Pharmacological Pitfalls in Older Adults

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SESSION OBJECTIVES

• Discuss the physiologic changes impacting medication therapy in elders.
• Examine the risks of adverse drug events in aging patients.
• Describe techniques to limit polypharmacy in older adults.
Pharmacological Pitfalls in Older Adults

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  – Adult/Gerontological Nurse Practitioner

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  University of Massachusetts Boston
Course Objectives

At the end of this session, the participants will be able to:

• Discuss the physiologic changes impacting medication therapy in elders.

• Examine the risks of adverse drug events in aging patients.

• Describe techniques to limit polypharmacy in older adults.
Disclosure of Relevant Financial Relationships

I have no current connections to any pharmaceutical or medical supply companies.
The Increase in Life Expectancy

• Worldwide improvement in socioeconomic conditions

• Improved detection of illness and disease

• Increased access to health care
Aging

Physiologic changes (and medications) affect organ function...impacting an older adult’s ability to recover from illness or injury.

Start age 45!

Every system affected
Obesity:
Increased distribution lipophilic meds
Aging Changes

• Diminished vision, strength, & fine motor skills
• Decreased body water & muscle mass
  – decreased distribution hydrophilic med
• Diminished liver perfusion
  – Esp. if ETOH, NASH, HF, malnutrition
  – Affects Phase 1, but some Phase 2 metabolism
• Kidneys atrophy, function wanes
  – $GFR\downarrow$
Additional Aging Changes

- Immunocompromise
- Albumin ↓
- Impaired temperature regulation
- Economic changes
- Possible cognitive changes
- Possible losses
Pharmacodynamic Aging Changes

- Change in receptor responsiveness
- Decreased # of receptors
The Aging Brain

• Changes in blood brain barrier
• Increased brain-medication sensitivity
  – Benzos, opioids, anesthetics

• Atrophy
• Microinfarcts
• Vascular changes
• Memory changes
Pharmacodynamics & kinetics also affected by:

Lifestyle

- Daily exercise-amt. affects absorption, distribution
- Diet: malnutrition is common among older adults
  - Patients do not need to be frail to be malnourished!
- ETOH
- Herbals
Pharmacokinetic Changes
Absorption

• Usually not too significant
  – Some conditions/meds affect absorption
  – Oral absorption slower, topical faster!
  – Drug-drug interactions affect absorption
  – PMH bariatric surgery: absorption can be an issue
Pharmacokinetic Changes
Distribution

• *Protein binding not usually problematic, but*
  – Highly bound drug & low albumin = too much free drug = toxicity
Pharmacokinetic Biotransformation Changes

• Decreased liver perfusion = decreased clearance
  – Hepatic changes do not affect all meds

• Phase 1 (p420) metabolism most affected by age

• p450 enzyme inhibition = increased levels of drugs
• p450 induction = decreased levels of drugs
Phase II reactions*

- Not as affected *unless* less blood flow to liver

- *Parent drugs or their metabolites from phase I reaction couple w/endogenous substance forming a drug conjugate.*

- Many drug conjugates are polar, readily excreted, inactive.
Biotransformation

• Genetic impact in elders unclear
• p450 system may impact elders of varied ethnicities affecting metabolism of some drugs
  – e.g., psychotropics: ? R/T being slow metabolizer
    • Asians: increased sensitivity to benzos, neuroleptics, antidepressants, lithium
    • African Americans: higher serum levels w/ TCAs
Renal Changes

- Abnormal renal function impacts @ 2/3 elders
  - Poor perfusion and co-morbidities also affect

- CKD
  - Asymptomatic until GFR < 35 or less
  - Even if seemingly normal renal function: + risk with many meds

GFR helpful, *but remember:*

*if decreased renal function, increased half life*
Preventing Iatrogenic Effects

• Need to identify those at risk to prevent adverse events
• Need for early recognition/treatment to prevent the *iatrogenic cascade*
The Million Dollar?

• What to do/not to do
Medication Safety

Elders > age 60 consume 1/3 of meds
34 % of all prescription meds
30 % of OTCs

Meds affect elders unexpected ways, impact QOL
Dizziness
Falls
Depression/anxiety
Delirium
2/5 elders take 5+ prescription meds.

Most commonly prescribed meds for elders

- HTN
- CAD
- Analgesics/anti-inflammatory
- Sedatives
- GI meds
ADEs in Elders

• Result in @120,000 hospitalizations/year
• Four meds cause > 2/3 of hospitalizations
  – Warfarin: 1/3 of these hospitalizations
  – Insulin
  – Oral antiplatelets
  – Oral hypoglycemics
ADEs

• Confusion, hallucinations
• Depression
• Falls: even young adults taking > 2 meds/day are 2 ½ times more likely to have a fall!
• Malnutrition
ADE Causes

Age-related changes

Polypharmacy

Drug-drug interactions

both provider and patient related
Error
“m&ms”

Miscommunication

Misunderstanding

Med regimen complexity

Missed monitoring opportunity
Risks in Transitions of Care

• Medication changes are common
  • Many are considered high-risk

• Increased complexity of instructions

• Polypharmacy
Elder Health Literacy

• 2/5 of elders cannot read prescription.

• 67% cannot understand information we give them.
  – Cognitive issues
  – Sensory issues
  – Linguistics
Miscellaneous Medication Issues

- Patients worry about side effects
- Problems
  - opening packaging
  - distinguishing one med from another
  - breaking pills/crumbling
  - swallowing the pill
  - affording the pill $$$
Prescribing Safety for Elders

• The history
  – Try to ferret out the problem.
  – ROS to determine if any med side effects

• Med review and documentation every visit-
  – Preferably a “Brown Bag Review” each visit
  – Other meds-did they take a friend’s meds?
  – Does pharmacy relate missed prescription refills?
The Physical Exam

VS, orthostatics

The Basics

Cognition

Visual/hearing acuity

Functional status ? Changes
Differential Diagnosis

• The top 3
  – What are + findings in history, PE?
  – What is causing patient symptoms?
  – Is this a new problem or med side effect?
    • Even old meds can cause side effects
    • e.g., donepezil HCl (Aricept), a cholinesterase inhibitor, may contribute to urinary incontinence

– Attribution
  • Mistaking signs and symptoms
    – e.g., Treating agitation when the problem might be pain or caused by a medication
Mrs. C.

• You are called to see an older nursing home resident who is anxious. The nurse requests “Ativan” to help Mrs. C. “relax”.
  – Mrs. C: older retired, widowed teacher. PMH atrial fibrillation, heart failure, and chronic back pain. NKDA.
Mrs. C’s Meds

- Citalopram 20 mg po QD
- Digoxin 0.125 mg po QD
- Toprol XL 25 mg po QD
- Torsemide 20 mg po QD
- Reglan 5 mg po TID
- Remeron 15 mg po QHS
- Methadone 10 mg po BID
- Warfarin 2 mg po QD
- KCl 20 mEq po QD
Mrs. C

• S: “I feel like I just cannot sit down. I need to keep walking because I feel jumpy under my skin”. ROS -

• O: Slender, kyphotic, elder pacing with walker in corridor. Wgt stable 122lbs. T: 96.4, 138/62, 111 irreg, RR 18, O 2 sat 96% Room air. Appropriate, tremulous. Otherwise neg exam

• A/P ?
Drug-Drug Interactions

- Cat X: citalopram/methadone (QT prolongation: severe)

- Cat D: citalopram/reglan/remeron (serotonin syndrome*: severe); methadone/remeron (serotonin syndrome: severe); methadone/Toprol XL (increases serum concentration metoprolol: severe)
  - *serotonin syndrome: confusion, agitation, tachycardia, shivering, N/V/D
STOPP and START Criteria

• The STOPP (Screening Tool of Older Persons’ potentially inappropriate prescriptions)

• The START (Screening Tool to Alert doctors to Right Treatment)

  • http://www.ngna.org/_resources/documentation/chapter/carolina_mountain/STARTandSTOPP.pdf
<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>MEDICATIONS</th>
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</thead>
<tbody>
<tr>
<td><strong>A Cardiovascular system</strong></td>
<td>3 Loop diuretic as first-line monotherapy for hypertension.</td>
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<tr>
<td></td>
<td>8 Calcium channel blockers with chronic constipation.</td>
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<td>12 Aspirin at dose &gt;150 mg day.</td>
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<td></td>
<td>13 Aspirin with no history of coronary, cerebral or peripheral vascular symptoms or occlusive event.</td>
</tr>
<tr>
<td><strong>B Central nervous system and psychotropic drugs</strong></td>
<td>7 Long-term (i.e., &gt;1 month), long-acting benzodiazepines and benzodiazepines with long-acting metabolites, e.g., diazepam.</td>
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<td></td>
<td>8 Long-term (i.e., &gt;1 month) neuroleptics as long-term hypnotics.</td>
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<td>9 Long-term neuroleptics (&gt;1 month) in those with parkinsonism.</td>
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<td><strong>D Respiratory system</strong></td>
<td>3 Nebulized ipratropium with glaucoma.</td>
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<td><strong>E Musculoskeletal system</strong></td>
<td>2 NSAID with moderate–severe hypertension.</td>
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<td></td>
<td>3 NSAID with heart failure.</td>
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<td></td>
<td>4 Long-term use of NSAID (&gt;3 months) for symptom relief of mild osteoarthritis.</td>
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<tr>
<td></td>
<td>6 NSAID with chronic renal failure.</td>
</tr>
<tr>
<td><strong>F Endocrine system</strong></td>
<td>1 Glibenclamide or chlorpropamide with Type 2 diabetes mellitus.</td>
</tr>
<tr>
<td><strong>H Drugs that adversely affect fallers</strong></td>
<td>1 Benzodiazepines.</td>
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<tr>
<td></td>
<td>2 Neuroleptic drugs.</td>
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<tr>
<td><strong>J Duplicate drug classes</strong></td>
<td>Any duplicate drug class prescription (two concurrent: NSAIDs, benzodiazepines)</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>66</td>
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*Serum creatinine >150 mmol l⁻¹, or estimated GFR 20–50 ml min⁻¹.
<table>
<thead>
<tr>
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</thead>
</table>
| **A** Cardiovascular system  
1 y 2 Warfarin (Acenocumarol) or Aspirin in the presence of chronic atrial fibrillation (AF).  
5 Statin therapy with a documented history of coronary, cerebral or peripheral vascular disease, where the patient’s functional status remains independent for activities of daily living and life expectancy is >5 years.  
6 Angiotensin converting enzyme (ACE) inhibitor with chronic heart failure. | 7 |
| **B** Respiratory system  
1 Regular inhaled beta 2 agonist or anticholinergic agent for mild to moderate asthma or chronic obstructive pulmonary disease (COPD). | 7 |
| **C** Central nervous system  
1 L-DOPA in idiopathic Parkinson’s disease with definite functional impairment and resultant disability.  
2 Antidepressant drug in the presence of moderate–severe depressive symptoms lasting at least 3 months. | 5 |
| **D** Gastrointestinal system  
1 Proton pump inhibitor with severe gastro-oesophageal acid reflux disease  
2 Fibre supplement for chronic, symptomatic diverticular disease with constipation. | 2 |
| **E** Musculoskeletal system  
3 Calcium and Vitamin D supplement in patients with known osteoporosis. | 12 |
| **F** Endocrine system  
1 Metformin with Type 2 diabetes (in the absence of renal impairment*).  
3 Antiplatelet therapy in diabetes mellitus with co-existing major cardiovascular risk factors (hypertension, hypercholesterolaemia, smoking history).  
4 Statin therapy in diabetes mellitus if co-existing major cardiovascular risk factors present. | 8 |

| TOTAL Potential prescribing omissions | 58 |

*Serum creatinine >150 mmol l⁻¹, or estimated GFR 20–50 ml min⁻¹.
Prescriptions

• Elements for a safe prescription
• Are all meds still necessary? PPIs? Vitamins? BP meds?
  – Are patient S&S due to a med, or physiologic change?
  – alternative modalities when possible.
Prescribing Safety for Elders

• To add a med, dc a med.
  – Elders may not need all those BP meds!!
    • GOAL BP 140/80

• Know the meds you are prescribing.
  – What does the med do to the body?
  – What does the body do to the med?
  – Know med SEs you are prescribing

• Check the drug-drug interactions!
Prescribing Safety for Elders

• Assess cognitive understanding & depression.
• Determine health literacy.
  – Rapid Estimate of Health Literacy in Medicine Tool (REALM)
  – Test of Functional Health Literacy in Adults (TOFHLA)
  – Newest Vital Sign (NVS)
Nutrition Facts
Serving Size 1/2 cup
Servings per container 4

Amount per serving
Calories 250
Fat Cal 120

%DV
Total Fat 13g 20%
Sat Fat 9g 40%
Cholesterol 28mg 12%
Sodium 55mg 2%
Total Carbohydrate 30g 12%
Dietary Fiber 2g
Sugars 23g
Protein 4g 8%

*Percentage Daily Values (DV) are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.


Score Sheet for the Newest Vital Sign Questions and Answers

READ TO SUBJECT: This information is on the back of a container of a pint of ice cream.

1. If you eat the entire container, how many calories will you eat?
   Answer: 1,000 is the only correct answer

2. If you are allowed to eat 60 grams of carbohydrates as a snack, how much ice cream could you have?
   Answer: Any of the following is correct: 1 cup or any amount up to 1 cup, half the container. Note: If patient answers "two servings," ask "How much ice cream would that be if you were to measure it into a bowl?"

3. Your doctor advises you to reduce the amount of saturated fat in your diet. You usually have 42 g of saturated fat each day, which includes one serving of ice cream. If you stop eating ice cream, how many grams of saturated fat would you be consuming each day?
   Answer: 33 is the only correct answer

4. If you usually eat 2,500 calories in a day, what percentage of your daily value of calories will you be eating if you eat one serving?
   Answer: 10% is the only correct answer

READ TO SUBJECT: Pretend that you are allergic to the following substances: Penicillin, peanuts, latex gloves, and bee stings.

5. Is it safe for you to eat this ice cream?
   Answer: No

6. Ask only if the patient responds "no" to question 5: Why not?
   Answer: Because it has peanut oil.

Interpretation
Number of correct answers:
Score of 4-6 almost always indicates adequate literacy.
Score of 2-3 indicates the possibility of limited literacy.
Score of 0-3 suggests high likelihood (50% or more) of limited literacy.
Avoiding Prescribing Pitfalls

• “Start low, go slow.”
  – Elders may need less than you think!
  – Prevent hypoglycemia in diabetics

• Assess potential all potential drug-drug interactions.
  – Use technology resources
Tips for Prescribing Safety

• Monitor labs routinely
  – Creatinine does not realistically reflect kidney status.

• Simplify prescriptions
  – One med when possible (i.e., combo med).
  – Daily dose or BID; avoid half pills *(though hard to do).*
  – Write reason for med on prescription/instructions.

• Clear, organized instructions, 1 page, large print.
  – at 3rd to 6th grade level.

• Ask permission to involve family
More Tips

- Try to only add one med at a time
- Cautious use of risky meds
- Avoid prescribing meds new to the market
- Provide med list every visit
  - Have patients carry med list at all times!
Avoid Polypharmacy

• More than ¼ of older adults receive at least one medication that is potentially dangerous and possibly also inappropriate.
  – Avoid “rational” polypharm

  – Many OTCs and herbals now available, but liver function can be compromised
    • E.g., Black cohosh, energy drinks & ETOH, weight loss products
Concerning Meds in Elders

• The Anti’s
  – Antiarrhythmics: renal concern, drug-drug interactions
  – Antianxiety/antidepressants
    • Avoid paroxetine, tricyclics, SSRIs: increased GI blds, fractures
  – Anticholinergics
    • Incr. hospitalizations, confusion
  – Anticonvulsants (except for seizures)
  – Antidiabetic agents
    • Insulin, sulfonylureas
More Anti’s

- Antihistamines, 1st gen

- Antihypertensives
  - Low SBP or DBP: incr. mortality

- Antipsychotics
  - Hyponatremia, increased falls, frx ., mortality

- Antispasmodics
  - Anticholinergic effect
The B’s

• The B’s
  – Barbituates, Benzos, Belladonnas
    • *Benzos: increase risk of falls, confusion, ? Risk factor for dementia/Alzheimer’s*
      
  Yaffe K., Boustani M. (2014)

  – Blockers
    • BB and CCBs-use caution especially together
    • Do use bisoprolol or propanolol for patients on dialysis because not as dialysable.
    • First generation $H_1$ blockers
    • Cimetidine
Other Meds affecting Elders

• Antibiotics
  – For pneumonia: 5-7 day rx. “Start low, go slow” not applicable
  – Nephrotoxicity: aminoglycosides, B-lactams, nitrofurantoin, sulfonamides, quinolones, vancomycin

• Aspirin: not indicated for “primary prevention” CVD in elders
  Ward et al, 2012

• Cholinesterase inhibitors (interact w/P 450 inhibitors)

• Contrast dye: nephrotoxicity

• Dipyridamole: orthostatic hypotension
More Concerning Meds for Elders

• HTCZ: hyponatremia

• Digoxin ? safety in new onset AF

• PPIs: potential nephrotoxicity, osteoporosis, fractures, C. diff, pneumonia, hypomagnesemia

• Sedatives-Hypnotics-Muscle relaxants
  – Confusion,
  – Increased ½ life in elders, ? Increased sensitivity receptors?
Warfarin

- Still one of most concerning meds for elders

- Less expensive even with INR monitoring

- Increased risk bleeding w/antibiotics or antifungals
New Oral Anticoagulants

- Fast acting
- No food interactions
- No lab monitoring required
- More costly
Drug Burden Index Score and Decline (Hilmer et al, 2009)

• 6 –year study of community dwelling elders taking meds with anticholinergic and sedative effects had decreased physical function regardless of co-morbidities, baseline function, or socio-demographics.
Immunizations

• If 65 or older and never received *any* type of pneumococcal vaccine: first give PCV13, then PPSV23 6-12 months later.
  – Pneumovax @ $80.00 (SAM’s Club lowest price)
  – Prevnar @ $136 to $170.00

• If received PPSV23 before or at age 65, give one dose of PCV13 a year after receiving PPSV23.

• If PPSV23 revaccination needed, wait at least 5 years after the last dose of PPSV23 and 6-12 months after receiving PCV13 to revaccinate.
Mr. and Mrs. D.

• Elderly couple married 50+ years.
  – Mrs D. has + dementia & spinal stenosis and husband is caregiver.
  – Mrs D NKDA
  – Current meds: Tylenol 650 milligrams PO in morning for back pain.
  – Aricept 10 milligrams PO at bedtime
  – Seroquel 12.5 mg po at 4 PM for agitation
Mrs. D

- Mrs. D’s daughter calls requesting urgent appt. for mother change in status
- Family/pt. deny illness, fall, symptoms
- O: Wgt 112 lbs (down 3 lbs) 98/60, 98 reg, RR 26, afebrile, O2 sat 98% room air.
  - Alert female, gaunt appearing, weak and more confused than usual.
Mrs. D

• O: cont.
  – Skin: W/D no lesions. HEENT neg
  – Card: S1 S2 reg. No S3, S4 or M
  – Lungs: CTA w/o rales, wheezes, rhonchi
  – Abd: Soft, BS +, RUQ pain, no rebound/guarding
  – Ext: no edema

  – ? Differential/diagnostics???
BP Management in Older Adults

• 75 y.o. female presents for F/U HTN, hyperlipidemia, and AF. Meds: diltiazem 240 mg po, Toprol XL 50 mg po, warfarin 3 mg po, pravastatin 40 mg po. Goal BP for this pt. is:

• A. 140/78
• B. 128/68
• C. 138/50
• D. 118/80
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