Medication Considerations in the Elderly

Dora Cheung, Pharm.D., BCPS
Clinical Pharmacy Specialist – Internal Medicine
University of Colorado Hospital
October 5, 2009

Objectives

- List major pharmacokinetic and pharmacodynamic changes seen with aging
- Name some of the drugs on Beers’ and STOPP criteria and explain why they should be avoided in the elderly
- Discuss strategies to improve medication management in the elderly

Case Study

- JM is a 75 yo male with DM, HTN, and diabetic neuropathy admitted for AMS and UTI. He complains of increased urinary frequency and hesitancy.
  - His current meds include:
    - insulin
    - lisinopril
    - metoprolol
    - simvastatin
    - amitriptyline
    - ceftirorone
- What changes would you make prior to discharge?
  A. No changes
  B. Add tamsulosin
  C. Discontinue amitriptyline, add aspirin
  D. Taper off amitriptyline, start pregabalin, and add aspirin
The Elderly Population

- Patients 65 years or older
- Fastest growing population in US
  - Will account for 25% of population by 2040
- Greater than 90% of elderly use at least one medication
  - 44% males and 57% females use ≥ 5 medications
  - 12% use ≥ 10 medications.

The Problem...

- Adverse drug event (ADE) rate in elderly is at least 3 times that of general population
- 30% of elderly hospital admissions attributed to drug-related problems or ADEs
- Consequences of medication-related problems
  - Estimated to cause 106,000 deaths and cost $85 billion annually
  - If ranked as a disease, it would be the 5th leading cause of death in the US

Why are the elderly at risk for ADEs?

- Multiple chronic medical problems
- Physiologic changes seen with aging
- Use of numerous medications
  - Increased incidence of polypharmacy
  - Higher likelihood for inappropriate prescribing and "medication cascade"
Physiologic Changes in the Elderly

- Pharmacokinetic (PK)
- Pharmacodynamic (PD)

PK Changes in the Elderly

- Absorption
- Distribution
- Metabolism
- Elimination

PK Changes in the Elderly

<table>
<thead>
<tr>
<th>Physiologic Changes</th>
<th>Clinical Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction in gastric acid secretion</td>
<td>Minimal change overall</td>
</tr>
<tr>
<td>increased pH</td>
<td></td>
</tr>
<tr>
<td>Decreased splanchnic blood flow</td>
<td></td>
</tr>
<tr>
<td>Weakened peristalsis; delayed gastric emptying</td>
<td></td>
</tr>
</tbody>
</table>
PK Changes in the Elderly

### Distribution:

<table>
<thead>
<tr>
<th>Physiologic Changes</th>
<th>Clinical Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased adipose tissue</td>
<td>Larger volume of distribution (Vd) for lipophilic drugs leading to longer half-lives and duration of action (e.g., diazepam, clonazepam, lidocaine)</td>
</tr>
<tr>
<td>Decreased lean body mass</td>
<td>Smaller Vd leading to lower concentration of hydrophilic drugs (e.g., aminoglycosides, digoxin, ethanol, theophylline)</td>
</tr>
<tr>
<td>Decreased total body water</td>
<td>Altered protein binding of drugs; increase free fraction of highly protein bound drugs (e.g. NSAIDs, phenytoin, valproic acid, warfarin)</td>
</tr>
<tr>
<td>Decreased serum albumin</td>
<td></td>
</tr>
</tbody>
</table>

### Metabolism:

<table>
<thead>
<tr>
<th>Physiologic Changes</th>
<th>Clinical Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decreased hepatic blood flow; reduced liver size</td>
<td>Increased bioavailability of drugs that exhibit high first-pass metabolism (e.g., morphine, propranolol, levodopa, verapamil, some &quot;statins&quot;)</td>
</tr>
<tr>
<td>Possible decreased (variable) in Phase I metabolism (cytochrome P450 system)</td>
<td>Changes in drug metabolism will depend more on illness severity and drug interactions than aging alone</td>
</tr>
<tr>
<td>Little to no change in Phase II metabolism (activation, glucuronidation, sulfation, and glycine conjugation)</td>
<td></td>
</tr>
</tbody>
</table>

### Elimination:

- Decline in glomerular filtration rate and tubular function
- Decreased renal elimination of drugs leading to longer half-lives (e.g. majority of antibiotics, digoxin, meperidine, etc.)
- A normal serum creatinine (SCr) may be present despite renal impairment
  - Reduced creatinine production with decreased muscle mass
  - Example:
    - Estimated CrCl for a 22 yo vs. 85 yo female with the same weight (55 kg) and Scr (0.9) differs significantly (85 ml/min vs. 39 ml/min)
### PD Changes in the Elderly

- Altered homeostatic mechanisms
  - Impaired baroreceptor response
    - Postural hypotension
- Alterations in cerebral blood flow
  - Mental confusion
  - Autonomic changes
    - Bradycardia
    - Problems regulating body temperature

### PD Changes in the Elderly

- Sensitivity to drug effects may either increase or decrease with aging
- Less sensitive to:
  - Beta-adrenergic agents
- More sensitive to:
  - CNS depressants
  - Antiepileptic drugs
  - Anticholinergics

### Quality of Medication Use in the Elderly
Validated Screening Tools

- Should serve as a guide and **NOT** replace clinical judgment
- Inappropriate Medications:
  - Anticholinergic Risk Scale (ARS)
  - Beers’ Criteria
  - Screening Tool of Older Persons’ Prescriptions (STOPP)
- Medication Underutilization:
  - Screening Tool to Alert doctors to Right Treatment (START)

Anticholinergic Risk Scale (ARS)

- A ranked list of medications with potential anticholinergic (ACH) adverse effects
- Scale evaluated on a retrospective cohort of 132 pts and prospective cohort of 117 pts > 65 years
- Results:
  - ARS score reliably associated with risk for ACH adverse effects
  - 70% of pts reported $\geq 2$ ACH adverse effects when ARS score $\geq 3$

Beers Criteria

- List of meds or med classes that *should be generally avoided* in person 65 years or older
- Based on expert consensus, literature review, and questionnaire of nationally recognized experts in geriatric care
  - 1991 – List of 30 drugs to be avoided in elderly nursing home residents
  - 1997 – updated; modified to include community-dwelling elderly
  - 2002 – updated; added severity rating for each medication
Beers Criteria – 2002
- Includes 48 individual meds or classes of meds that should be avoided in the elderly
- Lists 20 diseases or conditions and meds to avoid in elderly with these conditions

STOPP Criteria
- Established by a Delphi consensus process with 18 experts in geriatric pharmacotherapy from Ireland and the UK
- 65 indicators for potentially inappropriate prescribing in the elderly

Underutilization
- Definition: omission of drug therapy that is indicated for the treatment or prevention of a disease or condition.
- Frequently present in the elderly
  - A recent study of VA outpts > 65 yrs (N=196) found a 64% prevalence of medication underuse.
START Criteria

- Established by a Delphi consensus process with 18 experts in geriatric pharmacotherapy from Ireland and the UK
- 22 evidence-based indicators for prescribing omissions in people ≥ 65 years

START Criteria – cont.

- Tool tested in a prospective cohort of 600 pts ≥ 65 years on admission to hospital
  - Mean age = 77.9 years
  - 56% female
  - Median number of meds per pt = 6
  - 57.9% with ≥ 1 appropriate medication omission
    - Statins, warfarin, ACEI, ASA, Ca supplementation

Improving Medication Management in the Elderly

- Decrease polypharmacy
  - Review med list at every encounter
  - Eliminate meds not providing a clear benefit
  - Prevent medication cascade
- Prevent inappropriate prescribing
  - Avoid drugs:
    - With high ACH effects, or multiple ACH drugs
    - On Beers and STOPP criteria
- Check for medication omissions regularly
- Simplify dosage regimen when possible
Improving Medication Management in the Elderly – cont.

- Prevent adverse drug effects
  - Dose meds appropriately based on physiologic changes seen with aging
  - Start low and titrate based on response
  - Screen new meds for drug-drug and/or drug-disease interactions
- Patient education
  - Review drug indication(s) and common side effects
  - Fill all meds at one pharmacy
  - Bring updated med list to all appointments

Summary

- The elderly population is increasing
- Care of the elderly is challenging due to their increased risk for ADEs
- Reducing inappropriate prescribing, decreasing polypharmacy, and adjusting drug dosing based on age-related physiologic changes will improve outcomes in this population

Back to the Case…

JM is a 75 yo male with DM, HTN, and diabetic neuropathy admitted for AMS and UTI. He complains of increased urinary frequency and hesitancy.

- His current meds include:
  - insulin
  - lisinopril
  - metoprolol
  - simvastatin
  - amitriptyline
  - cefditoren

- What changes would you make prior to discharge?
  A. No changes
  B. Add tamsulosin
  C. Discontinue amitriptyline, add aspirin
  D. Taper off amitriptyline, start pregabalin, and add aspirin
References


References – cont.


References – cont.