



# Systemwide Approach to Improving Overprescribed and Problematic Polypharmacy

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# Objectives

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- Review patient and system-related factors that lead to polypharmacy
- Summarize interprofessional screening tools to identify high-risk drug for deprescription
- Outline how and interprofessional team can coordinator managing polypharmacy and deprescribe medications



# Demographics

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- >56 million adults aged 65+ in the US (16.9%)
  - 2030: 73.1 million aged 65+ (>20%)
  - 2050: 85.7 million aged 65+ (22%)
  - 2060: 95 million aged 65+
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- Current population age strata-older adults fall into different age strata
    - 65-74 years of age: 58.0%
    - 75-84 years of age: 29.0%
    - 85+ years of age: 12.8% - expected to increase 6.5 MM → 19.6 MM by 2060



# Demographic shifts

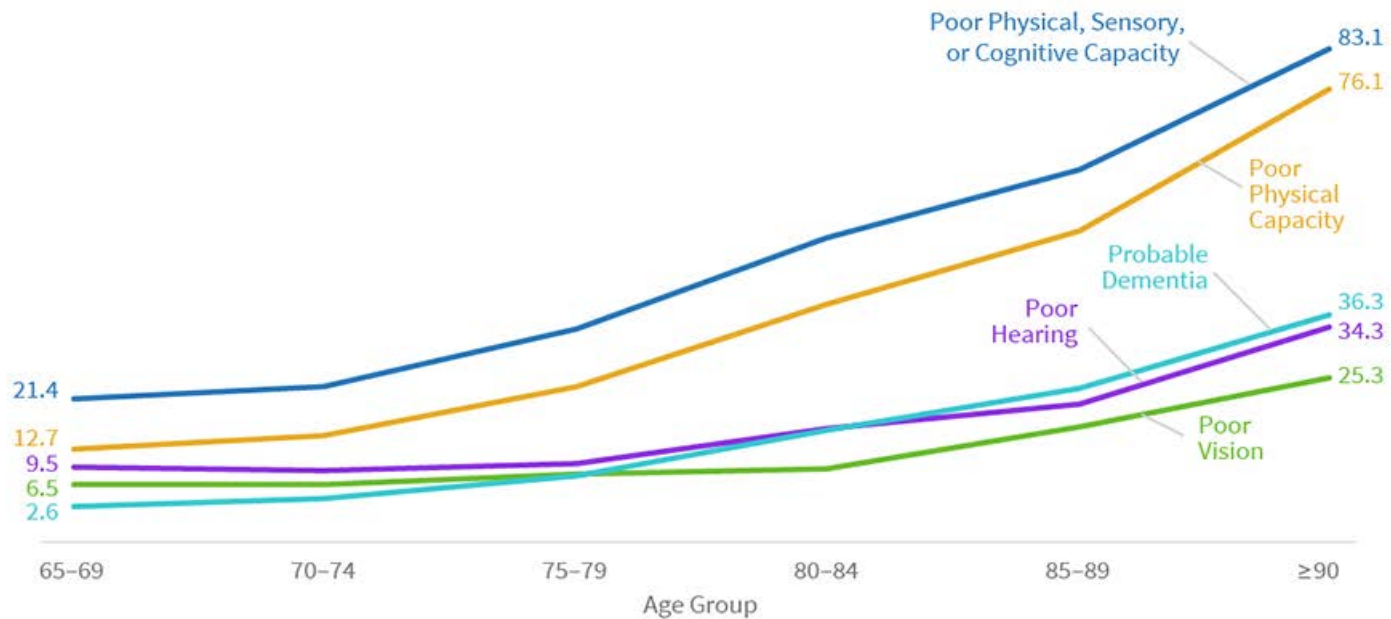
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- Age gap between men and women is expected to shrink
- The older adult population will become more ethnically diverse
  - Proportion of non-Hispanic white older adults projected to decrease from 77% in 2017 to 55% by 2060
- A larger proportion of older adults live in rural areas than urban areas
  - Proportion of older adults in non-urban (i.e., suburban and rural) areas is projected to increase in the coming decades
- The number of older Americans living with one or more disabilities is projected to increase



# The Likelihood of Having a Disability Increases With Age

Age-Specific Estimates of Poor Physical, Sensory, and Cognitive Capacity, Adults Ages 65 and Older (%), 2015



Source: National Health and Aging Trends Study.



# Increased incidence of chronic conditions

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- Alzheimer's disease
- Parkinson's disease
- Vascular dementia
- Stroke
- Visual impairment
  - Cataracts and macular degeneration
- Atherosclerosis
- Coronary heart disease
- Heart failure
- Diabetes
- Arthritis
- Osteoporosis and fractures
- Cancer
- Incontinence



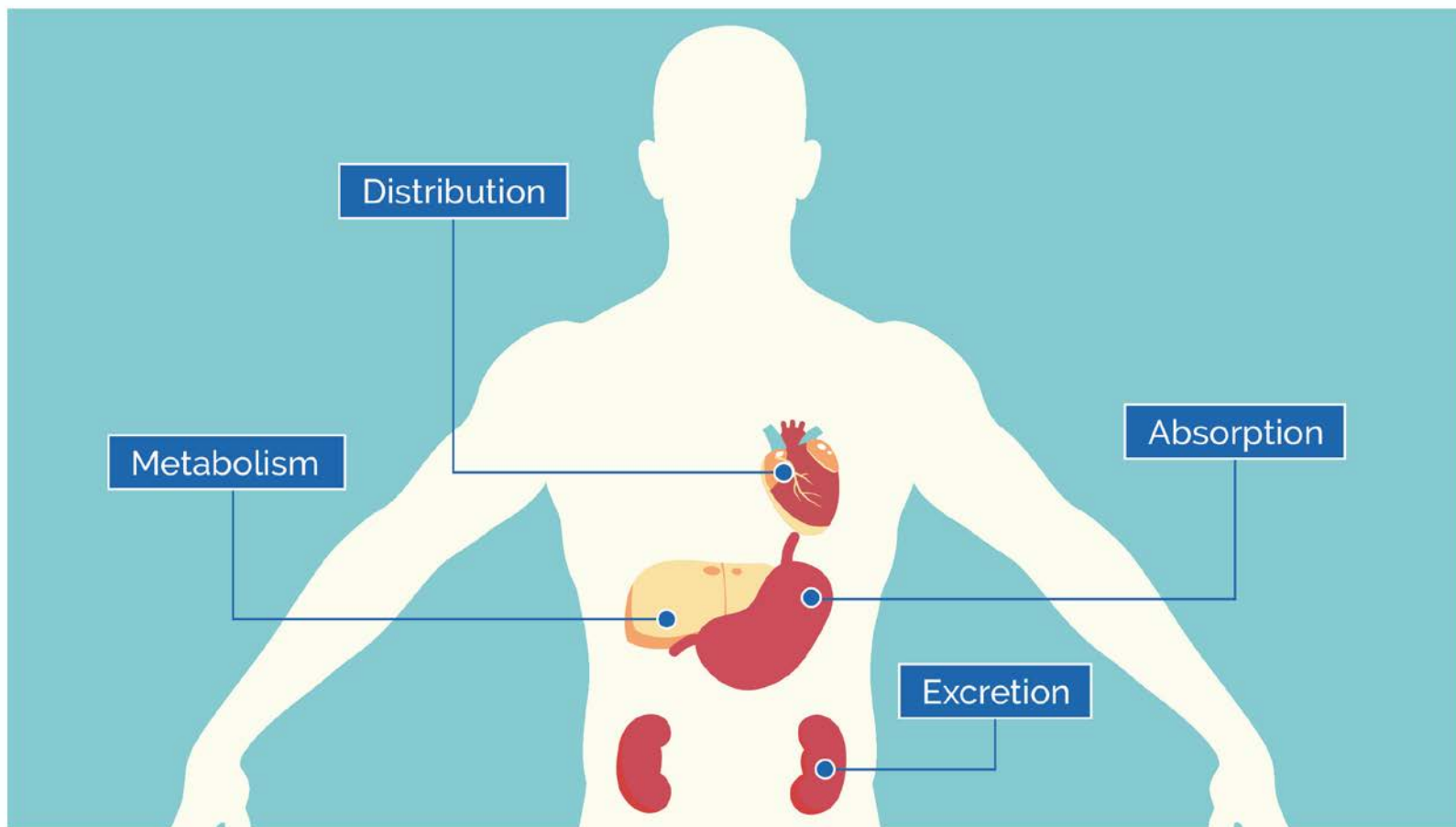
# Physiologic changes

Organ system	Manifestation
Body composition	↓ Total body water ↓ Lean body mass ↑ Body fat
Cardiovascular	↓ Myocardial sensitivity to $\beta$ adrenergic stimulation ↓ Cardiac output ↑ Total peripheral resistance
CNS	↓ Brain weight
Endocrine	Thyroid gland atrophy ↑ Incidence of diabetes
Gastrointestinal	↓ GI blood flow Slowed intestinal transit
Liver	↓ Hepatic size and blood flow
Renal	↓ Glomerular filtration rate ↓ Renal blood flow ↓ Renal mass



# ADME

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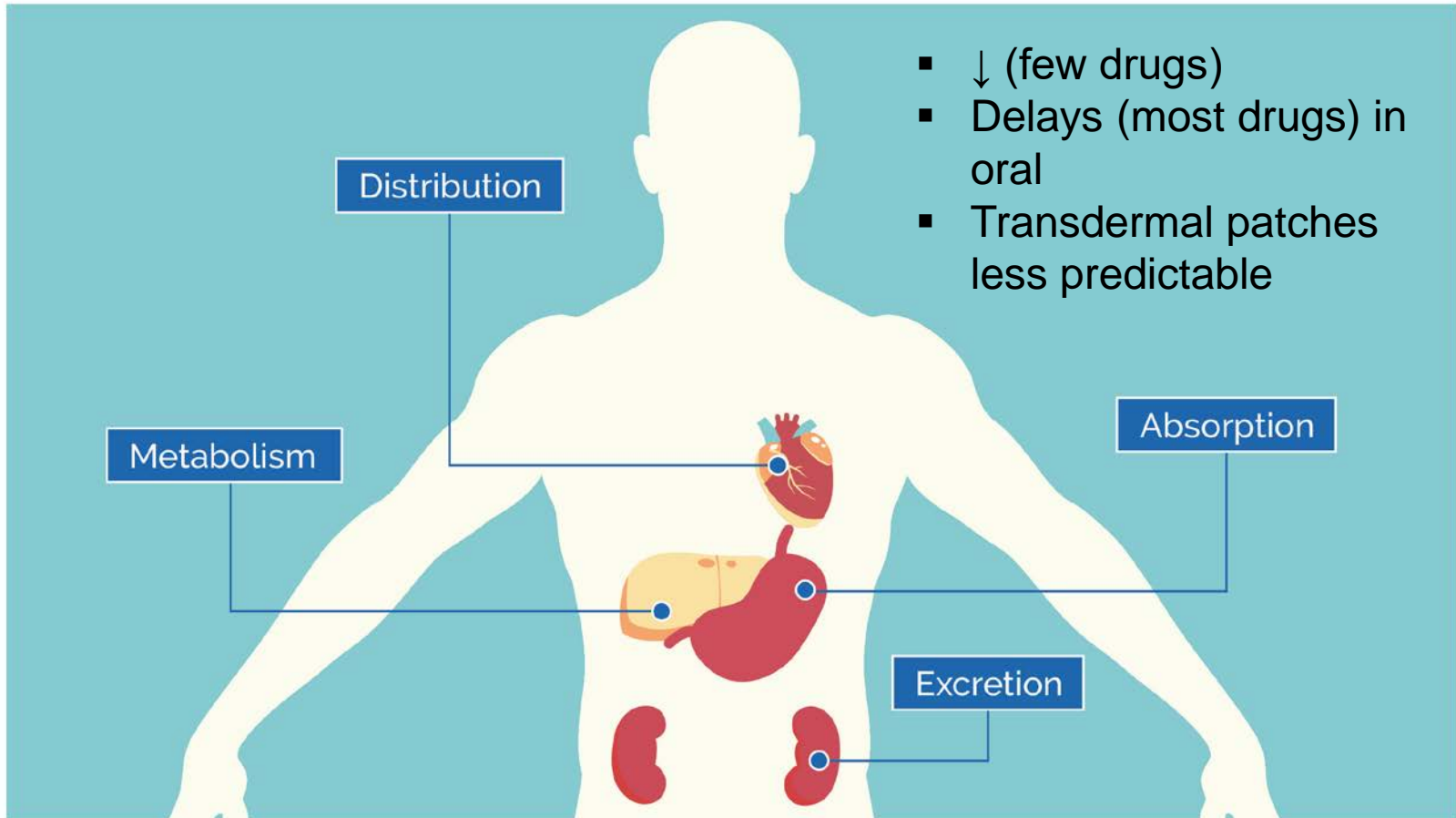
# Absorption

*Movement of a chemical from the administration site to the bloodstream*

- Four main routes of administration:
  - Ingestion through the digestive tract (Enteral)
    - Oral, sublingual, buccal, rectal
    - Absorption typically occurs 30–60 minutes after dosage
  - Inhalation via the respiratory system (Parenteral)
    - Bypasses the GI tract, providing a rapid onset of action. Inhalation may also minimize side effects because dosage requirements are lower than for oral medications
  - Dermal application to the skin or eye (Parenteral)
    - Usually ointment or cream, or it can be imbedded in a patch placed on the skin. Usually slower absorption
  - Injection through direct administration into the bloodstream (Parenteral)
    - Fastest onset, complete absorption (100% bioavailability)



# Changes with aging – Absorption



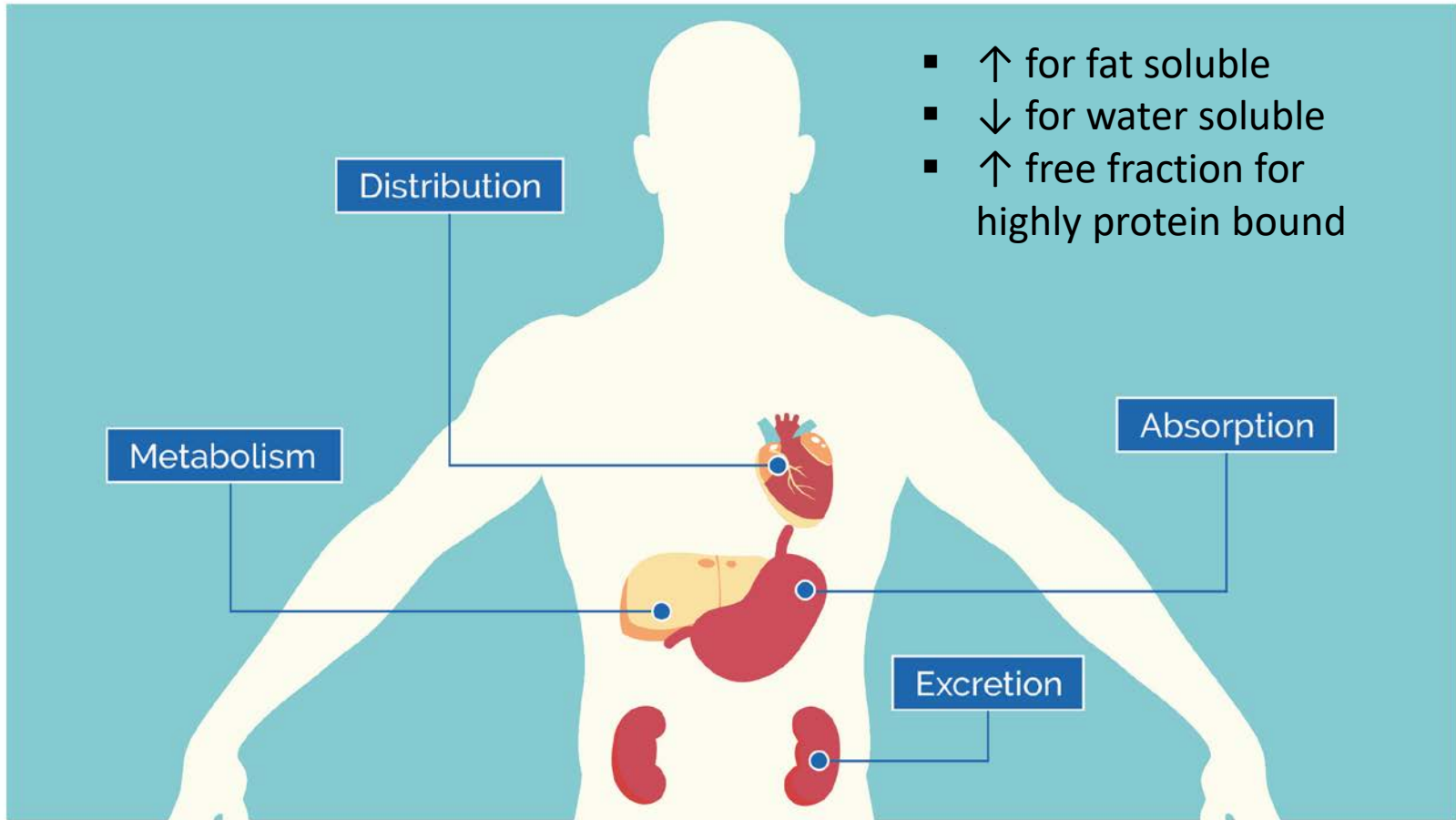
# Distribution

*Movement from the absorption site to tissues around the body*

- Typically accomplished via the bloodstream, but it can also occur from cell-to-cell
- Affected by:
  - Blood flow
  - Lipophilicity
  - Tissue binding
  - Molecular size influence distribution
- **Blood-brain barrier** – series of narrow junctions at the area where the capillaries transport blood into the central nervous system
  - Protects the brain from the toxic effects of many medications
  - Specific carrying proteins transport select medications across these junctions



# Changes with aging – Distribution



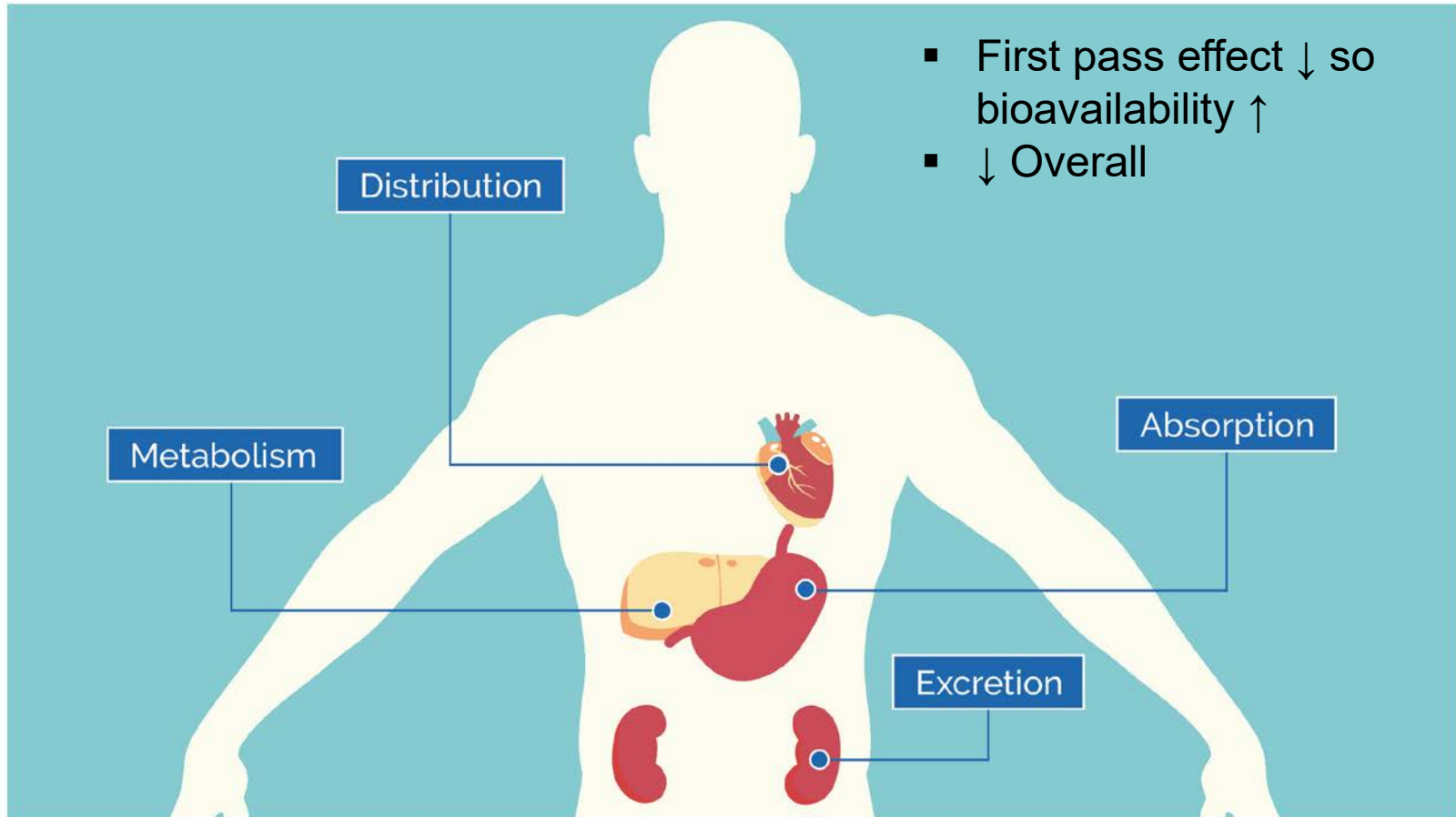
# Metabolism

Biotransformation of a drug by organs or tissues so that the drug can be excreted

- Primarily via the liver, kidney, skin, or digestive tract
- Drug compound is altered to become more water-soluble (metabolite)
  - Can be toxic, the active form of the drug, or unchanged
- **Half-life ( $T_{1/2}$ )** – the time it takes for the amount of a drug's active substance in your body to reduce by half
  - Helpful to determine potential safety or toxicity of a drug
  - Can be used to determine the likelihood of drug-drug interactions (DDIs)



# Changes with aging – Metabolism



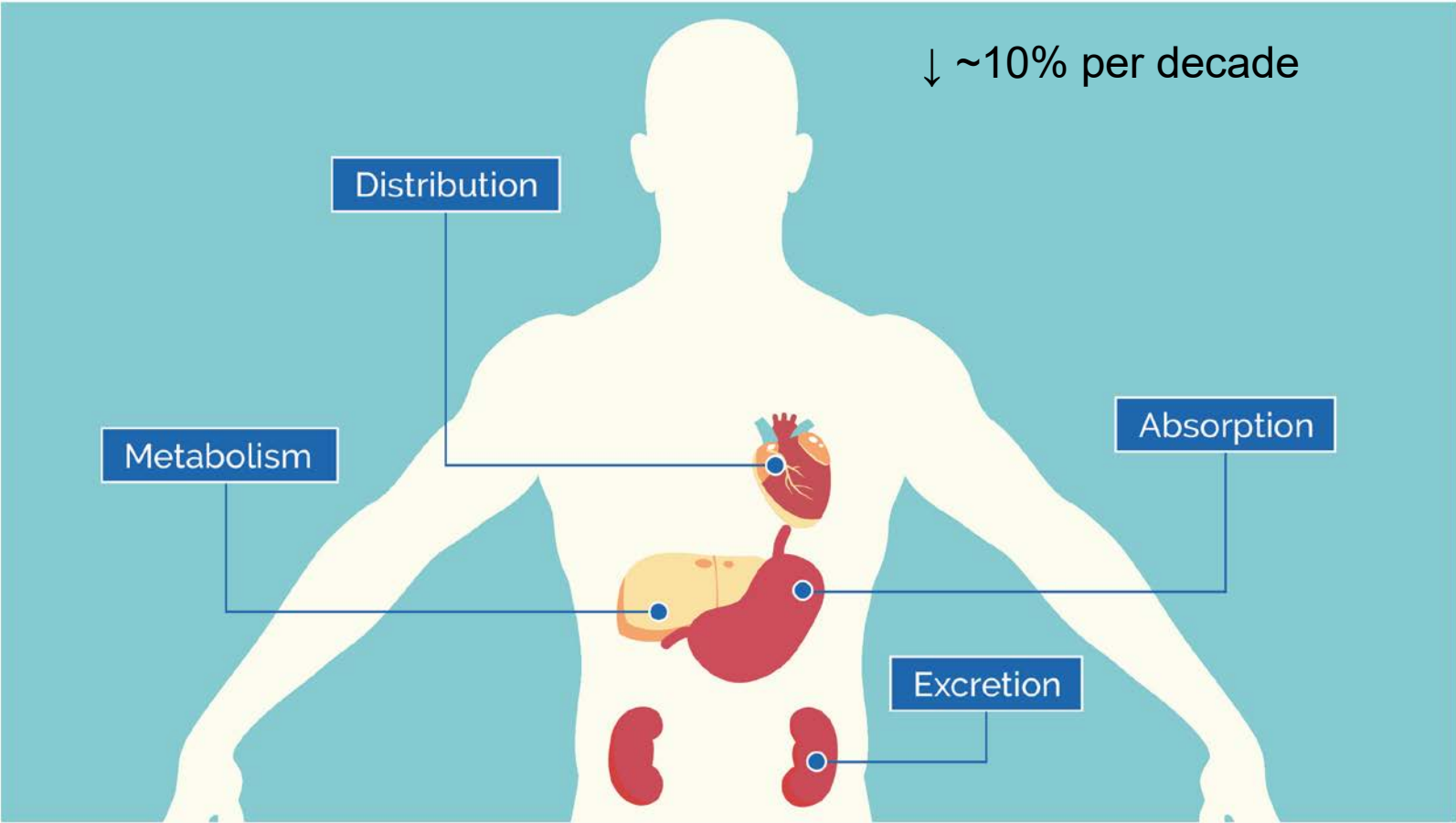
# Excretion

Process by which the metabolized drug compound is eliminated from the body

- Primarily via the feces or urine
  - Sometimes via the lungs or in sweat through the skin
- Not every drug compound is fully excreted
  - When the chemical or metabolites bioaccumulate, adverse effects can occur
  - Lipid-soluble compounds are more prone to bioaccumulate compared to water-soluble compounds



# Changes with aging – Excretion





# Geriatric Medication Use

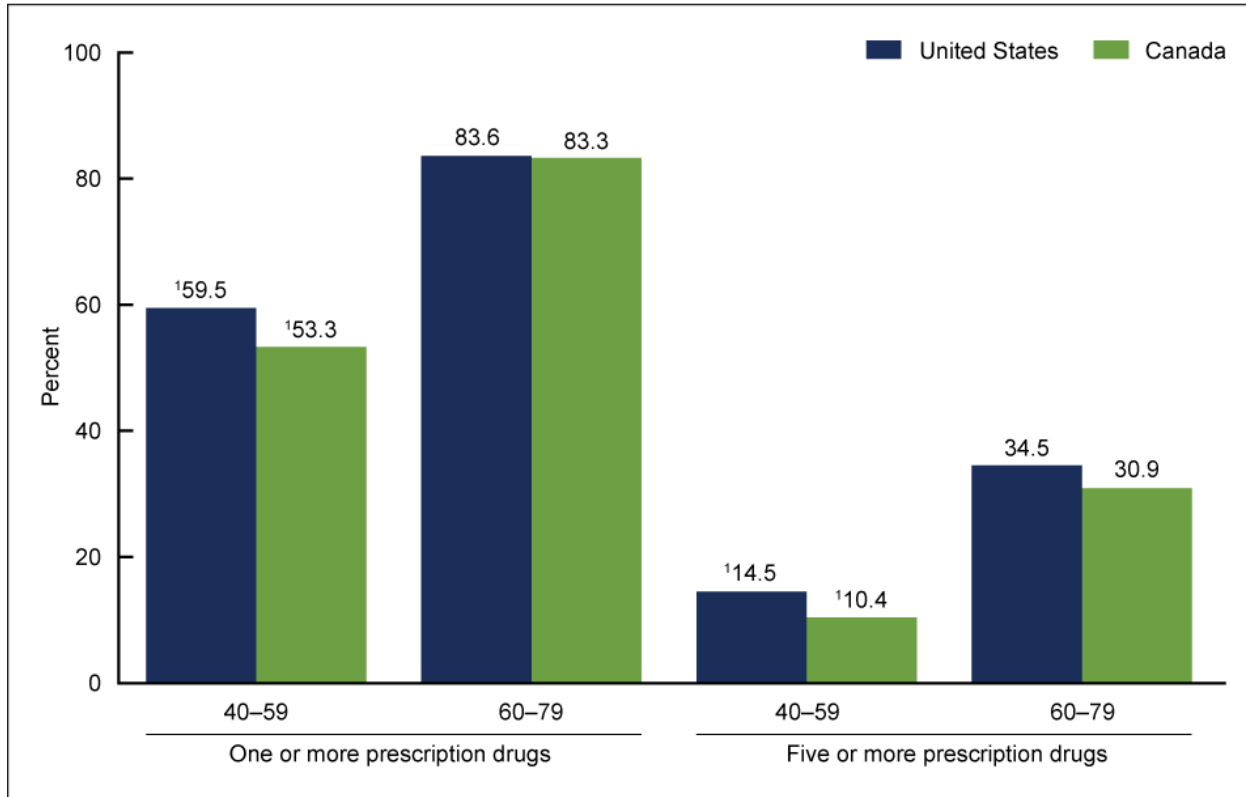
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- 25-30% of medication used
  - 34% of medication costs
  - 36% of hospital stays
  - 40% of medication-related hospitalizations
  - 50% of medication-related deaths
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- At least \$30 billion/year is spent on medication-related morbidity



# Geriatric drug use

Figure 3. Use of one or more and five or more prescription drugs in the past 30 days among adults aged 40–79, by age group: United States, 2015–2016, and Canada, 2016–2017



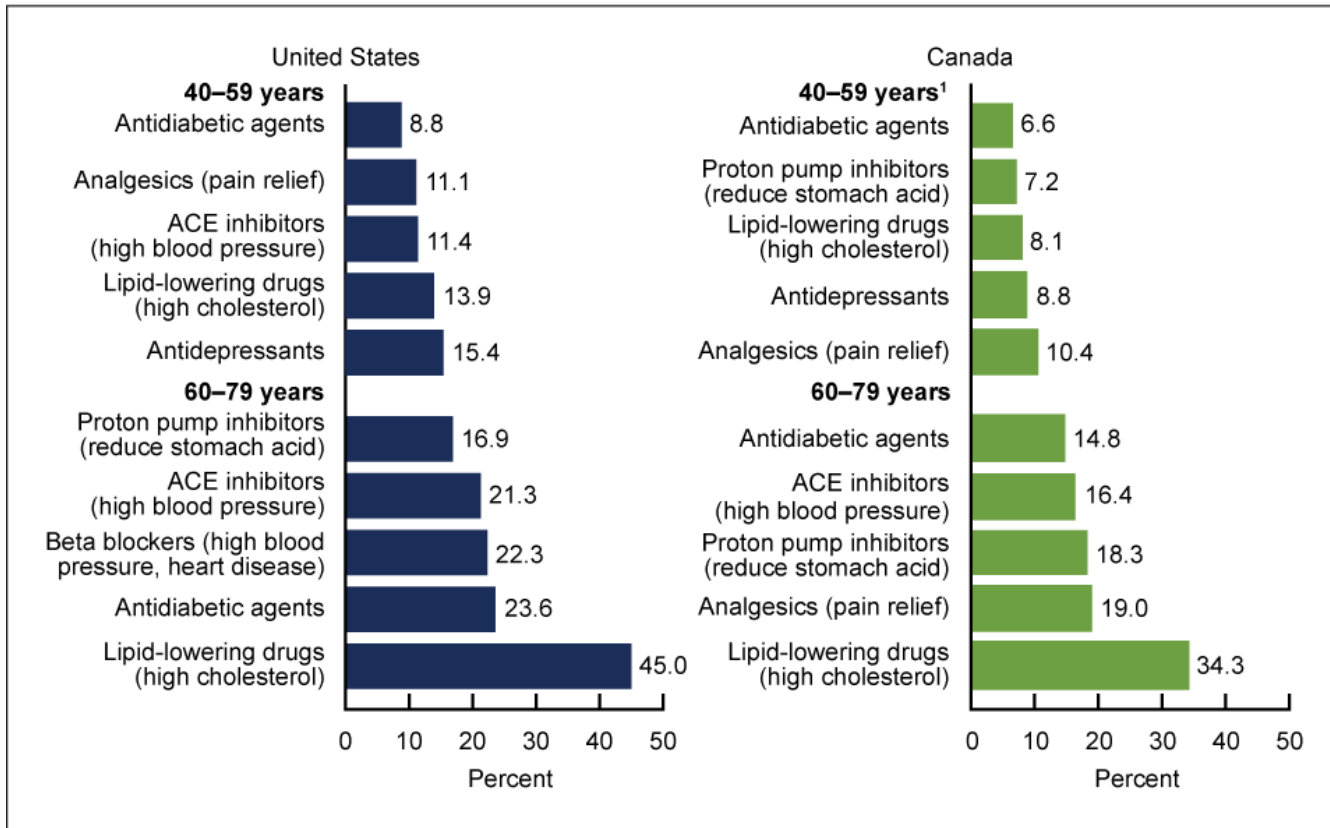
<sup>1</sup>Significantly different from adults aged 60–79.

NOTE: Access data table for Figure 3 at: [https://www.cdc.gov/nchs/data/databriefs/db347\\_tables-508.pdf#3](https://www.cdc.gov/nchs/data/databriefs/db347_tables-508.pdf#3).

SOURCES: NCHS, National Health and Nutrition Examination Survey, 2015–2016, and Statistics Canada, Canadian Health Measures Survey, 2016–2017.

# Most common Rx medications

Figure 4. Use in the past 30 days of the most common prescription drug types among adults aged 40–79, by age group: United States, 2015–2016, and Canada, 2016–2017



<sup>1</sup>Estimates for Canadian adults aged 40–59 may be unreliable and should be used with caution.

NOTES: Primary indication for the use of the drug class is in parentheses. ACE is angiotensin converting enzyme. Access data table for Figure 4 at: [https://www.cdc.gov/nchs/data/databriefs/db347\\_tables-508.pdf#4](https://www.cdc.gov/nchs/data/databriefs/db347_tables-508.pdf#4).

SOURCES: NCHS, National Health and Nutrition Examination Survey, 2015–2016, and Statistics Canada, Canadian Health Measures Survey, 2016–2017.

# Polypharmacy

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5 or more medications

Adverse outcomes such as falls, frailty, disability, and mortality in older adults

World Health Organization – emphasis should be on evidence-based practice and the goal of reducing inappropriate polypharmacy

# Overuse of medications

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- Unnecessary drugs: Use of more medications than clinically indicated and unneeded therapeutic duplication
- Common unnecessary drugs: GI agents, CNS agents, vitamins, minerals
- May be caused by:
  - Prescribing cascade: When a drug is prescribed for treating another drug's adverse effects
  - Several prescribers
  - Care transitions



# Underuse of medications

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- Omitted but necessary or indicated drug therapy or inadequate dosing
- Commonly underused drugs: Anticoagulants, statins, antihypertensives
- Medications considered appropriate according to guidelines may be omitted because prescriber or patient is overly wary of ADRs



# Noncompliance

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- Unintentional nonadherence caused by complex drug regimen
- Adherence is defined as taking 80% or more of the prescribed medication doses
- Prevalence ranges from 40-80% (mean, ~50%)
- Thought to cause ~125,000 preventable deaths and \$100 billion in preventable medical costs per year



# Potential Barriers to Medication Adherence

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## Patient-related barriers

- Lack of motivation
- Depression
- Denial
- Cognitive impairment
- Drug or alcohol misuse
- Cultural issues
- Low health literacy
- Alternate belief systems
- Poor practitioner-patient relationship

## Treatment-related barriers

- Complexity of treatment
- Side effects (or fear of side effects)
- Inconvenience
- Cost
- Time
- Asymptomatic disease being treated





# Adverse Drug Reaction

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Symptom, consequence, or injury that occurs due to the administration of a medication, causing a noxious, unintended, and/or undesired effect



Occurs at normal human doses for prophylaxis, diagnosis, and/or treatment



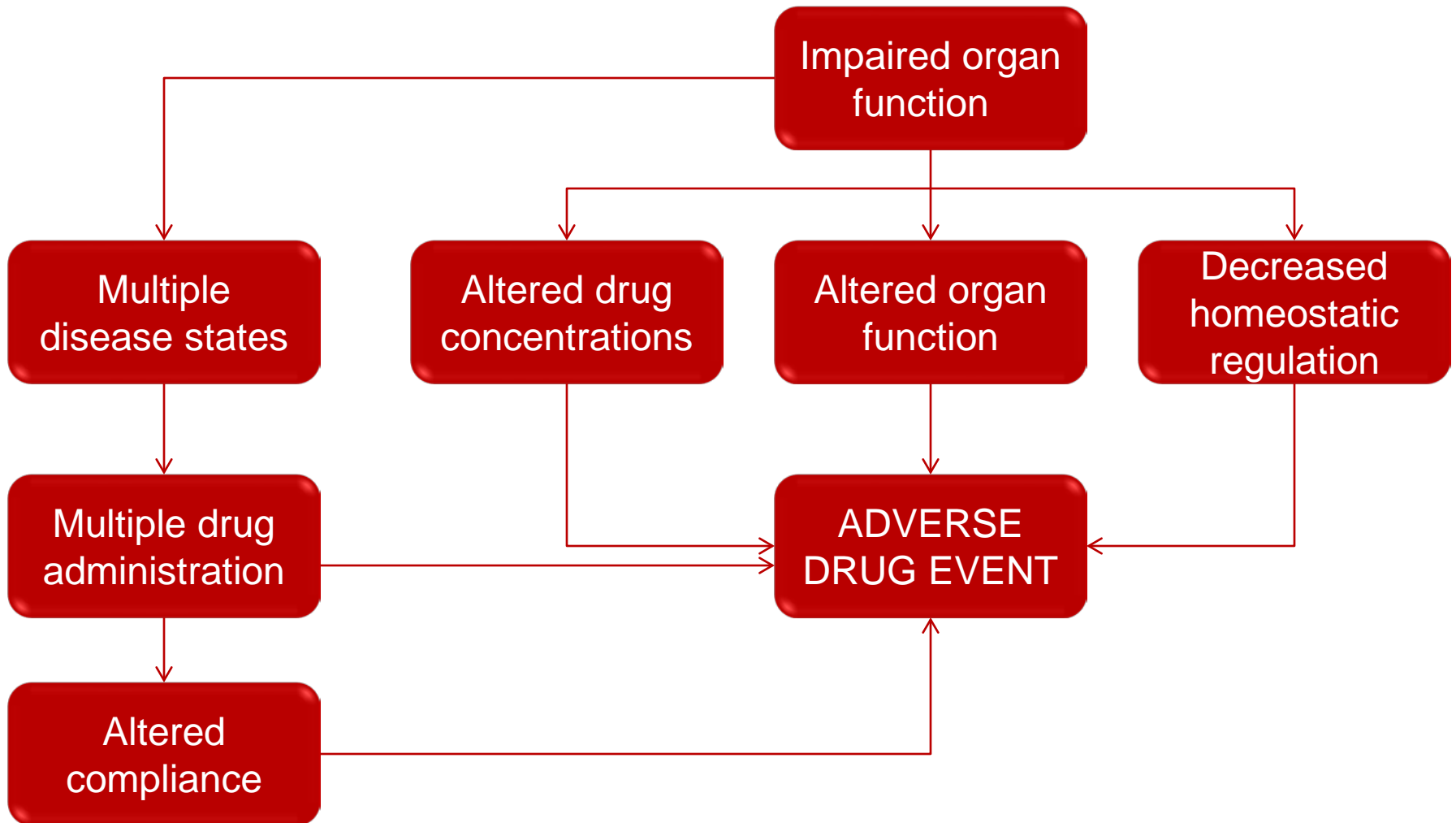
Undesirable, different from therapeutic effect



Functional decline or impairment in mental or physical function

# Adverse Drug Event

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# ADEs Examples

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End organ response	Implicated medication
↑ Risk of bleeding	NSAIDs, ASA, Heparin, Warfarin
Urinary retention	Anticholinergics
Delirium	Antibiotics, Narcotics, BZDs
Constipation	Narcotics, Anticholinergics
CHF, HTN	NSAIDs, BZDs, TZDs
Dizziness, falls	BP meds, BZDs, Anticholinergics

NSAIDs – Non-steroidal anti-inflammatory drugs; ASA – Aspirin;  
BZD – Benzodiazepines; TZD – Thiazolidinediones



# Risk Factors

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- Newly prescribed drugs
- Use of multiple pharmacies
- Multiple medications
- Recent hospitalization/ER visit
- Female gender
- Comorbidity
- Residence in a nursing facility



# Deaths due to ADEs

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- Increase in persons > 55 years old
- Highest risk occurring > 75 years old
- Highest implicated drug classed
  - Anticoagulants
  - Opioids
  - Immunosuppressants



# Adverse Drug Events

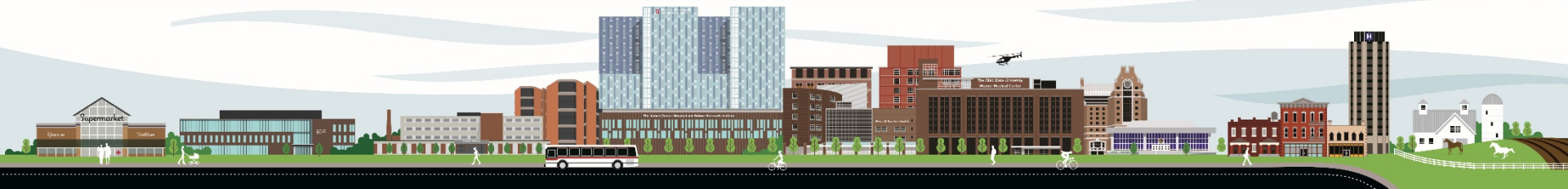
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Reported rates ranging from 2.5% to 50.6% depending on the study population and methodology used

In the nursing home setting, a cost-of-illness study estimated cost of \$4 billion per year

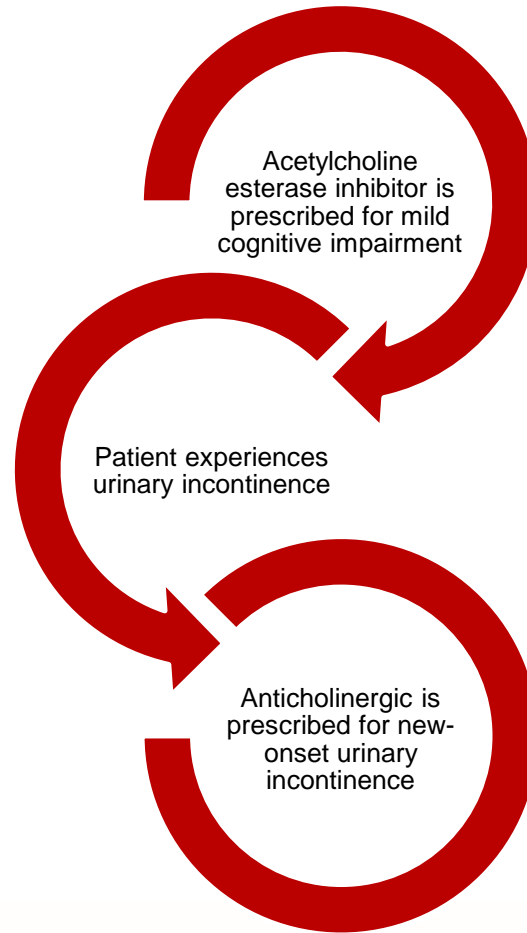
The individual cost of a significant or life-threatening ADE has been estimated to be \$2,852-\$8,116 in community hospitals

Estimated 3 million skilled nursing facility admissions per year



# Prescribing Cascade

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# Strategies to Prevent Polypharmacy

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- Maintain an accurate medication list and medical history and update whenever possible
- Encourage patients to bring all medications, including prescription, OTC, supplements, and herbal preparations
- Review any changes with the patient and caregiver and, if possible, provide all the changes in writing
- Use the fewest possible number of medications and the simplest possible dosing regimen
- Try to link each prescribed medication with its diagnosis
- Discontinue all unnecessary medications
- Screen for drug-drug and drug-disease interactions
- Use a team approach, if possible, involving the caregiver or family and pharmacist
- Avoid starting potentially harmful medications; use Beers Criteria





# Strategies to Prevent Polypharmacy

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- Try to start a new medication at the lowest dose and then titrate slowly
- Avoid starting medications to combat the potential side effects of other medications.
- Exercise careful medication reconciliation during transitions of care, including proper communication handoffs to accepting providers
- Ensuring a close post-discharge follow-up for updating medical history and medications can help prevent medication errors, treatment failures, and rehospitalizations
- Consider goals of care and life expectancy of patients when assessing medication appropriateness
- The polypharmacy does not consider the medications that were reduced in dose but not discontinued
- The integration of STOPP (Screening Tool of Older Person's Prescriptions) & START (Screening Tool to Alert to Right Treatment) for medication review in multi-morbid older people in clinical settings



# AGS Beers Criteria for Potentially Inappropriate Medications

- Evidence-based list of drugs likely to cause problems
- Adopted by many federal agencies and Part D plans
- Revised every 3 years, updated in 2023
- Arranged as drugs and drug classes to avoid, drugs to avoid in certain diseases or conditions, and drugs to be used with caution
- Examples: Anticholinergics, benzodiazepines, sedative-hypnotics, older antipsychotics, certain opiates or pain medications, hypoglycemics, NSAIDs, and GI drugs



# STOPP/START

- Initially published in 2008 w/ updates in 2015 and 2023
- 133 STOPP criteria and 57 START criteria (2023 version)
- STOPP (Screening Tool of Older People's Potentially Inappropriate Prescriptions)
  - Developed to identify potentially inappropriate prescriptions in individuals aged 65 and older
  - STOPP criteria were evaluated against hospital admissions, revealing that one-third of patients with “potentially inappropriate prescriptions” based on STOPP criteria experienced associated adverse drug events
  - The tool helps clinicians recognize medications where risks outweigh benefits in the elderly
- START (Screening Tool to Alert Doctors to Right Treatments)
  - Designed to highlight appropriate and indicated treatments for people aged 65 and above
  - It identifies medications that should be considered when no contraindications exist
  - START complements STOPP by emphasizing the right treatments for older patients
- Highly operator dependent - 5 mins for an expert, up to 20-30 mins



# NO TEARS tool

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- **Need an indication** – The indication and duration for each medication should be reviewed in every visit. The intended treatment duration, appropriate dosing, and other non-pharmacological options should be reviewed.
- **Open questions** – Patients should be asked open-ended questions about medication understanding. These questions should include indications, compliance, any issues with it, including understanding the benefit and side effects.
- **Tests and monitoring** – Patients' conditions based on clinical findings and labs should be assessed.
- **Evidence and guidelines** – Medication appropriateness should be reviewed based on current evidence and guidelines. Any appropriate tests of the disease should be ordered.
- **Adverse events** – Any adverse drug reaction should be noted.
- **Risk reduction or prevention** – Any risks of optimizing medications should be assessed. Any risk for falls, opportunistic infections, or any side effects should be assessed.
- **Simplification and switches** – Medical treatment should be simplified with medication reconciliation and proper transition of care.



# Hyperpharmacotherapy Assessment Tool (HAT)

- 6 goals and help prescribers reduce polypharmacy in long-term care facilities
  1. Monitor the number of medications used
    - Includes OTC, herbal supplements, and vitamins
  2. Decrease inappropriate drug use
    - Assessing the efficacy of the drugs, addressing the treatment goals and disease status, finding effective but lower-cost drugs, and any alternative non-drug therapy
  3. Decrease inappropriate pharmacotherapy
  4. Optimize the dosing regimen
  5. Organize the sources of medicine
  6. Educate the patient about the medications
    - This should be revisited in every patient encounter



# Medication Appropriateness Index

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10 questions to ask about each medication regarding indication, effect, dosing, directions, interactions, duration, and cost

Indication, effectiveness, and correct dosage carry the most weight



# Choosing Wisely criteria

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10 things to question in older adults

7 of the 10 items are drug related

- Antipsychotics in patients with dementia should be avoided
- Target A1<sub>c</sub> in diabetes management is 7.5% or higher
- Avoid benzodiazepines and sedative-hypnotics for insomnia, agitation, or delirium
- Do not initiate antimicrobials for bacteriuria without symptoms
- Assess benefit-risk of cholinesterase inhibitors (CIs)
- Appetite stimulants are not helpful for anorexia or cachexia
- Drug regimen review is necessary with every new prescription



# Non-pharmacologic Interventions

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Requesting large-print instructions from pharmacists

Prescription bottle magnifier

Nonslip bottle cap opener

Pill splitter or crusher

Bottle grip and magnifier

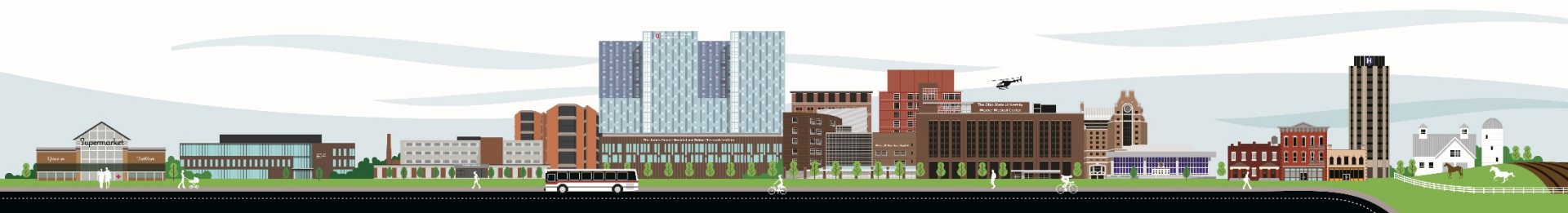
Partitioned weekly or daily box or container

Watches that provide an audio reminder of medication schedules



# When to Deprescribe

- New symptoms due to ADE
- Presence of terminal illness, dementia, or extreme frail with complete dependence for all care
- High-risk medications
- Preventative medications with no clear-cut benefit
  
- Drug discontinuation to improve the QOL should **NOT** be at the expense of making stable chronic conditions unstable



# Barriers to Deprescribing

- Lack of communication among health care workers and specialists
- Patients taking chronic medications may be reluctant to discontinue medications fearing the flare-up of the diseases
- Automatic refills may create confusion in the patients and delay deprescription
- Monitoring and follow-up



# My process

- Medication reconciliation at admission and discharge with progress note in chart
- Update medication list in EMR (variable by institution)
- High risk patients and high risk medications first (AAAs)
  - AAAs – Anticoagulants, antiepileptic medications, antibiotics
- Low-hanging fruit – PPIs/H2RAs, chronic Vitamin D, herbal supplements
- Medications that are prescribed by institution providers



# Optimizing Therapy to Prevent Avoidable Hospital Admissions in Multimorbid Older Adults (OPERAM)

**Objective:** To examine the effect of optimizing drug treatment on drug related hospital admissions in older adults with multimorbidity and polypharmacy admitted to hospital

**Design:** Cluster randomized controlled trial

**Setting:** 110 clusters of inpatient wards within university-based hospitals in four European countries

**Participants:** 2008 older adults ( $\geq 70$  years) with multimorbidity ( $\geq 3$  chronic conditions) and polypharmacy ( $\geq 5$  drugs used long term).

**Intervention:** Clinical staff clusters were randomized to usual care or a structured pharmacotherapy optimization intervention performed at the individual level jointly by a doctor and a pharmacist, with the support of a clinical decision software system deploying the screening tool of older person's prescriptions and screening tool to alert to the right treatment (STOPP/START) criteria to identify potentially inappropriate prescribing.

**Main outcome measure:** Primary outcome was first drug related hospital admission within 12 months

# OPERAM Results

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- 2008 patients randomized (963 in intervention cluster vs 1045 in control)
- 86.1% of participants (n=789) had inappropriate prescribing, with a mean of 2.75 (SD 2.24) STOPP/START recommendations for each participant
- 62.2% (n=491) had  $\geq 1$  recommendation successfully implemented at two months, predominantly discontinuation of potentially inappropriate drugs
- 211 participants (21.9%) experienced a first drug related hospital admission compared with 234 (22.4%) in the control group
- ITT HR for first drug related hospital admission was 0.95 (95% CI 0.77-1.17)
- Per protocol HR for first drug related hospital admission 0.91 (95% CI 0.69-1.19)
- HR for first fall was 0.96 (0.79 to 1.15; 237 v 263 first falls) and for death was 0.90 (0.71 to 1.13; 172 v 203 deaths)
  
- Author's conclusion: Additional efforts are needed to identify pharmacotherapy optimization interventions that reduce inappropriate prescribing and improve patient outcomes

# Future directions

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- Artificial intelligence (AI) to reduce polypharmacy
- Endorsed the use of a multi-disciplinary research team consisting of specialists in AI, medicine, biostatistics, pharmacy, public health, law, and ethics, which can analyze polypharmacy from additional points of view and will contribute to an in-depth understanding of the clinical, social, and ethical issues related polypharmacy and its solution
- HIPPA (Health Insurance Portability and Accountability Act) compliance, data privacy, and ethical challenges need to be addressed before the application of AI in healthcare and polypharmacy
- Clinical decision support in prescribing



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