

Drug Prescription for Older Adult

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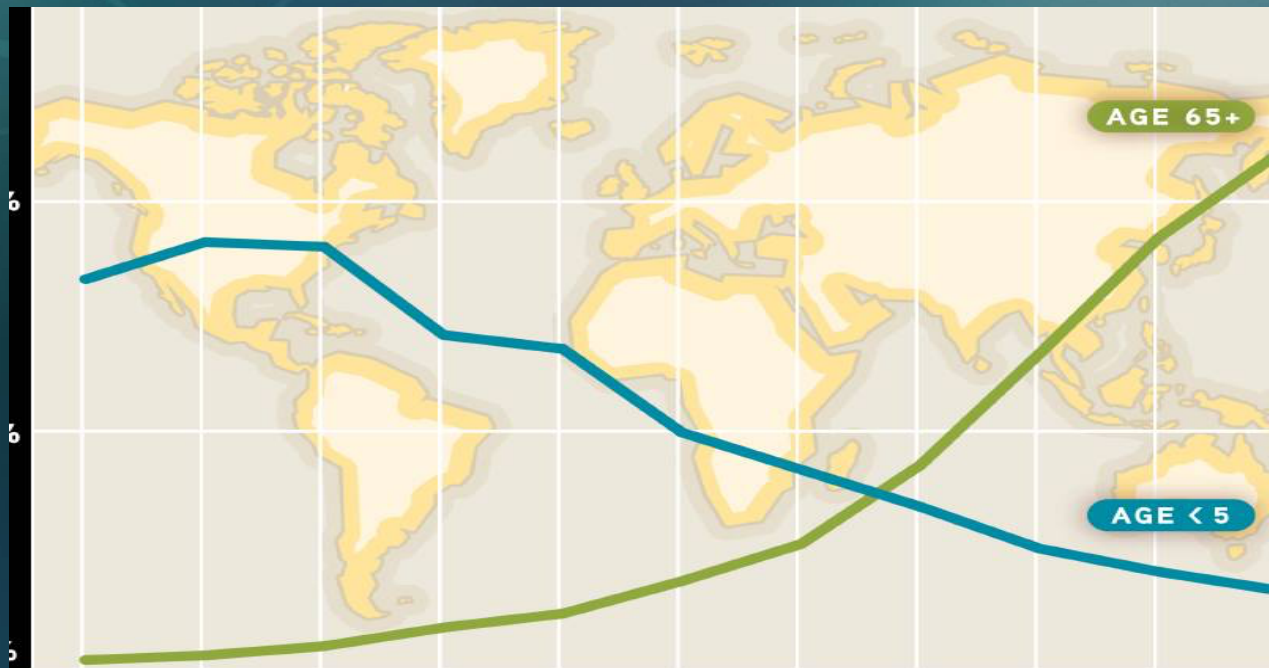
Agenda

1. Global Population is Graying
2. The reason for the difference in drug prescription for the older adult
3. Important Points in the Treatment of older adult
4. Drug prescription based on Beers Criteria (American Geriatrics Society 2023)
5. Conclusion

Global Population is Graying

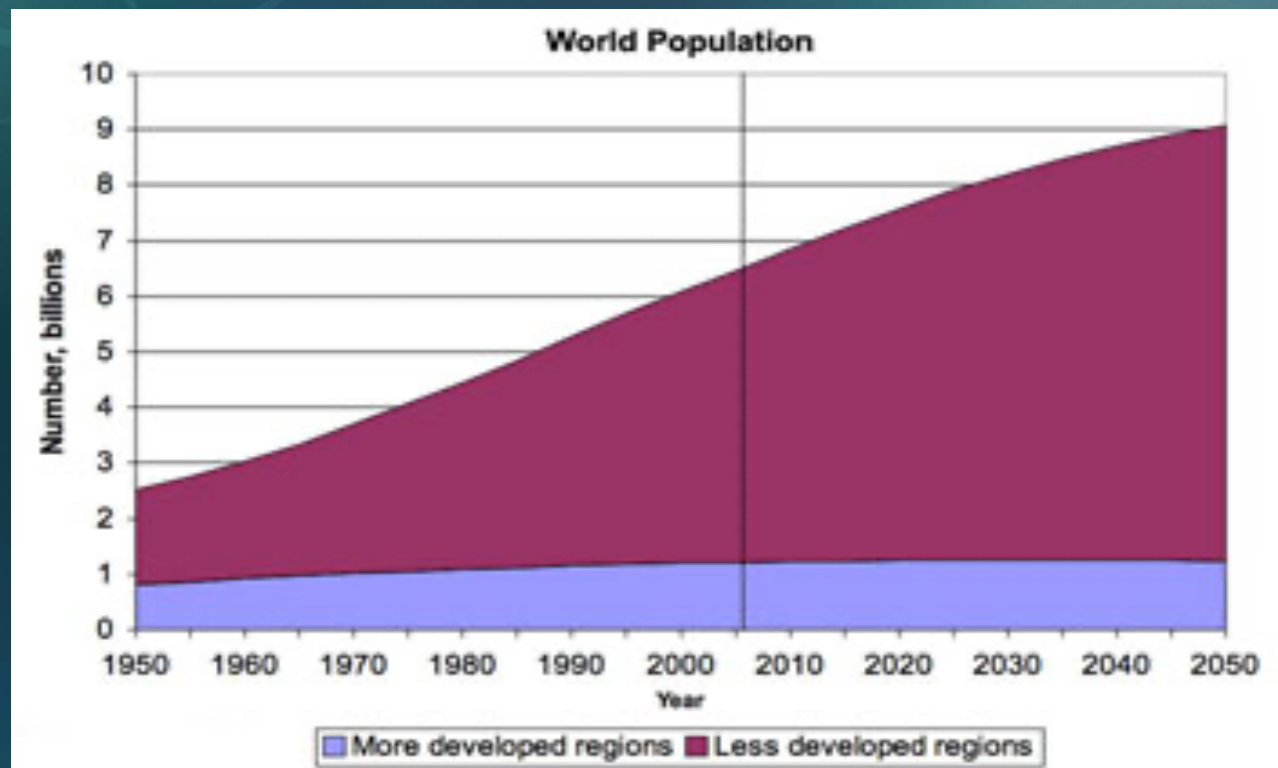


Trends in Global Ageing



Source: United Nations Department of Economic and Social Affairs, Population Division. *World Population Prospects, The 2004 Revision*. New York: United Nations, 2005.

World in the Future





- بیمار آقای 73 ساله که با شکایت درد در زانوها، اختلال خواب، پرسیدن سوالات تکراری و اختلال حافظه به کلینیک سالمندان آورده شده. بیمار از اپیوم تدخینی روزانه استفاده می کند

• BP: 150/90 PR: 14 RR: 68 T: 37

داروهای مصرفی:

Nortriptyline/ Diclofenac/ Clidinium-c/warfarin
/Chlordiazepoxide/ginko

Polypharmacy

Prescription Medications

- At least one prescription medication was used by 87 percent.
- Five or more prescription medications were used by 36 percent.
- 38 percent used over-the-counter medications.

Change in the Older Adult

- Pharmacokinetics
- Pharmacodynamic
- Increased body Fat
- Decreased body water
- Decreased renal clearance

There are multiple reasons why older adults are especially impacted by polypharmacy:

↓ Drug Clearance

↑ Drug-Drug interactions

↑ ADEs

- Beers
 - STOPP /START : (screening tool of older person's prescriptions)
 - criteria was introduced in 2008 in Ireland
- ↓
- The FORTA (Fit FOR The Aged)_Aged)_
 - criteria was introduced in Germany

در دانشگاه کالیفرنیا در سال 1991 mark beers آقای دکتر
برای اولین بار این جدول تداخلات دارویی در سالمندان را
طراحی کرد و این جدول به نام ایشان ماندگار شد.

Beers criteria



Beers criteria 2023

Medications are grouped into five categories:

1. Medication considered as potentially inappropriate.
2. Medication potentially inappropriate in patients with certain diseases or syndromes.
3. Medication to be used with caution.
4. Potentially inappropriate drug-drug interactions.
5. Medication whose dosages should be adjusted based on renal function.

***Medication
considered as
potentially
inappropriate***



Medication considered as potentially inappropriate

Antihistamines

First-generation antihistamines

Brompheniramine

Chlorpheniramine

Cyproheptadine

Dimenhydrinate

Diphenhydramine (oral)

Doxylamine

Hydroxyzine

Meclizine

Promethazine

Triprolidine

Highly anticholinergic; clearance reduced with advanced age, and tolerance develops when used as hypnotic; risk of confusion, dry mouth, constipation, and other anticholinergic effects or toxicity. Cumulative exposure to anticholinergic drugs is associated with an increased risk of falls, delirium, and dementia, even in younger adults. Consider total anticholinergic burden during regular medication reviews and be cautious in “young-old” as well as “old-old” adults.

Use of diphenhydramine in situations such as acute treatment of severe allergic reactions may be appropriate.

Medication considered as potentially inappropriate

----Anti infection----

Anti-infective

Nitrofurantoin

Potential for pulmonary toxicity, hepatotoxicity, and peripheral neuropathy, especially with long-term use; safer alternatives available.

Avoid in individuals with CrCl <30 mL/min or for long-term suppression.



Medication considered as potentially inappropriate

Central nervous system

Central nervous system

Antidepressants with strong anticholinergic activity, alone or in combination

Amitriptyline

Amoxapine

Clomipramine

Desipramine

Doxepin >6 mg/day

Imipramine

Nortriptyline

Paroxetine

Highly anticholinergic, sedating, and cause orthostatic hypotension; the safety profile of low-dose doxepin (≤ 6 mg/day) is comparable to that of placebo.

Medication considered as potentially inappropriate

Antipsychotic

Antipsychotics, first- (typical) and second- (atypical) generation

Aripiprazole

Haloperidol

Olanzapine

Quetiapine

Risperidone

Others^d

Increased risk of stroke and greater rate of cognitive decline and mortality in persons with dementia. Additional evidence suggests an association of increased risk between antipsychotic medication and mortality independent of dementia.

Avoid, except in FDA-approved indications such as schizophrenia, bipolar disorder, Parkinson disease psychosis (see Table 3), adjunctive treatment of major depressive disorder, or for short-term use as an antiemetic.

Medication considered as potentially inappropriate

---Benzodiazepines---

Benzodiazepines

Alprazolam
Chlordiazepoxide (alone or in combination with amitriptyline or clidinium)
Clobazam
Clonazepam
Clorazepate
Diazepam
Estazolam
Lorazepam
Midazolam
Oxazepam
Temazepam
Triazolam

The use of benzodiazepines exposes users to risks of abuse, misuse, and addiction. **Concomitant use of opioids may result in profound sedation, respiratory depression, coma, and death.**

Older adults have increased sensitivity to benzodiazepines and decreased metabolism of long-acting agents; the continued use of benzodiazepines may lead to clinically significant physical dependence. In general, all benzodiazepines increase the risk of cognitive impairment, delirium, falls, fractures, and motor vehicle crashes in older adults.

May be appropriate for seizure disorders, rapid eye movement sleep behavior disorder, benzodiazepine withdrawal, ethanol withdrawal, severe generalized anxiety disorder, and periprocedural anesthesia.

Medication considered as potentially inappropriate

Nonbenzodiazepine benzodiazepine receptor agonist hypnotics (“Z-drugs”)

Eszopiclone

Zaleplon

Zolpidem

Nonbenzodiazepine benzodiazepine receptor agonist hypnotics (“Z-drugs”) have adverse events similar to those of benzodiazepines in older adults (e.g., delirium, falls, fractures, increased emergency room visits/hospitalizations, motor vehicle crashes); minimal improvement in sleep latency and duration.

Medication considered as potentially inappropriate

----Gastrointestinal----

Gastrointestinal

Proton-pump inhibitors

Dexlansoprazole
Esomeprazole
Lansoprazole
Omeprazole
Pantoprazole
Rabeprazole

Risk of C. difficile infection, pneumonia, GI malignancies, bone loss, and fractures.

Avoid scheduled use for >8 weeks unless for high-risk patients (e.g., oral corticosteroids or chronic NSAID use), erosive esophagitis, Barrett's esophagitis, pathologic hypersecretory condition, or demonstrated need for maintenance treatment (e.g., because of failure of drug discontinuation trial or H2-receptor antagonists).

Metoclopramide

Can cause extrapyramidal effects, including tardive dyskinesia; the risk may be greater in frail older adults and with prolonged exposure.

Avoid, unless for gastroparesis with a duration of use not to exceed 12 weeks except in rare cases.

Medication considered as potentially inappropriate

Contraindicated

GI antispasmodics with strong anticholinergic activity

Atropine (excludes ophthalmic)

Clidinium-chlordiazepoxide

Dicyclomine

Hyoscyamine

Scopolamine

Highly anticholinergic, uncertain effectiveness.

Avoid

Mineral oil, given orally



Potential for aspiration and adverse effects; safer alternatives available.

Avoid

Medication considered as potentially inappropriate

Pain medication

Pain medications

Non-COX-2-selective NSAIDs, oral:

Aspirin >325 mg/day

Diclofenac

Diflunisal

Etodolac

Flurbiprofen

Ibuprofen

Indomethacin

Ketorolac

Meloxicam

Nabumetone

Naproxen

Oxaprozin

Piroxicam

Sulindac

Increased risk of GI bleeding or peptic ulcer

disease in high-risk groups, including those

>75 years old or taking oral or parenteral

corticosteroids, anticoagulants, or antiplatelet

agents; use of proton-pump inhibitor or

misoprostol reduces but does not eliminate

risk. Upper GI ulcers, gross bleeding, or

perforation caused by NSAIDs occur in ~1% of

patients treated for 3–6 months and in ~2%–4%

of patients treated for 1 year; these trends

continue with longer duration of use. Also can

increase blood pressure and induce kidney

injury. Risks are dose-related.

Indomethacin

Ketorolac (oral and parenteral)

Increased risk of GI bleeding/peptic ulcer disease

and acute kidney injury in older adults. Of all

the NSAIDs, indomethacin has the most

adverse effects, including a higher risk of

adverse CNS effects.

Medication considered as potentially inappropriate

Skeletal muscle relaxants

Carisoprodol
Chlorzoxazone
Cyclobenzaprine
Metaxalone
Methocarbamol
Orphenadrine



Muscle relaxants typically used to treat musculoskeletal complaints are poorly tolerated by older adults due to anticholinergic adverse effects, sedation, and increased risk of fractures; effectiveness at dosages tolerated by older adults is questionable.

This criterion does not apply to skeletal muscle relaxants typically used for the management of spasticity (i.e., baclofen and tizanidine) although these drugs can also cause substantial adverse effects.

Drug-disease or drug-syndrome interactions



Drug-disease or drug-syndrome interactions

----Heart failure----

Cardiovascular

Heart failure

Cilostazol

Dextromethorphan-quinidine

Nondihydropyridine calcium channel blockers (CCBs)

Diltiazem

Verapamil

Dronedarone

NSAIDs and COX-2 inhibitors

Thiazolidinediones

Pioglitazone

Potential to promote fluid retention and/or exacerbate heart failure (NSAIDs and COX-2 inhibitors, non-dihydropyridine CCBs, thiazolidinediones); potential to increase mortality in older adults with heart failure (cilostazol and dronedarone); concerns about QT prolongation (dextromethorphan-quinidine).

Note: This is not a comprehensive list of medications to avoid in patients with heart failure.

Drug-disease or drug-syndrome interactions

----syncope----

Syncope

Antipsychotics (selected)

Chlorpromazine

Olanzapine

Cholinesterase inhibitors (AChEIs)

Donepezil

Galantamine

Rivastigmine

Non-selective peripheral alpha-1 blockers

Doxazosin

Prazosin

Terazosin

Tertiary tricyclic antidepressants (TCAs)

Amitriptyline

Clomipramine

Doxepin

Imipramine

Antipsychotics listed and tertiary TCAs increase the risk of orthostatic hypotension.

AChEIs cause bradycardia and should be avoided in older adults whose syncope may be due to bradycardia.

Non-selective peripheral alpha-1 blockers cause orthostatic blood pressure changes and should be avoided in older adults whose syncope may be due to orthostatic hypotension.

Avoid

Drug-disease or drug-syndrome interactions

----Delirium----

Central nervous system

Delirium

Anticholinergics (see Table 7)

Antipsychotics^c

Benzodiazepines

Corticosteroids (oral and parenteral)^d

H2-receptor antagonists

Cimetidine

Famotidine

Nizatidine

Nonbenzodiazepine benzodiazepine receptor agonist hypnotics ("Z-drugs")

Eszopiclone

Zaleplon

Zolpidem

Opioids

Avoid in older adults with or at high risk of delirium because of the potential of inducing or worsening delirium.

Antipsychotics: avoid for behavioral problems of dementia or delirium unless nonpharmacologic options (eg, behavioral interventions) have failed or are not possible and the older adult is threatening substantial harm to self or others. If used, periodic deprescribing attempts should be considered to assess ongoing need and/or the lowest effective dose.

Corticosteroids: if needed, use the lowest possible dose for the shortest duration and monitor for delirium.

Opioids: emerging data highlights an association between opioid administration and delirium. For older adults with pain, use a balanced approach, including the use of validated pain assessment tools and multimodal strategies that include nondrug approaches to minimize opioid use.

Drug-disease or drug-syndrome interactions

--Dementia or cognitive impairment--

Dementia or cognitive impairment

Anticholinergics (see Table 7)

Antipsychotics, chronic use or persistent as-needed use^c

Benzodiazepines

Nonbenzodiazepine benzodiazepine receptor agonist hypnotics ("Z-drugs")

Eszopiclone

Zaleplon

Zolpidem

Avoid because of adverse CNS effects. See criteria on individual drugs for additional information.

Antipsychotics: increased risk of stroke and greater rate of cognitive decline and mortality in people with dementia. Avoid antipsychotics for behavioral problems of dementia or delirium unless documented nonpharmacologic options (e.g., behavioral interventions) have failed and/or the patient is threatening substantial harm to self or others. If used, periodic deprescribing attempts should be considered to assess ongoing need and/or the lowest effective dose.

Drug-disease or drug-syndrome interactions

----History of falls or fractures----

History of falls or fractures

Anticholinergics (see Table 7)

Antidepressants (selected classes)

SNRIs

SSRIs

Tricyclic antidepressants (TCAs)

Antiepileptics

Antipsychotics^c

Benzodiazepines

May cause ataxia, impaired psychomotor function, syncope, or additional falls.

Antidepressants (selected classes): evidence for risk of falls and fractures is mixed; newer evidence suggests that SNRIs may increase falls risk.

Benzodiazepines: shorter-acting ones are not safer than long-acting ones.

If one of the drugs must be used, consider reducing the use of other CNS-active medications that increase the risk of falls and fractures

History of falls and fractures, cont'd

Nonbenzodiazepine benzodiazepine receptor agonist hypnotics ("Z-drugs")

Eszopiclone

Zaleplon

Zolpidem

Opioids



***Potentiality inappropriate
medications
Used with caution
In older adult***



Potentiality inappropriate medications Used with caution in older adult

Antidepressants (selected)

Mirtazipine

SNRIs

SSRIs

TCAs

Antiepileptics (selected)

Carbamazepine

Oxcarbazepine

Antipsychotics

Diuretics

Tramadol

May exacerbate or cause SIADH or hyponatremia; monitor sodium levels closely when starting or changing dosages in older adults.

Potentiality inappropriate medications Used with caution in older adult

Trimethoprim-
sulfamethoxazole

Increased risk of hyperkalemia when used
concurrently with an ACEI, ARB, or
ARNI in presence of decreased CrCl.

Use with caution in patients on
ACEI, ARB, or ARNI and
decreased CrCl.

**Drug-Drug
interactions
Should be avoided
in older adults**



Drug-Drug interactions **Should be avoided in older adults**

Opioids	<u>Benzodiazepines</u>	<u>Increased risk of overdose and adverse events.</u>
Opioids	<u>Gabapentin</u> <u>Pregabalin</u>	Increased risk of severe sedation -related adverse events, including <u>respiratory depression</u> and <u>death</u> .

Drug-Drug interactions **Should be avoided in older adults**

Anticholinergic

Anticholinergic

Use of more than one medication with anticholinergic properties increases the risk of cognitive decline, delirium, and falls or fractures.

Drug-Drug interactions **Should be avoided in older adults**

Antiepileptics (including gabapentinoids)

Antidepressants (TCAs, SSRIs, and SNRIs)

Antipsychotics

Benzodiazepines

Nonbenzodiazepine benzodiazepine receptor agonist hypnotics (i.e., "Z-drugs")

Opioids

Skeletal muscle relaxants

Any combination of >3 of these CNS-active drugs

Increased risk of falls and of fracture with the concurrent use of ≥ 3 CNS-active agents (antiepileptics including gabapentinoids, antidepressants, antipsychotics, benzodiazepines, nonbenzodiazepine benzodiazepine receptor agonist hypnotics, opioids, and skeletal muscle relaxants).

Drug-Drug interactions **Should be avoided in older adults**

Lithium	<u>ACEIs</u>	Increased risk of <u>lithium toxicity</u> .
	<u>ARBs</u>	
	<u>ARNIs</u>	
Lithium	<u>Loop diuretics</u>	Increased risk of <u>lithium toxicity</u> .

Drug-Drug interactions ***Should be avoided in older adults***

Phenytoin

Trimethoprim-
sulfamethoxazole

Increased risk of phenytoin toxicity

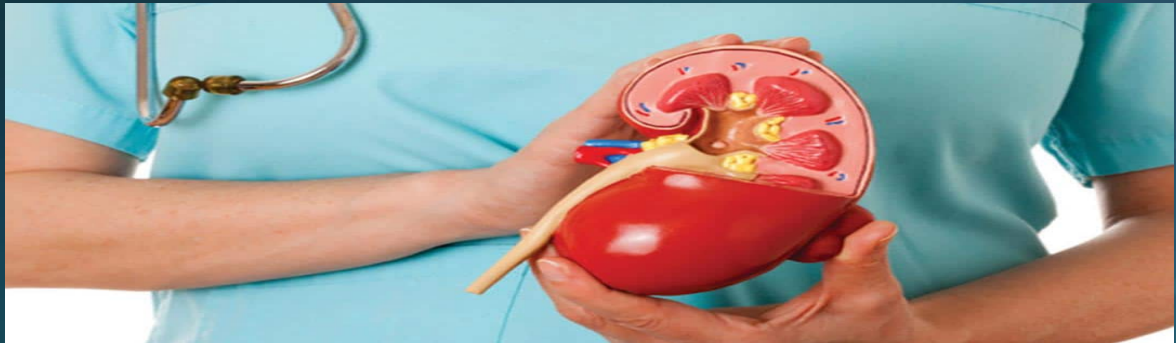
Drug-Drug interactions ***Should be avoided in older adults***

Theophylline	<u>Cimetidine</u>	Increased risk of <u>theophylline toxicity</u>
Theophylline	<u>Ciprofloxacin</u>	Increased risk of <u>theophylline toxicity</u>

Drug-Drug interactions **Should be avoided in older adults**

Warfarin	<u>Amiodarone</u>	<u>Increased risk of bleeding.</u>	<u>Avoid when possible; if used together, monitor INR closely.</u>
	<u>Ciprofloxacin</u>		
	<u>Macrolides (excluding azithromycin)</u>		
	<u>Trimethoprim-sulfamethoxazole</u>		
	<u>SSRIs</u>		

***The dose of the drug
should be adjusted
based on kidney
function in older adults***



The dose of the drug should be adjusted based on kidney function in older adults

Anti-infective

<u>Ciprofloxacin</u>	<30	Increased risk of CNS effects (e.g., <u>seizures</u> , <u>confusion</u>) and <u>tendon rupture</u> .	Dosages used to treat common infections typically require <u>reduction</u> when CrCl <30 mL/min.
<u>Nitrofurantoin</u>	<30	Potential for <u>pulmonary toxicity</u> , <u>hepatotoxicity</u> , and <u>peripheral neuropathy</u> , especially with <u>long-term use</u> . (See also Table 2).	<u>Avoid</u> if CrCl <30 mL/min
<u>Trimethoprim-sulfamethoxazole</u>	<30	Increased risk of <u>worsening of kidney function</u> and <u>hyperkalemia</u> ; risk of <u>hyperkalemia</u> especially prominent with <u>concurrent use of an ACE, ARB, or ARNI</u> .	<u>Reduce</u> dosage if CrCl is 15–29 mL/min. <u>Avoid</u> if CrCl <15 mL/min.

The dose of the drug should be adjusted based on kidney function in older adult

Cardiovascular and antithrombotics

Amiloride	<30	Hyperkalemia and hyponatremia	Avoid
<u>Enoxaparin</u>	<30	<u>Increased risk of bleeding</u>	Reduce dose
Fondaparinux	<30	Increased risk of bleeding	Avoid
<u>Rivaroxaban</u>	<50	<u>Lack of efficacy or safety evidence in people with CrCl <15 mL/min; limited evidence for CrCl 15–30 mL/min.</u>	<u>Avoid if CrCl <15 mL/min.</u> Reduce the dose if CrCl is 15–50 mL/min following manufacturer dosing recommendations based on indication-specific dosing.
<u>Spironolactone</u>	<30	<u>Hyperkalemia</u>	Avoid
<u>Triamterene</u>	<30	<u>Hyperkalemia and hyponatremia</u>	Avoid

The dose of the drug should be adjusted based on kidney function in older adult

Central nervous system and analgesics

Baclofen	eGFR <60	Increased risk of <u>encephalopathy requiring hospitalization in older adults with eGFR <60 mL/min or who require chronic dialysis</u> .	Avoid baclofen in older adults with <u>impaired kidney function (eGFR <60 mL/min)</u> . When baclofen cannot be avoided, use the lowest effective dose and monitor for signs of CNS toxicity, including altered mental status.
Duloxetine	<30	Increased GI adverse effects (<u>nausea, diarrhea</u>)	Avoid
Gabapentin	<60	<u>CNS adverse effects</u>	Reduce dose
Levetiracetam	≤80	<u>CNS adverse effects</u>	Reduce dose

The dose of the drug should be adjusted based on kidney function in older adult

Central nervous system and analgesics

NSAIDs (non-
selective, COX-2
selective, and
nonacetylated
salicylates, oral and
parenteral)^a

< 30

May increase the risk of
acute kidney injury and
a further decline in
kidney function

Avoid

Pregabalin

<60

CNS adverse effects

Reduce dose

Tramadol

<30

CNS adverse effects

**Immediate release: reduce
dose**

Extended-release: avoid

The dose of the drug should be adjusted based on kidney function in older adult

Gastrointestinal

<u>Cimetidine</u>	<50	<u>Mental status changes</u>	Reduce dose
<u>Famotidine</u>	<50	<u>Mental status changes</u>	Reduce dose
<u>Nizatidine</u>	<50	<u>Mental status changes</u>	Reduce dose

The dose of the drug should be adjusted based on kidney function in older adult

Hyperuricemia

<u>Colchicine</u>	<30	<u>GI, neuromuscular, and bone marrow toxicity</u>	Reduce dose; monitor for adverse effects.
Probenecid	<30	Loss of effectiveness	Avoid

Drugs with strong anticholinergic properties



Drugs with strong anticholinergic properties

Antidepressants

Amitriptyline

Amoxapine

Clomipramine

Desipramine

Doxepin (>6 mg/day)

Imipramine

Nortriptyline

Paroxetine

Antiemetics

Prochlorperazine

Promethazine

Drugs with strong anticholinergic properties

Antihistamines (first-generation)

Brompheniramine

Chlorpheniramine

Cyproheptadine

Dimenhydrinate

Diphenhydramine

Doxylamine

Hydroxyzine

Meclizine

Promethazine

Tripolidine

Drugs with strong anticholinergic properties

Antimuscarinics (urinary incontinence)^a

Darifenacin
Fesoterodine
Flavoxate
Oxybutynin
Solifenacin
Tolterodine
Trospium

Antiparkinsonian agents

Benztropine
Trihexyphenidyl

Drugs with strong anticholinergic properties

Antipsychotics

Chlorpromazine

Clozapine

Olanzapine

Perphenazine

Antispasmodics

Atropine

Clidinium-chlordiazepoxide

Dicyclomine

Homatropine

Hyoscyamine

Scopolamine

Skeletal muscle relaxants

Cyclobenzaprine

Orphenadrine

Herbal and Dietary Supplements

interactions:

- Ginkgo biloba extract taken with warfarin.
- St. John's wort taken with serotonin-reuptake inhibitors, increasing the risk of serotonin syndrome in older adults



- بیمار آقای 70 ساله که با شکایت درد در زانوها، اختلال خواب، بی اختیاری ادراری نوع اورژانسی، پرسیدن سوالات تکراری به کلینیک سالمندان آورده شده. بیمار از اپیوم تدخینی روزانه استفاده می کند

• BP: 150/90 PR: 14 RR: 68 T: 37

داروهای مصرفی:

Nortriptyline/ Diclofenac/ Clidinium-c/warfarin
/Chlordiazepoxide/ginko

THANK YOU !

