

POLYPHARMACY in the Older Population

By

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SUMMARY

- I will be using drugs/meds interchangeable including scripts, OTC, herbals, supplements
- Definition of polypharmacy
- How is drug dosing established: clinical trials
- Normal metabolism of drugs
- Metabolism in the older population
- Some reasons for polypharmacy
- Some tools for assessing polypharmacy
- Statistics of use in the older population
- Some statistics of adverse events
- Approach to the older patient



POLYPHARMACY

- STATEMENT: There are obvious benefits when therapies are combined to cure, slow progression or reduce symptoms of disease.
- **Definition of Polypharmacy**
 - Taking more medications/drugs than medically necessary or appropriate
 - Could potentially cause harm



How drugs get dosed

Clinical Trial Phases

- **Phase I:** Researchers test a new drug or treatment in a small group of people, usually young healthy, for the first time to evaluate its safety, determine a safe dosage range, and identify side effects.
- **Phase II:** The drug or treatment is given to a larger group of people to see if it is effective and to further evaluate its safety.



How drugs get dosed

Clinical Trial Phases

- **Phase III:** The drug or treatment is given to large groups of people to confirm its effectiveness, monitor side effects, compare it to commonly used treatments, and collect information that will allow the drug or treatment to be used safely.
- **Phase IV:** Studies are done post marketing to gather information on the drug's effect in various populations and any side effects associated with long-term use.



How drugs get dosed

Clinical Trial Phases

- Phase 1—to establish safety and dose—young and healthy almost exclusively
- Phase 2 and 3—to establish efficacy, compare to other drugs in that category—usually <75, no comorbidities and no one frail



Why Older Adults Do Not Participate

- Clinical trials exclude in their criteria
- Recruiting takes place on phone and internet
- Getting to the appointments takes mobility and money



Clinical Trials

- In 2000, an executive mandate from President Clinton created an amendment to Medicare policy that required the coverage of routine patient care costs associated with clinical trials. This policy change successfully increased clinical trial enrollment for older patients from 25% to 38% between 1993 and 2003

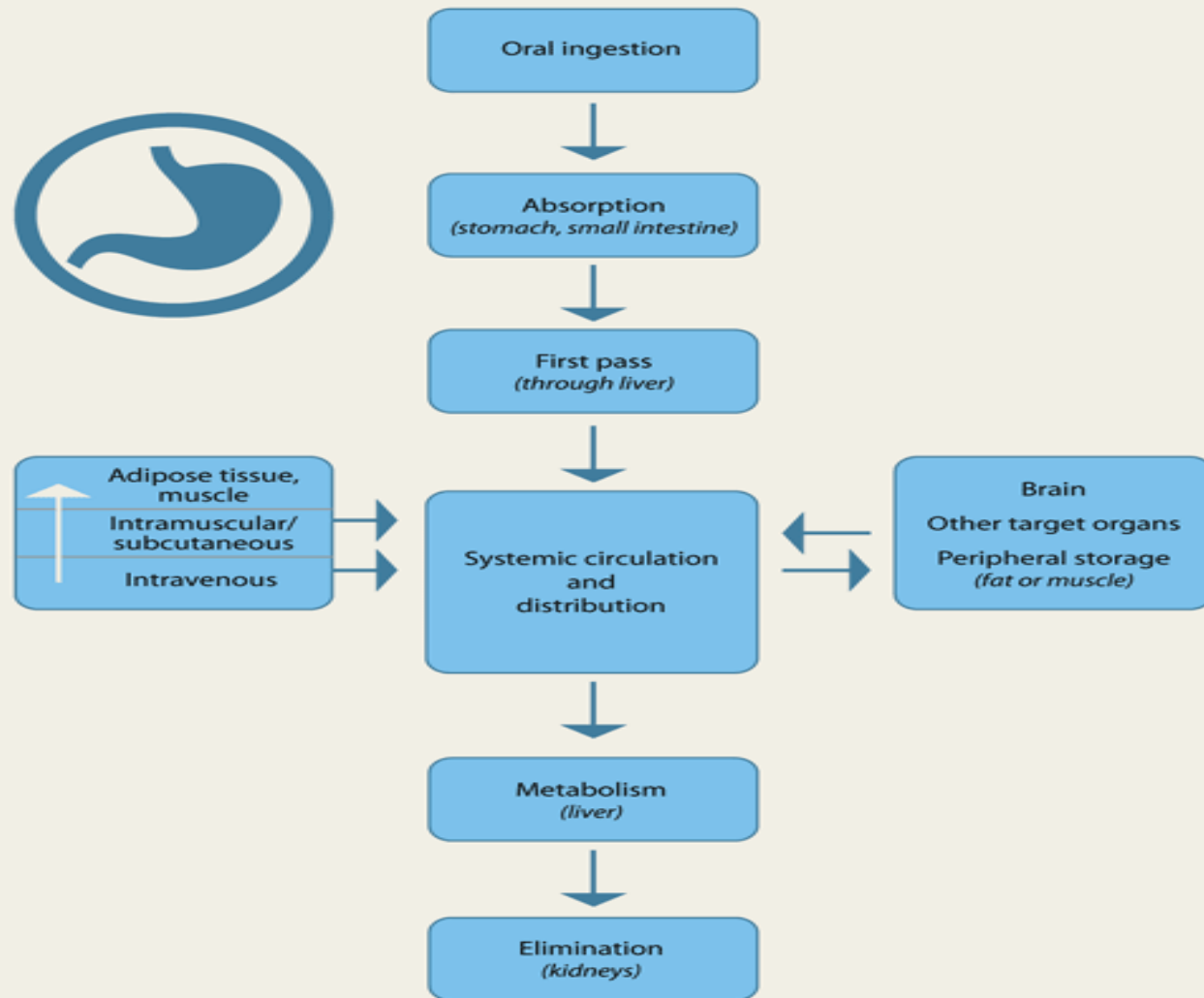


Normal Drug Metabolism

- Ingestion
- Absorption and first pass
- Distribution
- Metabolism
- Excretion



Figure 1 – Basic pharmacokinetic process: an orally ingested drug passes from the stomach to the proximal small intestine

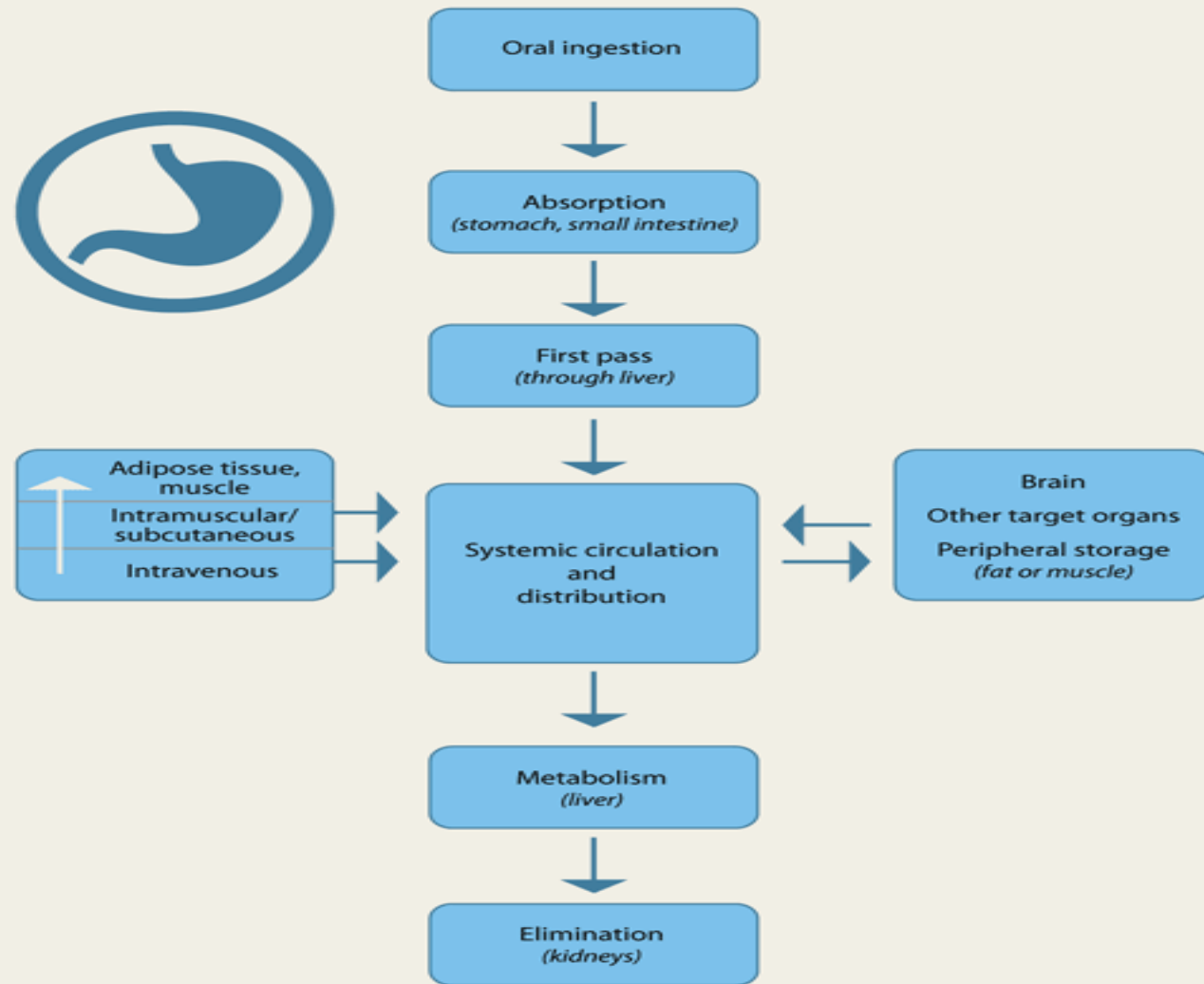


Drug Metabolism Changes in Older

- Ingestion:
 - Depends on remembering to take it
 - Depends on ability to swallow



Figure 1 – Basic pharmacokinetic process: an orally ingested drug passes from the stomach to the proximal small intestine



Drug Metabolism Changes in Older

- Absorption
 - Gastric emptying
 - Food can interfere or is needed
 - Decreased acid and blood flow
 - Over use of PPI's and H2 Blockers

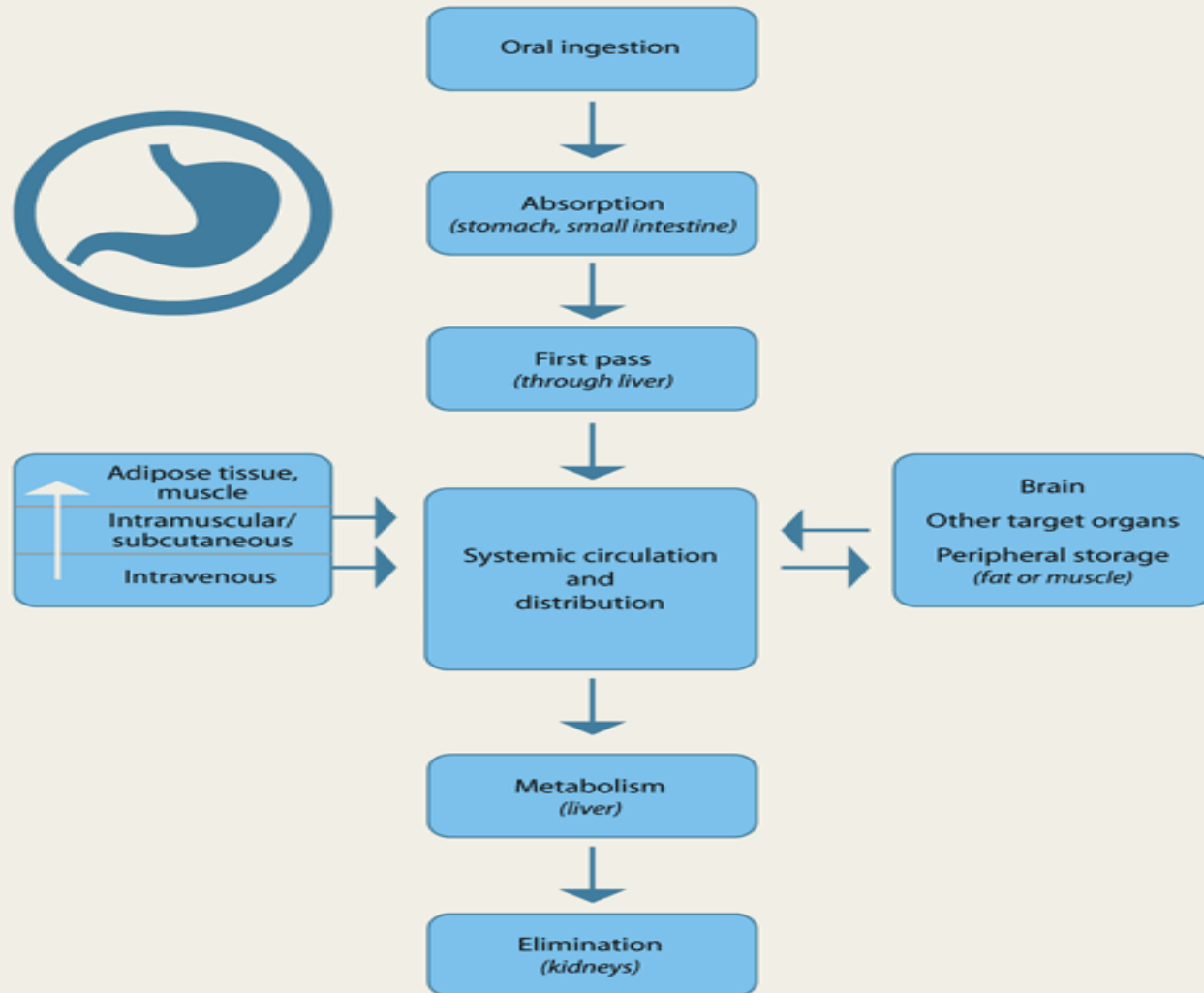


Drug Metabolism Changes in Older

- First Pass:
- Decreased liver mass
 - Decreased blood flow to the liver
 - Decreased liver function as we age



Figure 1 – Basic pharmacokinetic process: an orally ingested drug passes from the stomach to the proximal small intestine



Drug Metabolism in Older

- Distribution and arrival at target:
 - Protein binding is dependent on nutritional status—unbound levels of drug can be higher and more potent
 - Muscle mass decreases
 - Increase proportionally to body fat
 - Decrease in body water
 - $\frac{1}{2}$ life of drugs can be increased or decreased requiring dosing adjustments



Drug Metabolism in Older

- Distribution and arrival at target--continued
 - The older organs can have a different response than younger
 - The older brain reacts differently in response to drugs

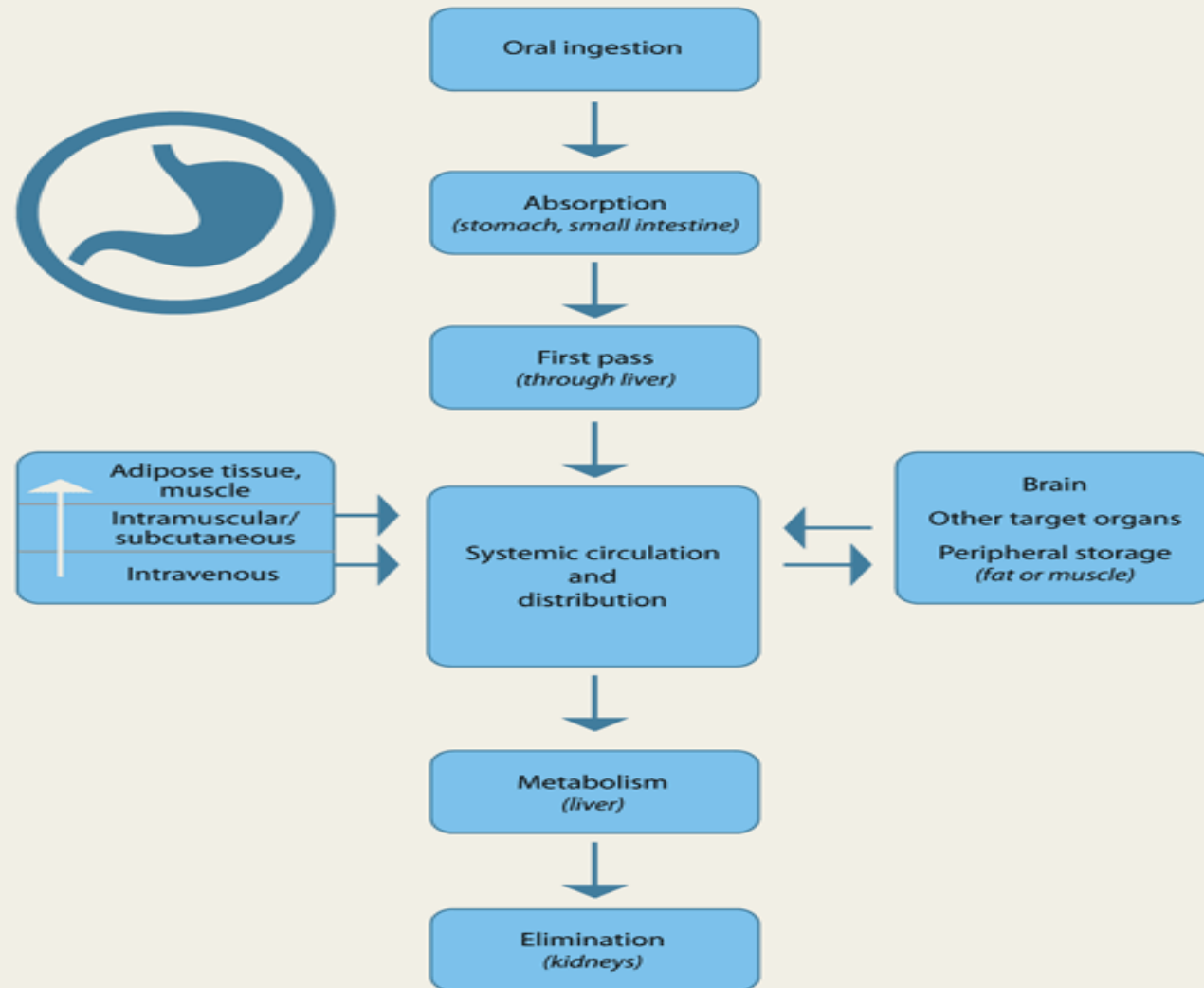


Drug Metabolism Changes in Older

- Metabolism:
 - Unknown alcohol use can decrease liver function; up to 10% use
 - Decrease liver mass
 - Decrease blood flow
 - Intrinsic decrease activity of the metabolic enzymes including Cytochrome P450
 - Great difference in gender
 - One drug can change the rate of metabolism of another—drug/drug interactions



Figure 1 – Basic pharmacokinetic process: an orally ingested drug passes from the stomach to the proximal small intestine



Drug Metabolism Changes in Older

- Elimination:
 - Reduced renal function normal part of aging.
 - Creatinine as a measurement of renal function is flawed, so even when providers look at creatine, it is not an accurate measure of renal function.



SUMMARY

Why Drugs are Different in Older

- **Dosing: Clinical Trials Phases 1-3**
 - Older and frail patients are not included much of the time so never tested on older adults
- **Metabolism:**
 - Aging changes that include lower volume of distribution, less muscle mass, less blood to the GI tract
- **Target tissues:**
 - The brain and other organs in older are affected differently



POLYPHARMACY

Estimated Statistics for Drug Use
in Older Adults in the
United States



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STATISTICS

on Drug Use in US Older

- 81% used at least one prescription
- 5 or more prescriptions used by 29% overall and 36% of 75-85 years old
- 46% took at least one over the counter med
- Herbal and dietary supplements are difficult to count
- One study of 75 and older found $\frac{3}{4}$ of those surveyed took at least one dietary supplement



OTC's and Herbals

- Older people purchase 40% of OTC's
- Nearly 15 billion dollars spent each year on herbals
 - Older people use twice as much as younger



Dietary Supplements

- One study said that most of those surveyed did not tell their provider about the supplements they were taking



Dietary Supplements

- A study searched web distributors of dietary and herbal supplements and found these:
- Ginkgo biloba, St. John's wort, Echinacea, ginseng, garlic, saw palmetto, kava, and valerian root have made at least one health claim suggesting use could treat, prevent or cure specific conditions.



- **Some Reasons For Polypharmacy**



Some Reasons for Polypharmacy

- In a 2006 survey of 89 national colleges and schools of pharmacy, 43% of schools reported having 2 full-time geriatrics faculty members, whereas the rest relied on part-time faculty. Of 125 accredited medical schools, only 12 teach geriatrics as a separate required course, only 14 have mandatory geriatrics clerkships, and most mix geriatrics training into regular coursework



Some Reasons for Polypharmacy

- Many older adults have more than one chronic disease; One study showed 20% of Medicare beneficiaries have 5 or more chronic diseases each with a medical regime



Some Reasons for Polypharmacy

- Not every patient has a case manager
- PCP's do not have enough time to do strict medication reconciliation each visit
- Patients are not asked and do not tell of dietary supplements, OTC's or herbals
- Transitions of care cause special problems due to medication changes



Some Reasons for Polypharmacy

- Older adults:
 - Have cognitive issues that interfere with medication management: i.e. coming home from the hospital with dose changes or added medications in the same class
 - Have hearing impairment: cannot hear instructions
 - Have visual impairment: cannot see the pill that fell, which day it might be on the mediset



Some Reasons for Polypharmacy

- See multiple providers and specialists; many do not do medication, OTC and supplement reconciliation routinely



Some Reasons for Polypharmacy

- Prescribing cascade:
 - A symptom develops from a medication
 - A provider prescribes another medication to treat that symptom
 - An example:
 - Cholinesterase inhibitor causes urinary incontinence
 - NSAIDS cause hypertension
 - Clonidine causes hallucinations



- **Risks associated with Polypharmacy**



RISKS FOR POLYPHARMACY

- Older adults have greater risk for adverse drug events (ADE) due to all of the metabolic, cognitive and physical changes of aging
- Increased potential for drug-drug interactions



RISKS FOR POLYPHARMACY

- Polypharmacy is an independent risk factor for hip fractures



RISKS FOR POLYPHARMACY

- Drug effects can be augmented in older
 - For example:
 - Postural hypotension with BP meds
 - Dehydration and hypovolemia and electrolyte disturbances with diuretics
 - Hypoglycemia with antidiabetics
- The brain is especially sensitive drug target
 - Any drug that effects the brain can cause confusion, functional or cognitive decline



INAPPROPRIATE MEDICATIONS

Things to address

- What is appropriate in the older population
- Time to benefit needs to be assessed
- Life expectancy
- Goals of care



INAPPROPRIATE MEDICATIONS

Tools for Assessment of Drugs

- Drug Burden Index
- Screening Tool of Older Person's Prescriptions (STOPP)
- Beers list/criteria



Drug Burden Index

- Measure of anticholinergic and sedative medications
- A high score increases risk of pneumonia, urinary retention, and rate of cognitive decline



Drug Burden Index

- Higher DBI at years 1, 3 and 5 was consistently associated with poorer function at year 6. On multivariate analysis, a one unit increase in AUCDB predicted decreases in SPPB score of 0.08 ($p = 0.01$), gait speed of 0.01 m/s ($p=0.004$), and grip strength of 0.27 kg ($p=0.004$) at year 6.
- **Conclusion**
- Increasing exposure to medication with anticholinergic and sedative effects, measured with DBI, is associated with lower objective physical function over five years in community dwelling older people.



Drug Burden Index

- [Am J Med. 2009 Dec; 122\(12\): 1142–1149.e1-2.](#)
- doi: [10.1016/j.amjmed.2009.02.021](#)



Anticholinergic effects

- [Poor coordination](#)
- Dementia^[8]
- Decreased mucus production in the nose and [throat; consequent dry, sore throat](#)
- [Dry-mouth with possible acceleration of dental caries](#)
- Stopping of [sweating; consequent decreased epidermal thermal dissipation leading to warm, blotchy, or red skin](#)
- Increased [body temperature](#)
- [Pupil dilation; consequent sensitivity to bright light \(photophobia\)](#)
- Loss of accommodation (loss of focusing ability, blurred vision – [cycloplegia](#))
- [Double-vision](#)
- [Increased heart rate](#)
- Tendency to be easily startled
- [Urinary retention](#)
- Diminished bowel movement, sometimes [ileus \(decreases motility via the vagus nerve\)](#)
- Increased [intraocular pressure; dangerous for people with narrow-angle glaucoma.](#)



STOPP Criteria

- Screening Tool of Older Persons' Potentially Inappropriate Prescriptions
- Comprised of 65 clinical criteria
- More common avoidable practices
- Some overlap with the Beers Criteria
- Not comprehensive
- [www.researchgate.net/.../267046021_STOPPS TART_criteria_..](http://www.researchgate.net/.../267046021_STOPPS_TART_criteria_..)



STOPP criteria

Section A: Indication of medication:

- Any drug prescribed without an evidence-based clinical indication.
- Any drug prescribed beyond the recommended duration, where treatment duration is well defined.
- Any duplicate drug class prescription e.g. two concurrent NSAIDs, SSRIs, loop diuretics, ACE
- Platelet inhibitors, anticoagulants (optimization of monotherapy within a single drug class should be observed prior to considering a new agent).



BEERS criteria/list

- The **Beers Criteria for Potentially Inappropriate Medication Use in Older Adults**, commonly called the **Beers List**, is a guideline for healthcare professionals to help improve the safety of prescribing medications for older adults. It emphasizes deprescribing medication that is unnecessary which reduces the problems of high risk–benefit ratio, polypharmacy, drug interactions, and adverse drug reactions.
 - From Wikipedia



BEERS Criteria/List

- Most commonly used tool
- Updated in 2012
 - Newest additions:
 - Megestrol acetate (Megace)
 - Glyburide
 - Sliding scale insulin
- Available at [www. americangeriatrics.org](http://www.americangeriatrics.org)
- App available for \$2.99 on iTunes



BEERS list

- 53 potentially inappropriate medications or classes of medication in 3 categories:
 1. drugs to avoid in general in the elderly
 2. drugs to avoid in older people with certain diseases and syndromes
 3. drugs to use with caution in the elderly if there are no acceptable alternatives.



Selected BEERS Medications

- Anticholinergic except amitriptyline
- Antipsychotics
- Benzos (Valium, Ativan) for insomnia, agitation
- Indomethacin and Ketorolac
- Nitrofurantoin
- Digoxin >0.125mg daily
- Spironolactone >25mg daily



Selected BEERS Medications

- Nonbenzo hypnotics—**ZOLPIDEM (AMBIEN)**
- NSAIDS in most circumstances
- Meperidine—Demerol
- Mineral Oil—can aspirate and cause pneumonia



Adverse Drug Events

Definition

- **Adverse drug events (ADEs)** are injuries resulting from **drug**-related medical interventions. ADEs can occur in any health care setting, including: inpatient, such as acute care hospitals; outpatient such as provider's offices; long-term care settings, such as nursing homes. [Overview - Adverse Drug Events - health.gov health.gov/hcq/ade.asp](http://health.gov/hcq/ade.asp)



Adverse Drug Events

- 15% risk with 2 medications
 - 58% risk with 5 meds
 - 82% risk with >6 meds
-
- Fulton MM, Allen ER. Journal of the American Academy of Nurse Practitioners 2005,17(4): 123-32
 - Emergency Medicine Reports 2002;23(11): 145-53
 - Gallagher LP. Applied Nursing Research 2001: 14(4)220-4



Adverse Drug Events

- Nearly 17% of hospital admissions due to ADE
- Rate increases to 33% in patients >74 yo
- 35% of outpatient and 40% on hospitalized older patients experience ADE

- Chan M. Nicklason F. Vial JH. Intern Med J 2001; 31(4) 199-204
- Tangilsuran B Age Ageing 2009; 28(4): 358-9



Adverse Drug Events

- Potentially preventable up to 50 percent of the time.
- Common serious manifestations include falls, orthostatic hypotension, heart failure, bleeding and delirium.
- The most common causes of death are gastrointestinal or intracranial bleeding and renal failure.
- Antithrombotic and antidiabetic medications, diuretics, and nonsteroidal anti-inflammatory drugs cause most of the preventable hospital admissions due to adverse drug events.



Adverse Drug Events

- One in six hospital admissions of older adults is because of an adverse drug event, 4x younger persons.
- For >75 years, one in three hospital admissions is because of an ADE
- While in the hospital, one in six older patients experiences an adverse drug event
- From American Academy of Family Physicians



Adverse Drug Events

- 9 international studies attributed most preventable medication-related admissions to antithrombotic medications, diuretics, and nonsteroidal anti-inflammatory drugs.
- In another study, 2/3 of medication-related admissions to the hospital involved antithrombotic and antidiabetic medications, almost always by unintentional overdose.
- In a prospective study of 1,225 hospital admissions related to adverse drug events, 20 of 28 deaths were due to gastrointestinal or intracranial bleeding and five were due to renal failure.



Approach to the older patient

- Rising tide of older Americans and worldwide
- Recommendations from AAFP



Approach to the older patient

- The use of antipsychotics, antidepressants, benzodiazepines, and sedative/hypnotics in older adults should be limited to reduce the risk of falls. C
- The number of medications in older adults should be limited, because each new medication adds more than one adverse drug event each year and taking six or more medications increases this risk fourfold. C
- Ideally, the primary care physician should prescribe all medications, because each additional prescriber increases the risk of adverse drug events in older adults by 30 percent. C
- Patients with several chronic health conditions should be asked often about adverse drug events, because the odds of an event double for four or five conditions and triple for six or more. C
- *A = consistent, good-quality patient-oriented evidence; B = inconsistent or limited-quality patient-oriented evidence; C = consensus, disease-oriented evidence, usual practice, expert opinion, or case series. For information about the SORT evidence rating system, go to <http://www.aafp.org/afpsort.xml>.*



Approach to the older patient

- Interventions:
 - HHS listed randomized controlled studies that improved medication use and quality on older adults on multiple medications
 - All of the studies noted using pharmacist review



Approach to the older patient Interventions

“Medication check up” with PCP at least yearly



Case 1



Mr. Brown is 79 yo retired accountant plays bridge, manages his own checkbook, and enjoys ballroom dancing with his wife.

His medications are:

- Aspirin 81mg for heart disease
- Hydrochlorothiazide for hypertension
- Clonidine for hypertension
- Ranitidine for reflux
- Naproxen for arthritis pain
- Lovastatin for hyperlipidemia
- Metformin for diabetes
- Nitro as needed for stable angina
- Diazepam for anxiety



Case 1



What is important for evaluating Mr. Brown's drugs?

- He is driving and dancing—notice when that changes
- We need to ask about OTC's and supplements—each visit
- Note there are several meds on the Beers list—be mindful of changes in his health status
- Ask now about advance care planning



Case 2



Mrs. Smith is 69 yo woman . She is a retired sales clerk and lives alone. She recently d/c from hospital after a 5 day stay for atrial fibrillation out of control. The day before her d/c her **Coumadin** dose was increased from 3 to 5mg, she was also prescribed a new blood pressure medication and was told to discontinue an older medication. When she picked up her script it said “Take as directed”. When she picks up her script, she also buys Vit E, Vit C, **Tagamet HB, Pepto Bismol**, ginkgo biloba.



Case 2



What issues are at play with Ms. Smith?

- Dose changes for existing medication after a hospitalization—coumadin is responsible for much of the preventable mortality and morbidity from overdose and bleeding
- New medications for a different problem—risk to get confused about what she should take
- OTC's and herbals that could potentially interfere with her prescribed meds.
- She is buying 2 medications for upset stomach



Case 3



Ms. Young is a 71 yo woman retired teacher. She was recently diagnosed with mild to moderate Alzheimer's disease.

- She lives with her husband and they rely on SocSec as their only income and the bus for transportation; he uses a walker and is her only caregiver
- . Ms. Young is having some word finding difficulty and misplaces common household items
- She and her husband go to the pharmacy and pick up Advil and Vitamin E, OTC sleep aid and a new blood pressure medication for Mr. Young
- The Young's shop at multiple pharmacies to get the best prices. They obtained her Aricept last month from another pharmacy She is also having new disturbing dreams which started when she started her new "memory pill", Aricept



Case 3



What are the issues?

- Caregiver may have limitations to medication management
- There is a risk of confusing his medications and hers
- OTC's interfere with prescribed medications and disease process
- Symptom of dreams probably side effect of Aricept; they are adding dangerous OTC's and their provider probably does not know about this new symptom nor the OTC's that she is taking
- Financial issues that may limit their ability to see a provider as often as needed
- Questionable social isolation



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SUMMING it up

- Polypharmacy is inappropriate use of drugs
- Dosing was never determined for older
- Aging changes make metabolism different
- Aging changes make medication management by the older adult difficult
- We use too many pharmaceuticals; we are too busy to keep track
- The medical profession has not been trained
- We need to reassess the medical necessity of all drugs that our patients are taking on each visit
- There are interventions that can help



THANK YOU

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