



Pharmacotherapy Workshop

Be a Geriatric Patient ...and a Geriatrician

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Workshop Objectives

By the end of this session, students will be able to:

- Identify factors that affect drug prescribing in older adults
- Describe physiologic changes that occur with aging and affect pharmacokinetics
- Recognize potentially inappropriate medications for older adults
- Recognize common drug- drug and drug-disease interactions



Geriatric Assessment

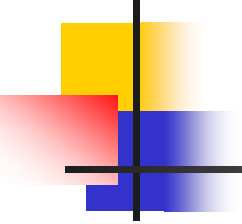
Multifaceted approach with the goal of promoting wellness and independent function

- Physical Assessment
 - functional status
 - Nutrition
 - vision and hearing
- Cognitive Assessment
- Psychological Assessment
- Social Assessment
- **Pharmacotherapy**

Pharmacotherapy in the Elderly



- Persons aged 65 years and older are prescribed the highest proportion of medications in relation to their percentage of the U.S. population (constitute 13% of the population yet purchased 33% of all prescription)
- Successful pharmacotherapy requires the correct drug at the correct dosage, for correct disease for the correct patient



What factors can affect
successful
pharmacotherapy?



Factors that affect pharmacotherapy

- Other disease states
- Other medications
- Adherence
- Personal beliefs
- Functional status
- Physiologic changes due to aging
- Ability to afford the medications



Age –Associated Changes in Pharmacokinetics

- ABSORPTION

- Rate of absorption may be slow, but extent of absorption remains unchanged – peak serum concentration of a drug may be lower in an older adult (time to reach it delayed)

- Overall, aging does not affect drug absorption to any clinically significant degree



Age-Associated Changes

DISTRIBUTION

Changes in body composition can alter drug distribution

- Older adults have less body water and lean body mass, but greater fat stores
- Water soluble drugs have lower volume of distribution e.g. digoxin, lithium, ethanol
- Fat soluble drugs: increased volume of distribution – longer to reach steady state and longer to be eliminated e.g. benzodiazepines, most CNS acting drugs



Age-Associated Changes

- Drugs bound to plasma proteins
 - higher proportion unbound and pharmacologically active in the elderly
 - Coumadin
 - anticonvulsants (phenytoin, valproic acid)
 - ceftriaxone



Age-Associated Changes in Pharmacokinetics

METABOLISM

- most common site: liver
- Decreased liver size, mass and blood flow with aging
- Reduced metabolic clearance of drugs in the elderly



Age-Associated Changes in Pharmacokinetics

ELIMINATION

- Usually involves the kidney
- Glomerular filtration declines
 - decrease in kidney size, renal blood flow, nephrons
- Decline begins in mid-thirties



Renal Function

- Serum creatinine is **NOT** an accurate reflection of renal function in the elderly

Renal Function Estimation

- Cockcroft and Gault equation¹

$$\text{CrCl(ml/min)} = \frac{(\text{lean body weight in kg})(140-\text{age in years}) \times (0.85 \text{ if female})}{(72)(\text{serum creatinine in mg/dl})}$$

- Modification of Diet in Renal Disease (MDRD) equation²

$$\begin{aligned} \text{GFR (mL/min/1.73m}^2\text{)} &= 186 \times (\text{SCr})^{-1.154} \\ &\times (\text{age})^{-0.203} \times (0.742 \text{ if female}) \\ &\times (1.21 \text{ if African American}) \end{aligned}$$

1. Cockcroft DW; Gault MH. Nephron 1976; 16:31

2. Levey AS; Bosch JP; Lewis JB et al. Ann Intern Med 1999; 130-461



Case

- Ms. JB. an 80 year old woman with a history of DJD, presents with knee pain. Her baseline Creatinine is 1.1 and weighs 100lbs. She is prescribed Naproxen 500mg bid
- CrCl (Cockcroft Gault): 29ml/min
- GFR (MDRD): Range 30 – 59ml/min/1.73m² (CKD stage 3)



Rules of prescribing in older adults

- Start low , go slow
- Try to limit number of medications and avoid prescribing “a pill for every ill”
- Try not to start two drugs at the same time
- Make sure it is the right dose
- Avoid “inappropriate medications”- Beers criteria
- Watch out for potential drug-drug, drug-disease interactions
- Make sure patient and caregiver understand what the medication is for , how and when to take it, possible side effects



Rules of prescribing

At least **annually**:

- Ask patient to bring in all medications (including OTC, herbal prep)
- Ask patient how each medication is being taken
- Look for medications with duplicate therapeutic or pharmacologic profiles
- Eliminate unnecessary medications
- Simplify the medication regimen
- Always review any changes in writing with the patient and caregiver.



Case 1

- 76 year old woman with a medical history of CHF and renal failure is seen in your clinic for the first time. Her medications are:
- Lisinopril 10mg po daily
- Spironolactone 25mg po daily
- Dyazide (triamterene/HCTZ, 37.5/25) 2 tabs po daily



Case 2

- A 90 year old woman who has CHF, NIDDM, Depression, Insomnia and GERD comes to you for a clinic visit. She lives with her daughter who notes new mild forgetfulness. Her medications are:
 - Omeprazole 20mg po daily
 - Pioglitazone 30mg po daily
 - Glipizide 10mg po daily
 - Furosemide 40mg po daily
 - Digoxin 0.5mg po daily
 - Amitriptyline 25mg po daily
 - Fluoxetine 20mg po daily
 - Cyclobenzaprine 10mg po tid
 - Valerian 1pill a day



Case 3

- Your clinic nurse calls you about Ms Smith's blood work. Her INR is 7. She is an 80 year old woman with HTN, atrial fibrillation on coumadin. Is being treated for a UTI with Bactrim DS 1 tab po bid for 14 days.
- Other medications are: Metoprolol 50mg po bid, Digoxin 0.25mg po daily and ginkgo biloba



Case 4

83 year old man with urge incontinence, frequent falls, anxiety, forgetfulness and fatigue comes to see you in clinic. Past medical history includes: CAD, CHF. His medications are:

- Oxybutynin 5mg po bid
- Timolol eye drops
- Diazepam 5mg po qhs
- Furosemide 40mg po qd
- Ibuprofen 200mg po bid



Case 5

- 68 yr old woman is taking ciprofloxacin 250mg po q12 hrs for an uncomplicated UTI due to E. Coli. She remains symptomatic after 5 days of therapy and urine sample reveals persistent bacteria
- Other meds are theophylline 300mg po bid, venlafaxine 75mg po bid, and multiple OTC drugs including MVI, Pepcid-Complete
- Which medication is the most likely cause of this treatment failure?