

Medication Management in Older Adults: Short Answer Questions

1. List 4 factors why older age is related to increased adverse drug reactions.

- Age-related changes in pharmacokinetics
- Correlation between frailty, ADRs and inappropriate prescription
- Multimorbidity (drug-disease interaction)
 - E.g. maxeran for gastric motility can worsen motor symptoms for PD
 - Beta blockers for CVD can worsen asthma symptoms
- Geriatric syndromes may reduce benefit of pharmacological treatment, increase risk ADRs, and more inappropriate rx
- Cognitive and sensory impairment – patient medication errors, nonadherence to treatment plans
- Polypharmacy – 5+ medications. Patients taking 2 meds have 13% ADR, vs 58% with 5 meds daily, 82% with taking 7 meds daily

REF: Zazzara, M. B., Palmer, K., Vetrano, D. L., Carfi, A., & Graziano, O. (2021). Adverse drug reactions in older adults: a narrative review of the literature. *European geriatric medicine*, 12, 463-473.

2. List 10 top medications for adverse drug events in older people

1. Anticoagulants
2. Insulins
3. Antiplatelet agents
4. Oral hypoglycemic agents
5. Opioids
6. Antibiotics
7. Diuretics
8. NSAIDs
9. Sedatives / antipsychotics
10. Anticonvulsants
11. Antineoplastic agents
12. Antiadrenergic agents
13. Renin-angiotensin inhibitors
14. Digoxin

Budnitz, D. S., Lovegrove, M. C., Shehab, N., & Richards, C. L. (2011). Emergency hospitalizations for adverse drug events in older Americans. *New England Journal of Medicine*, 365(21), 2002-2012.

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3. List 10 physiologic changes with aging

- Brain:
 - Dec brain mass
 - Dec nerve cells in brain
 - Dec NTs especially acetylcholine
 - Dec cerebral blood flow by 20%
 - Dec response to adrenergic stimulation
 - Inc permeability of blood brain barrier
- Heart:
 - Dec CO

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- Inc resting HR
 - Dec elasticity/inc vascular rigidity
 - Inc LV thickness
 - Inc LA size
- Liver
 - Loss of hepatocytes and dec size
 - Dec blood flow
 - Enzyme system activity is decreased
- Renal:
 - Dec renal cortical mass
 - Dec renal blood flow with less efficient clearance of medications
 - Increased susceptibility to nephrotoxicity
- GI:
 - Dec peristalsis, slowed gastric emptying and colonic transit
 - Dec gastric acid secretion and dec acid clearance with net effect = more acidic stomach
 - Dec small bowel surface area, less absorptive surface
- Metabolic System:
 - Dec body water
 - Dec lean body mass
 - Inc fat
 - Dec basal metabolic rate
 - Dec thirst response so often hypovolemia

4. What considerations of older age affect the administration of the following types of drugs:

- a. What changes are seen with aging (circle Increased or Decreased)
- i. Increased / Decreased proportion of fat
 - ii. Increased / Decreased proportion of water
 - iii. Increased / Decreased protein binding capacity

Answer: Increased fat, decreased water, decreased protein binding capacity

b. Lipophilic drugs (e.g. haloperidol)

- With age the proportion of fat increases – this impacts lipophilic drugs such as Haldol and propofol. You will see in Vd → dec plasma concentrations → prolonged clearance and inc half life

c. Hydrophilic drugs (e.g. digoxin)

- Dec proportion of water with age – this means for hydrophilic drugs like lithium and digoxin, you will have dec Vd and thus increased effective concentration

d. Highly protein bound drugs (e.g. phenytoin)

- Dec protein binding capacity – thus you may see inc free plasma levels of medications that have high protein binding capacity, such as dilantin and valproic acid

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5. What 3 clinical factors influence the calculation of creatinine clearance?

- With inc age → CrCl decreases
- With Dec body wt → CrCl decreases
- In females, CrCl decreases

6. For the following drug combinations, list the type of pharmacodynamic drug-drug interaction

a. Haldol and Ativan

- i. Additive drug-drug interaction: sedating effects of multiple CNS depressants used concurrently

b. Naproxen and furosemide

- i. Antagonistic: NSAIDs can increase blood pressure (inc salt and fluid retention), which antagonizes effects of anti-hypertensives/diuretics.

c. Sulfamethoxazole and Trimethoprim

- i. **Synergistic:** when the combined action of two drugs is greater than would be expected from a purely additive effect e.g. sulfamethoxazole and trimethoprim, combined to increase effectiveness

7. What is the prescribing cascade?

This is the misinterpretation of an adverse reaction to one medication, as another medical condition → leads to the prescription of new medications, with their own potential to cause side-effects

8. List 8 medications that have anticholinergic properties and should be avoided in older adults

TABLE 1

Medications With Strong Anticholinergic Properties

Antidepressants	Antihistamines (first-generation)	Antimuscarinics (urinary incontinence)*	Antipsychotics
Amitriptyline	Brompheniramine	Darifenacin	Chlorpromazine
Amoxapine	Chlorpheniramine	Fesoterodine	Clozapine
Clomipramine	Cyproheptadine	Flavoxate	Olanzapine
Desipramine	Dimenhydrinate	Oxybutynin	Perphenazine
Doxepin (> 6 mg/day)	Diphenhydramine	Solifenacin	Antispasmodics
Imipramine	Doxylamine	Tolterodine	Atropine
Nortriptyline	Hydroxyzine	Trospium	Clidinium-chlordiazepoxide
Paroxetine	Meclizine	Antiparkinsonian agents	Dicyclomine
Antiemetics	Triprolidine	Benzotropine	Homatropine
Prochlorperazine		Trihexyphenidyl	Hyoscyamine
Promethazine			Scopolamine
			Skeletal muscle relaxants
			Cyclobenzaprine
			Orphenadrine

Note: This table is not a comprehensive list of all medications with anticholinergic properties.

*—Data on whether certain bladder antimuscarinics confer greater adverse cognitive effects than others lack consistent quality. Oxybutynin has the best evidence for adverse cognitive effects. However, caution is warranted for all bladder antimuscarinics given their potential anticholinergic effects.

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9. For the following medications, what are alternative safer options for the older patient?

Inappropriate medications	Safer alternative
Dimenhydrinate (for nausea)	
Codeine, tramadol, NSAIDs (for pain)	
Trazodone, zopiclone, benzodiazepines (for sleep aid)	
Diphenhydramine (for allergy)	

Answers:

Inappropriate medications	Safer alternative
Dimenhydrinate (for nausea)	Ondansetron, metoclopramide, isopropyl alcohol
Codeine, tramadol, NSAIDs (for pain)	Acetaminophen, hydromorphone, morphine, topical agents
Trazodone, zopiclone, benzodiazepines (for sleep aid)	Melatonin, non-pharm measures
Diphenhydramine (for allergy)	Cetirizine