POLYPHARMACY IN ELDERLY

ARCHANA KUDRIMOTL, MBBS (MD) MPH
Associate Professor
UK Family and Community Medicine

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FACULTY DISCLOSURE

I have nothing to disclose- I have no financial/commercial interest and do not intend to discuss an off label use of drug

EDUCATIONAL NEED

- **Elderly** above 65 year account for 13% of US population
- Use more than 35% of all prescription meds and 40% of OTC used
- **For every** 1,000 outpatients who are taking medications 90 seek medical attention because of a prescription drug complications

TALK OBJECTIVES

Upon completion of this educational activity Learner will

- Review the principles of Geriatric pharmacotherapy in safe prescribing of elderly
- Identify Potentially Inappropriate drugs and problems with Polypharmacy in elderly
- Discuss approach to safer prescribing in elderly

EXPECTED OUTCOME

- Identification of drugs that cause adverse effects in the Elderly in their daily practice and consider alternate therapies

“One of the first duties of the physician is to educate the masses not to take the medicine”

---- William Osler
GERIATRIC PHARMACOTHERAPY

Pharmacodynamics
- Response that occurs when a drug interacts at receptors - less predictable in elderly
- START LOW and GO SLOW
  - Increased response - Opiates and Warfarin
  - Decreased response - Beta-blockers

Pharmacokinetics
Four Determinants
- Absorption
- Distribution
- Metabolism
- Elimination

You have prescribed oral iron replacement for a 60-year-old female with iron deficiency anemia. Which one of the following would you suggest for improving iron absorption?
- A) Calcium
- B) Vitamin C
- C) Coffee
- D) Milk

All of the following drugs is affected by gastric PH and its absorption is limited in the stomach except
- A. Taking calcium carbonate with meals
- B. Iron supplements
- C. Taking calcium citrate with meals
- D. Vitamin B12 supplements

73 year old has been taking omeprazole (Prilosec) for many years. Which one of the following adverse events is this patient at risk for as a result of her omeprazole use?
- A) Hypermagnesemia
- B) Urinary tract infections
- C) Nephrolithiasis
- D) Hip fractures
**ABSORPTION**
- ↑ Gastric pH
- ↓ Gastric emptying
- ↓ Splanchnic blood flow - decreased first pass effect
- ↓ Intestinal motility - slower GI transit time

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**DISTRIBUTION**
- Total body water decreases
- Muscle mass decreases
- Body fat increases
- Albumin decreases

Changes in body composition affects the volume of drug distribution

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**DIGOXIN**

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**NARROW THERAPEUTIC INDEX**
Narrow therapeutic index (NTI) drugs are agents for which small changes in systemic concentration can lead to significant changes in pharmacodynamic response
- Digoxin
- Phenytoin
- Theophylline
- Lithium
- Warfarin

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**DRUG METABOLISM**
- Serum creatinine does not accurately reflect renal function
- Cockcroft-Gault formula
  - Men: GFR = (140 - age) x weight (IBW) (kg) / (72 x serum creatinine)
  - In women, multiply this result by .85
  - IBW= weight for height or use actual weight
  - Males- IBW = 50 Kg +2.3 Kg for each inch over 5 feet
  - Females- IBW = 45.5+ 2.3 Kg for each inch over 5 feet
- Labs report MDRD which gives us estimated GFR and is not equal to Crcl. MDRD overestimates renal function in elderly and is not validated in elderly above 70.
ELIMINATION
• Decrease renal mass, blood flow
• Decrease GFR (10cc/decade)
• Increases concentration of drugs dependent on renal clearance
• Avoid drugs that are dependent solely renal excretion
• Check levels of the drugs- aminoglycosides

In a 88 yr old (wt 110 lbs) and cr. 1.1 with UTI-
Which of the following is the least appropriate choice for empiric treatment for UTI
A. Cephalexin
B. Nitrofurantoin
C. Bactrim
D. Levafloxacin

Estimated GFR for case
× MDRD eGFR= 50 ml/min
× CG eGFR = 28ml/min
× Nitofurantoin has lack of efficacy in patients with CrCl less than 30 mL/min due to inadequate concentration in urine

× American Geriatrics Society 2015- Updated BEERS CRITERIA

The following drugs need their dose adjusted based on renal function except
A. Atenolol
B. Glipizide
C. Glyburide
D. Gabapentin


DRUG METABOLISM
• Phase one pathway- is the major pathway via enzymatic oxidation in cytochrome P450 system
• CYP2A4 – 30 % of enzymes in liver and intestines
• Involved in metabolism of half the drugs in market-converts to less active metabolites by oxidation, reduction
• Phase two pathway- not affected by age-conjugation

The following drugs increase the INR when used in conjunction with warfarin except-
A. Amiodarone
B. Fluconazole
C. Clofibrate
D. Dicloxacillin
E. Metronidazole
ENZYMATIC INTERACTIONS
- Cytochrome P450 system that consists of various isozymes- CYP1A2, CYP3A4, 5,7
- Substrate- is the medication metabolized by the isozyme
- Inducers- drug that potentiates the isozyme action to metabolize the drug faster and hence less effect of the substrate drug
- Inhibitors- drug that inhibit the isozyme action and hence increases the risk of toxicity of the substrate drug

Which one of the following is an INDUCER of the cytochrome P450 enzyme?
A) Ciprofloxacin
B) Fluconazole
C) Phenobarbital
D) Cimetidine
E) Grapefruit juice

ENZYMATIC INTERACTIONS
- Amiodarone and cimetidine are very good inhibitors- potentiate the effect of warfarin, phenytoin, amitriptyline
- Phenytoin and Phenobarbital are good inducers- decrease the effect of most drugs

POLYPHARMACY
The young physician starts life with 20 drugs for each disease, and the old physician ends life with one drug for 20 diseases.
William Osler

POLYPHARMACY
Polypharmacy is defined as the use of several drugs (6) or more together in the treatment of disease, suggesting indiscriminate, unscientific, or excessive prescription leading to untoward consequences.
- NH residents- one-third use 9 or more drugs (average 7-8)
- Community dwellers 50% of the community elderly- 5 more meds 12% use 10 or more
POLYPHARMACY

RISK FACTORS FOR ADR
- Age above 85 years
- Low BMI
- Six or more medical conditions
- CrCl less than 50 mL/min
- 9 or more medications
- 12 or more doses a day
- Prior adverse event

ADVERSE DRUG REACTIONS ADRs/ADEs
- Amplified drug effects
- Side-effects
- Drug-drug interaction
- Drug-nutrient interaction
- Drug-disease interaction
- *not therapeutic failures
- *not ADWEs

CONSEQUENCES
- Neuropsychologic symptoms- confusion, sedation
- Bradycardia, hypotension
- Renal failure, dehydration
- Electrolyte problems
- Anticholinergic side effects
- Falls
- GI side effects- constipation, GI bleed
- Failure to thrive-poor appetite
Which one of the following is associated with falls in older adults?

A) Diphenhydramine
B) Atorvastatin
C) Metformin
D) Memantine
E) Theophylline

Treatment with donepezil (Aricept) is associated with an increased risk for

A) pulmonary embolism
B) liver failure
C) bradycardia requiring pacemaker implantation
D) cataract development requiring surgery

70 yr old AAF with HTN was started on a medication when she went to UTC for high BP. She presents to you with worsening pedal edema few weeks later.

Which of the following is likely cause?

A. Hydrochlorothiazide
B. Lisinopril
C. Felodipine
D. Losartan
E. Carvedilol

Which one of the following supplements can increase the effect of bleeding when taken with aspirin with except?

A) Ginkgo
B) Ginger
C) Garlic
D) Echinacea
E) Ginseng

HERBS

Many herbal supplements can prolong sedation during and after surgery, which slows recovery from anesthesia.
- Ginko Biloba
- Echinacea
- St. John's Wort
- Valerian
- Kava
- Goldenseal

HERBS

Many herbal medications and supplements can significantly increase bleeding during and after surgery
- Gingko biloba
- Garlic
- Ginger
- Ginseng
- Omega-3
- Vitamin E
- Chondroitin
- Dong quai
- Saw palmetto
HERBS

Some Herbal Supplements are known to affect the skin and may cause: sensitivity and healing

- St John’s Wort
- Ginko Biloba
- Kava
- Echinacea
- Goldenseal
- Arnica

Which one of the following tests should be done periodically when someone is treated with Amiodarone

A) Cortisol
B) Creatine phosphokinase
C) Renal panel
D) TSH

A 70-year-old female becomes psychotic and risperidone is prescribed. Which one of the following should be used to monitor the patient for adverse effects of this drug?

A) Serum sodium levels
B) Echocardiography
C) Nuclear stress testing
D) Electrocardiography

Based on current evidence, which one of the following NSAIDs would you recommend as being LEAST likely to be associated with an increased risk of myocardial infarction?

A) Celecoxib (Celebrex)
B) Diclofenac (Zorvolex)
C) Ibuprofen
D) Meloxicam (Mobic)
E) Naproxen (Naprosyn)

Which one of the following medications should be titrated to minimize the risk of Stevens-Johnson syndrome?

A) Risperdal
B) Divalproex
C) Lamotrigine
D) Lithium

Clarithromycin is associated with the following condition

A. Edema
B. Elevated BP
C. Anxiety
D. Torsades de pointes
A 65-year-old female who has hypertension, hyperlipidemia, and osteoarthritis of the knees develops acute gout. Which one of the following drug increases the risk of hyperuricemia?

A) Hydrochlorothiazide  
B) Losartan  
C) Metoprolol  
D) Simvastatin  
E) Acetaminophen

The desire to take medicine is perhaps the greatest feature which distinguishes man from animals.
William Osler

SAFE PRESCRIBING

SAFER PRESCRIBING

- Medication reconciliation during transitions—maintain comprehensive list at admission and discharge from all health care settings
- Coordinate medications by contacting other prescribers
- E-prescribing (CMS incentive)EMR—use tools for drug information/interaction— “epocrates”, “lexicomp”, drugs.com, ISMP (institute of safe medication practice—do not crush drug list)

IDENTIFY POTENTIALLY INAPPROPRIATE DRUG (PIM)

- Lack of proven effect in the elderly
- Serious adverse effects when other newer safer alternatives are available
- Excessive dosages and frequencies
- Long term usage may not be safe
- Some medications should be avoided in certain medical conditions—drug disease/syndrome interaction

Polypharmacy Assessment Check List

Every Visit:
- Match Med List vs. Diagnosis List
- Chief Complaint vs. Medication Side Effect
- Sleep, Appetite/Food, Bowel, Activity Level, Restlessness
- Over the Counter, Supplement, Herbal Use
- Recent Hospitalization
- New Physicians (document all providers)
- Dose adjustments
- Labs for monitoring specific medications (*quarterly, monthly, example: K, Cr, Ca, INR, HbA1c, Na)
- Drug/Supplement/Herb/Interactions

Annually at least:
- Annual Blood Pressure
- Health Literacy
- Executive Function or Cognitive Impairment
- Morbidity Scale for Adherence
- Concomitant Check-In: Patient’s dialogue about medications
- Annual labs for monitoring other medications (lipids, FSH, 
  CRC, LFT)
- Renal Excretion
- Quantifiable Measures: GDS, HAM-D, Cornell Scale, AIMS, 
  Pain Scale
- Who manages the medications at home
According to the Beers criteria, a list of drugs that should be avoided in geriatric patients, which one of the following NSAIDs should be avoided in older patients due to its highest rate of adverse effects?

A) Indomethacin
B) Ibuprofen
C) Diclofenac sodium
D) Etodolac
E) Celecoxib

NCQA - HEDIS / BEERS LIST

- First generation antihistamines
- GI antispasmodics - Belladona Alkaloids
- Long acting Benzodiazepines and sulphonyleuricas
- Tertiary TCAS - anticholinergic effects
- Chronic uses of non-COX selective NSAIDs - ketorolac, indomethacin
- Digoxin > 0.125mg
- Amphetamines
- Skeletal muscle relaxant

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MEDICATION APPROPRIATENESS INDEX

- Is there an indication for the drug?
- Is the medication effective for the condition?
- Is the dosage correct?
- Are the directions correct?
- Are the directions practical?
- Are there clinically significant drug-drug interactions?
- Are there any significant drug-disease/condition interactions?
- Is there unnecessary duplication with other drugs?
- Is the duration of therapy acceptable?
- Is this drug the least expensive alternative compared to others of equal utility?


TOOL TO MANAGE POLYPHARMACY

- Screening Tool to Alert to Right Treatment and Screening Tool of Older Persons' potentially inappropriate Prescriptions (STOPP)
- Screening Tool to Alert doctors to Alert to Right Treatment (START)

- Gallagher P, et al. STOPP (Screening Tool of Older Persons' Prescriptions) and START (Screening Tool to Alert doctors to Right Treatment). Int J Clin Pharmacol Ther. 2008;46(2):72-85

ANTICHLINERGIC BURDEN

- Anticholinergic Cognitive Burden List (ACB)
- Anticholinergic Risk Scale (ARS)

RESOURCES

https://www.drugs.com drug- drug interaction, pill identifier
- www.ismp.org
- Institute of safe medication practices, Do not crush list, name look alike lists
- https://credibledrugs.org for list of meds that affect QT
- https://ods.od.nih.gov/
- https://nccih.nih.gov
herbs and supplement