl

• Dimenhydrinate
• Doxylamine
• Triprolidine
• Diphenhydramine
• Hydroxyzine
• Meclizine

Skeletal muscle relaxants
• Cyclobenzaprine
• Orphenadrine
DRUGS WITH STRONG ANTICHOLINERGIC PROPERTIES

Antidepressants
- Amitriptyline
- Amoxapine
- Clomipramine
- Desipramine
- Doxepin (>6mg)
- Imipramine
- Nortriptyline
- Paroxetine
- Protriptyline
- trimipramine

Antipsychotics
- Chlorpromazine
- Clozapine
- Loxapine
- Olanzapine
- Perphenazine
- Thioridazine
- trifluoperazine

Antiarrhythmic
- Disopyramide

Antiemetic
- Prochlorperazine
- Promethazine
DRUGS WITH STRONG ANTICHOLINERGIC PROPERTIES

- Antimuscarinics
  - Darifenacin
  - Fesoterodine
  - Flavoxate
  - Oxybutynin
  - Solifenacin
  - Tolterodine
  - Trospium

- Antispasmodics
  - Atropine
    - excludes opthalmic
  - Belladonna
  - Alkaloids
  - Clidinium
  - Dicyclomine
  - Homatropine
    - excludes opthalmic
  - Hyoscyamine
  - Propantheline
    - excludes opthalmic
STOPP CRITERIA

• Criteria Includes 65 commonly encountered PIMs
  • Drug-drug, drug-disease interactions
  • Duplicate classes
  • Drugs that contribute to falls

• Arranged by physiological system
  • With explanations about why the drug is inappropriate

• Modest overlap with the 2012 Beers criteria
  • 55% of the 65 criteria are not found

A COMPARISON

• Primary aim: determine the prevalence of PIMs in primary care using the 2003 Beers criteria, STOPP, and 2012 Beers criteria
  • 2003 Beers criteria – 24.3% of participants, 120 PIMs
    • Benzodiazepines, NSAIDs, amiodarone, and fluoxetine
  • STOPP – 35.4% of participants, 173 PIMs
    • ASA (>150mg/d), benzodiazepines, glyburide, NSAIDs
  • 2012 Beers criteria – 44% of participants, 241 PIMs
    • Benzodiazepines accounted for the greatest number (n=95), antipsychotics in dementia, sulfonylureas, NSAIDs

Table 3. The Five Most Frequent Potentially Inappropriate Medications (PIMs) Detected According to the Three Tools

<table>
<thead>
<tr>
<th>Order</th>
<th>2003 Beers Criteria</th>
<th>Screening Tool of Older Person’s Potentially Inappropriate Prescriptions</th>
<th>2012 American Geriatrics Society Beers Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PIM, n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First</td>
<td>Benzodiazepine, 22 (18.3)%</td>
<td>Aspirin, 35 (20.2)</td>
<td>Benzodiazepine, 95 (39.4)%</td>
</tr>
<tr>
<td>Second</td>
<td>Noncyclooxygenase NSAID, 20 (16.6)%</td>
<td>Benzodiazepine, 28 (16.2)%</td>
<td>Antipsychotic, 31 (12.8)</td>
</tr>
<tr>
<td>Third</td>
<td>Amiodarone, 10 (8.3)</td>
<td>Glyburide, 23 (13.3)</td>
<td>Sulfonylurea, 23 (9.5)</td>
</tr>
<tr>
<td>Fourth</td>
<td>Fluoxetine, 10 (8.3)</td>
<td>NSAID, 18 (10.4)%</td>
<td>Noncyclooxygenase NSAID, 21 (8.7)%</td>
</tr>
<tr>
<td>Fifth</td>
<td>Doxazosin, 9 (7.5)</td>
<td>Diuretic,² duplicate class, 9 (5.2)</td>
<td>Nonbenzodiazepine hypnotic, 13 (5.8)</td>
</tr>
</tbody>
</table>

²Long-acting benzodiazepine.
³Short-, intermediate-, and long-acting benzodiazepines.
⁴Long-term use of full-dosage, longer half-life, noncyclooxygenase selective nonsteroidal anti-inflammatory drug (NSAID).
⁵Long-term, long-acting benzodiazepine and benzodiazepine with long-acting metabolites.
⁶Long-term use of NSAID (>3 months) for relief of mild joint pain in osteoarthritis.
⁷Oral noncyclooxygenase selective NSAID for pain.
⁸Loop diuretic as first-line monotherapy for hypertension.

A COMPARISON

• Aimed to compare the predictive ability of the 2003 Beers criteria, 2012 AGS Beers criteria, and the STOPP criteria
  • ADEs
  • All cause ED visits
  • All cause hospitalizations
  • Also evaluated the prevalence of PIMs detected according to each criteria
    • And measures of agreement between criteria

• 72493 (41.6%) were exposed to PIMs
  • 19.7% exposed to PIM based on all 3 criteria
  • 34.1% - 2012 Beers criteria
  • 32.2% - 2003 Beers criteria
  • 27.6% - STOPP criteria

A COMPARISON

• Level of agreement
  • Good for 2012 and 2003 Beers criteria ($\kappa=0.80$)
  • Moderate for STOPP and 2012 Beers criteria ($\kappa=0.58$) and 2003 Beers criteria ($\kappa=0.59$)

• Prevalence
  • 2012 Beers criteria – SSRIs, SNRIs, antipsychotics, drugs known to cause SIADH (16.2%); benzodiazepines (11.3%); skeletal muscle relaxants (6.6%); nonbenzodiazepine hypnotics (5.8%); NSAIDs (5.4%)
  • 2003 Beers criteria – anticholinergics and antihistamines (19.4%); SSRIs (10.5%); benzodiazepines (11.2%); muscle relaxants and antispasmodics (7.4%); NSAIDs (5.1%)
  • STOPP criteria – NSAIDs (16.2%); opioids (4.8%); beta blockers (4.7%); corticosteroids (3.8%); antihistamines (3.8%)
Table 3. Association Between the 2012 American Geriatrics Society (AGS) Beers, 2003 Beers, and Screening Tool of Older Persons’ Potentially Inappropriate Prescriptions (STOPP) Criteria and Adverse Drug Events (ADEs), Emergency Department (ED) Visits, and Hospitalizations for Time-Varying and Non-Time-Varying Models

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Unadjusted Models (Exposure Only)</th>
<th>Adjusted Models</th>
<th>ADEs Hazard Ratio (95% Confidence Interval)</th>
<th>ED Visits</th>
<th>Hospitalization</th>
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<tbody>
<tr>
<td></td>
<td>ADEs</td>
<td>ED Visits</td>
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<td>ADEs</td>
<td>ED Visits</td>
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<td>Hazard Ratio</td>
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<td>Interval)</td>
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<tr>
<td>Time-varying monthly lag (primary model)</td>
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<tr>
<td>2012 AGS Beers</td>
<td>2.51 (2.33–2.70)</td>
<td>2.21 (2.16–2.25)</td>
<td>2.25 (2.20–2.30)</td>
<td>2.17 (2.01–2.34)</td>
<td>2.00 (1.96–2.04)</td>
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<tr>
<td>2003 Beers</td>
<td>2.65 (2.46–2.85)</td>
<td>2.29 (2.25–2.34)</td>
<td>2.31 (2.26–2.37)</td>
<td>2.33 (2.16–2.52)</td>
<td>2.14 (2.10–2.19)</td>
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<tr>
<td>STOPP</td>
<td>2.89 (2.68–3.12)</td>
<td>2.66 (2.60–2.72)</td>
<td>2.80 (2.74–2.87)</td>
<td>2.43 (2.24–2.63)</td>
<td>2.38 (2.32–2.43)</td>
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<tr>
<td>Time-varying month to month</td>
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<tr>
<td>2003 Beers</td>
<td>5.01 (4.75–5.28)</td>
<td>4.89 (4.81–4.97)</td>
<td>4.76 (4.68–4.84)</td>
<td>4.30 (4.08–4.54)</td>
<td>4.51 (4.44–4.58)</td>
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<tr>
<td>STOPP</td>
<td>5.21 (4.91–5.52)</td>
<td>5.18 (5.09–5.28)</td>
<td>5.30 (5.20–5.41)</td>
<td>4.18 (3.92–4.44)</td>
<td>4.52 (4.43–4.60)</td>
</tr>
<tr>
<td>Time-dependent once exposed, always exposed</td>
<td>d</td>
<td></td>
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<tr>
<td>2012 AGS Beers</td>
<td>1.71 (1.57–1.87)</td>
<td>1.45 (1.42–1.48)</td>
<td>1.46 (1.42–1.49)</td>
<td>1.43 (1.31–1.56)</td>
<td>1.32 (1.29–1.35)</td>
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<tr>
<td>2003 Beers</td>
<td>1.66 (1.53–1.81)</td>
<td>1.39 (1.36–1.42)</td>
<td>1.38 (1.35–1.42)</td>
<td>1.45 (1.33–1.58)</td>
<td>1.32 (1.29–1.35)</td>
</tr>
<tr>
<td>STOPP</td>
<td>1.76 (1.62–1.91)</td>
<td>1.50 (1.46–1.53)</td>
<td>1.54 (1.51–1.58)</td>
<td>1.47 (1.35–1.60)</td>
<td>1.37 (1.34–1.40)</td>
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<tr>
<td>Ever exposure</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>2012 AGS Beers</td>
<td>3.06 (2.77–3.37)</td>
<td>2.34 (2.28–2.39)</td>
<td>2.58 (2.51–2.65)</td>
<td>2.60 (2.35–2.88)</td>
<td>2.08 (2.03–2.13)</td>
</tr>
<tr>
<td>2003 Beers</td>
<td>2.83 (2.57–3.12)</td>
<td>2.18 (2.13–2.23)</td>
<td>2.33 (2.27–2.39)</td>
<td>2.49 (2.25–2.74)</td>
<td>2.01 (1.97–2.06)</td>
</tr>
<tr>
<td>STOPP</td>
<td>3.11 (2.83–3.42)</td>
<td>2.44 (2.38–2.49)</td>
<td>2.71 (2.64–2.78)</td>
<td>2.64 (2.39–2.91)</td>
<td>2.18 (2.13–2.23)</td>
</tr>
</tbody>
</table>

Sample size for final model excluding preindex events: adverse drug events (ADEs), n = 170,717; emergency department (ED) visits, n = 147,661; hospitalizations (n = 152,085).

Notes:

A Covariates were age, sex, insurance status, region, long-term care, and comorbidities.

B Outcome events associated with time-varying exposure in the preceding month (e.g., March outcome associated with February exposure).

C Outcome events associated with time-varying exposure in the same month.

D Once exposed to a criteria, always exposed whether or not exposure status changes.

E Exposed at any point during the postindex follow-up period.
TAKE HOME POINTS

• Polypharmacy has multiple definitions
• Polypharmacy results in significant harms to patients and contributes to inappropriate utilization of health care resources
• The Beers list and STOPP criteria are resources to reduce polypharmacy and ADE
• It takes an army! Engage your team to assist with the identification and management of polypharmacy and ADE annually

QUESTIONS???
REFERENCES


REFERENCES


