

# Applying Clinical Pharmacology Principles to Improve Care for the Older Adult

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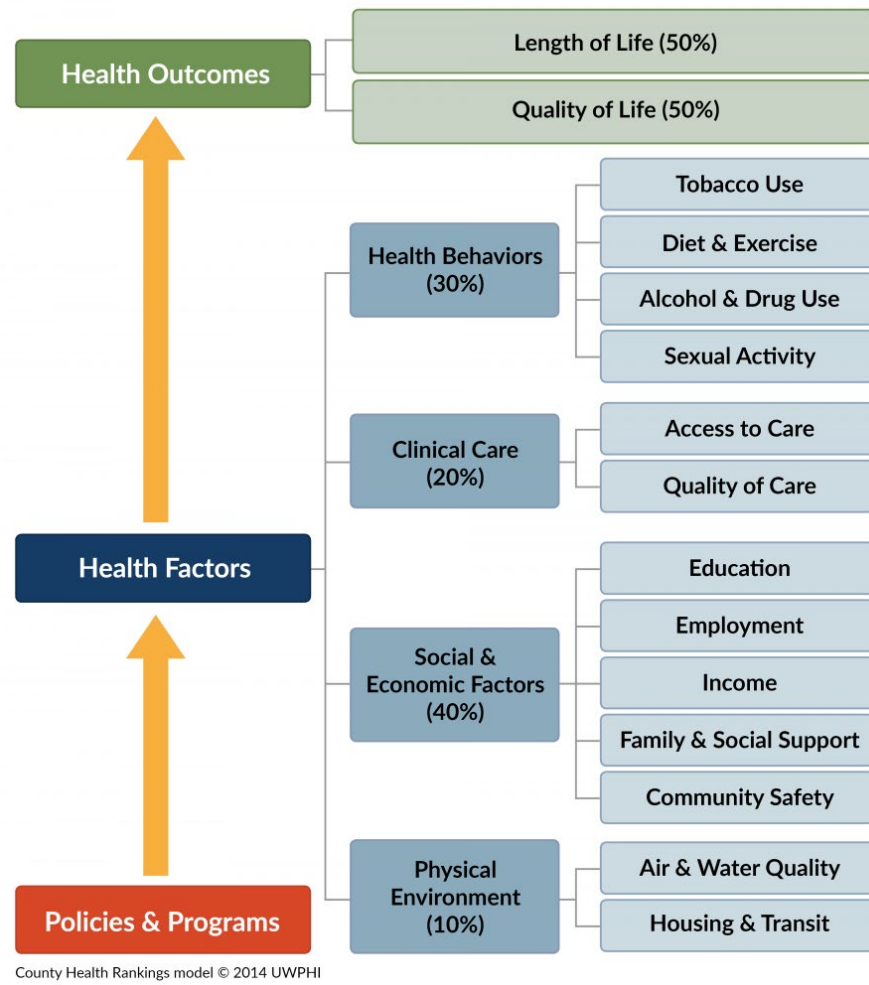
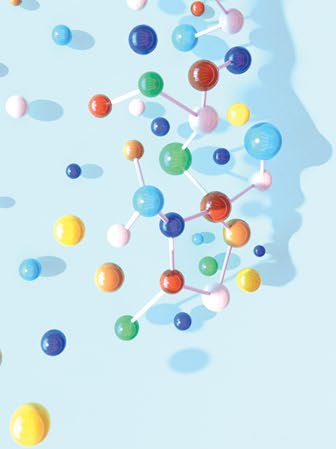
## Learning Objectives

- Describe the role of PK/PD in defining potentially inappropriate medications for older adults
- Consider multimorbidity, aging, frailty, polypharmacy and drug interactions in therapeutic decision making for older adults
- Identify opportunities for improving pharmacotherapy outcomes for older adults, including deprescribing

# My Practice

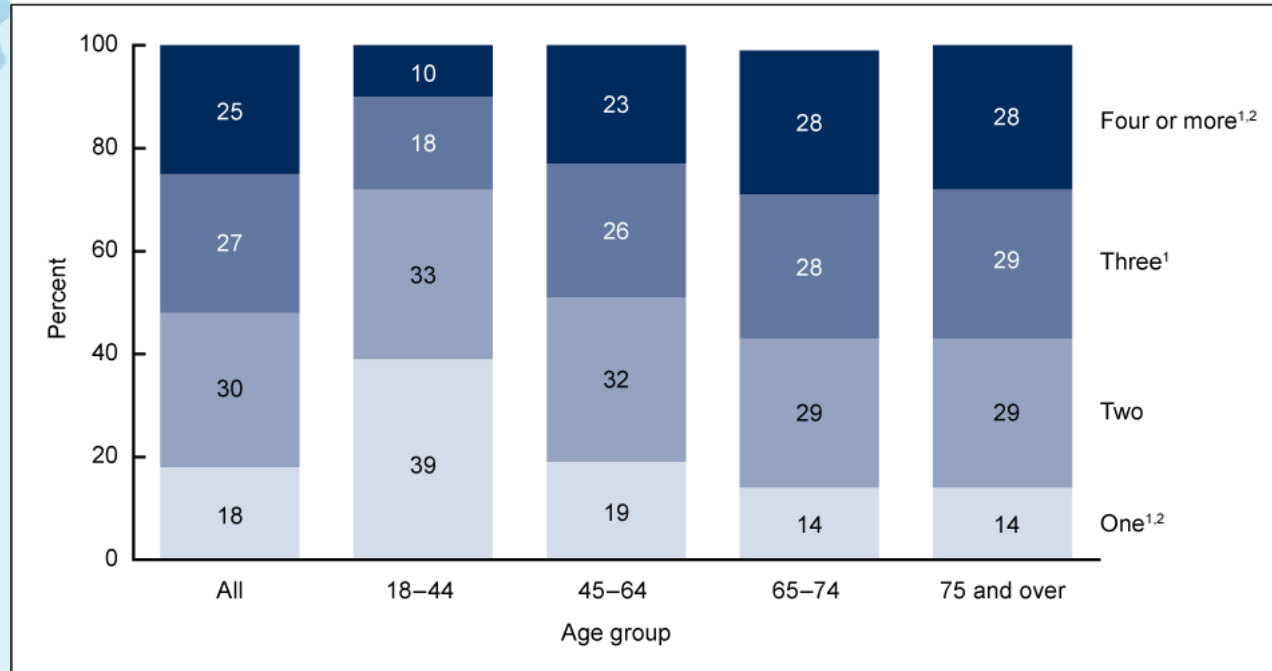
FROM  
MOLECULE TO  
PATIENT





County Health Rankings model © 2014 UWPHI

Figure 4. Percent distribution of number of diagnosed chronic conditions at office-based physician visits for adults with hypertension, by age: United States, 2013

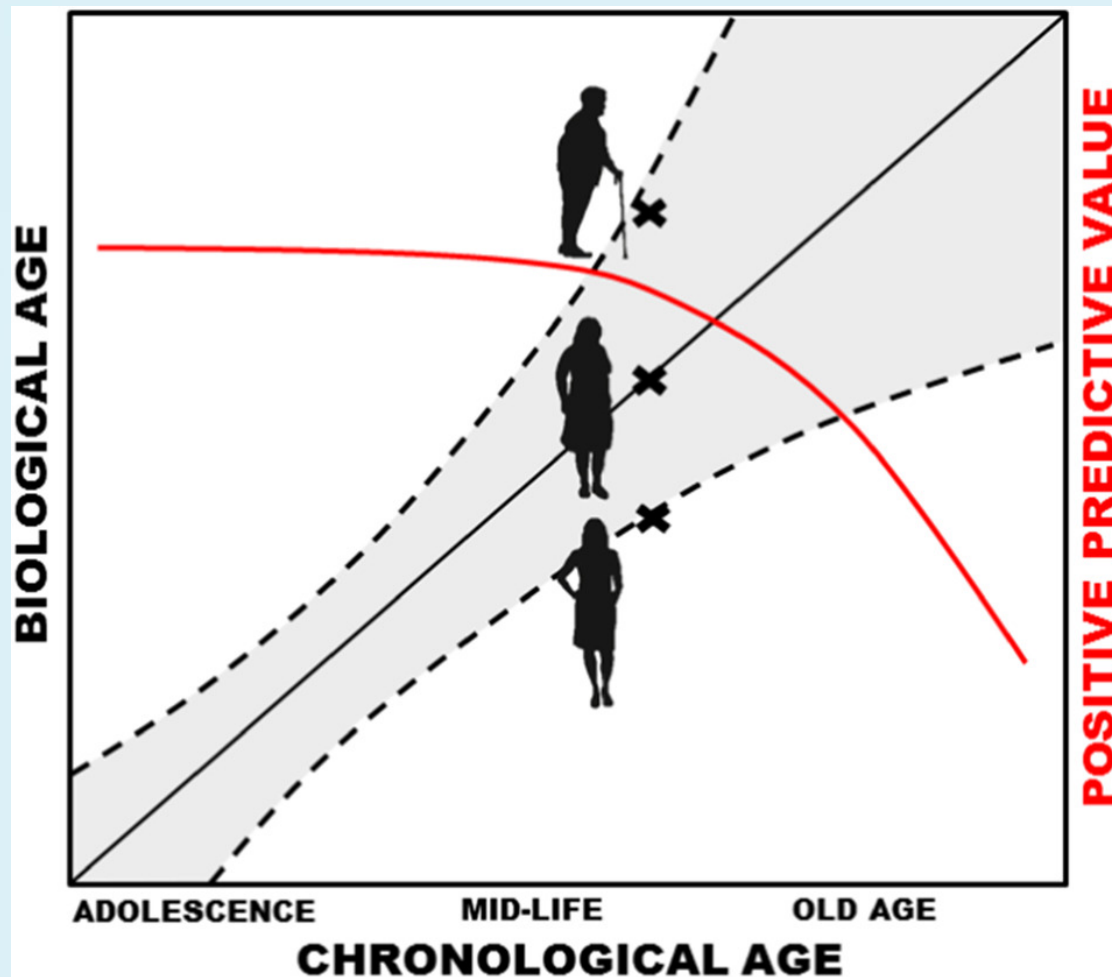
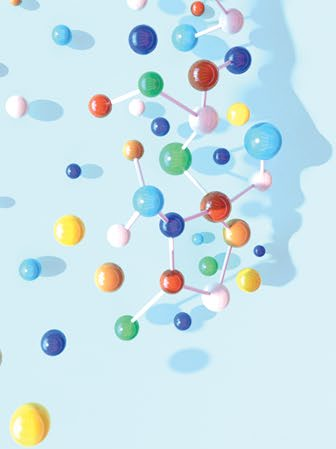


<sup>1</sup>Percentage for those aged 45-64, 65-74, and 75 and over is significantly different from those aged 18-44 ( $p < 0.05$ ).

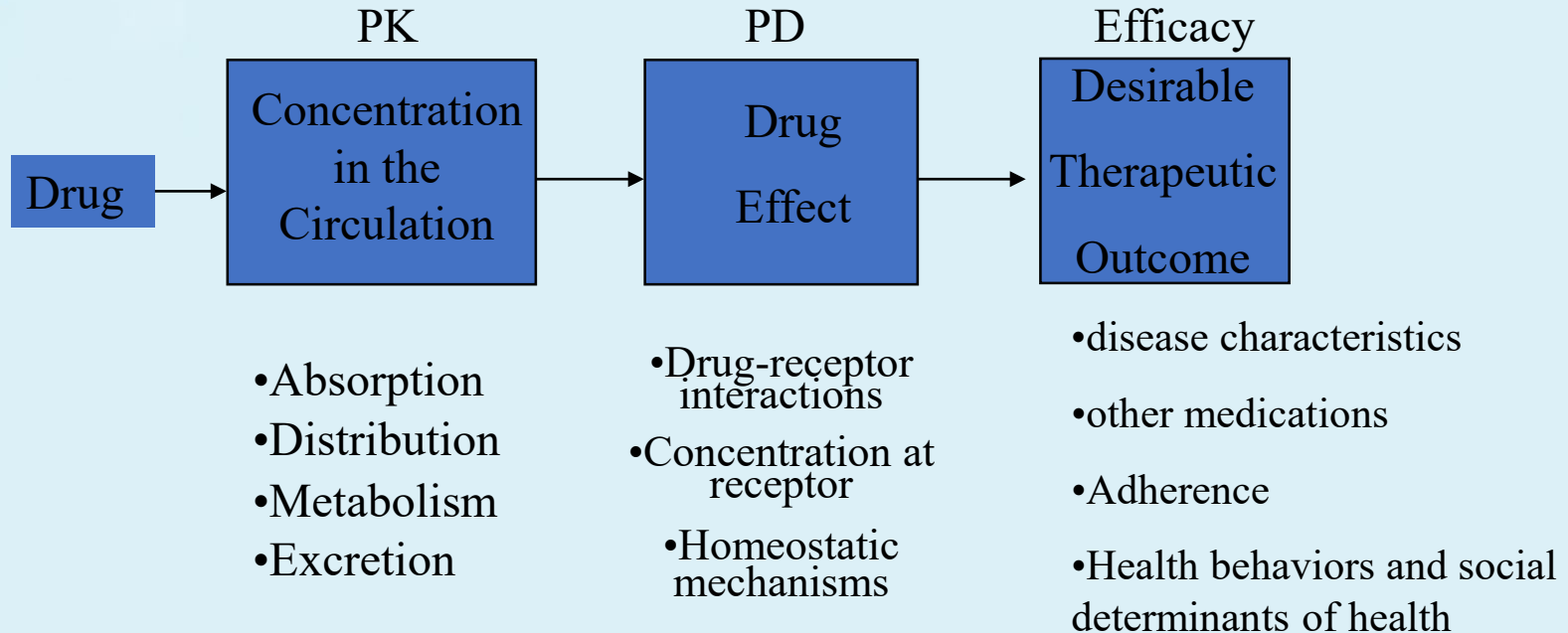
<sup>2</sup>Percentage for those aged 65-74 and 75 and over is significantly different from those aged 45-64 ( $p < 0.05$ ).

NOTES: Estimates may not add to 100 due to rounding. Access data table for Figure 4 at: [http://www.cdc.gov/nchs/data/databriefs/db263\\_table.pdf#4](http://www.cdc.gov/nchs/data/databriefs/db263_table.pdf#4).

SOURCE: NCHS, National Ambulatory Medical Care Survey, 2013.



# Pharmacokinetics, Pharmacodynamics and Aging



# Medications: The Right Balance

"Medications are probably the single most important health care technology in preventing illness and disability in the older population."



"Any symptom in an elderly patient should be considered a drug side effect until proven otherwise."



## A Case Study



- Ms. S is a 78 year-old living independently in a senior affordable housing apartment building.
- Her current diagnoses (self-report) include:
  - Chronic pain (knee and hip)
  - Schizophrenia
  - Hypertension
  - Anxiety
  - Depression
  - GERD
  - Incontinence
- She has a behavioral health case manager and currently sees a pain specialist, a psychiatrist and a primary care provider. She frequently changes providers and visits the ER multiple times per year.

## A Case Study



- She is experiencing difficulty with doing her laundry and preparing meals, and is using a wheelchair to navigate outside of her apartment.
- She is wearing incontinence underwear every day, but is having trouble affording them.
- She is a smoker.
- She has a long history of opioid use for chronic pain. Providers have stopped prescribing them to her in the past, but she changes providers or goes to the ER for new prescriptions. She admits to selling the opioids to purchase food and prescriptions at times and also reports occasional use at higher than the prescribed dose.
- She has a fall and ER visit the evening before her clinic visit.

## A Case Study



Trazodone 50 mg QHS  
Lurasidone 80 mg QHS  
Perphenazine 4 mg BID  
Bupropion 100 mg BID  
Hydroxyzine 50 mg TID  
Losartan 100 mg QD  
Atorvastatin 40 mg QHS  
Aspirin 81 mg QD  
Clonidine 0.2 mg TID  
Hydralazine 50 mg TID  
Omeprazole 40 mg QD

Diclofenac gel as needed  
Gabapentin 800 mg TID  
Acetaminophen/Diphenhydramine  
QHS  
Ibuprofen 800 mg BID—taking as  
many as 5 per day  
Acetaminophen/Oxycodone 325  
mg/7.5 mg: 1 tablet TID  
Linaclotide 290 mcg QD  
Senna OTC 4 tabs as needed



# Kidney Function and Older Adults: Gabapentin

*Age:* The effect of age was studied in subjects 20-80 years of age. Apparent oral clearance (CL/F) of gabapentin decreased as age increased, from about 225 mL/min in those under 30 years of age to about 125 mL/min in those over 70 years of age. Renal clearance (CL<sub>r</sub>) and CL<sub>r</sub> adjusted for body surface area also declined with age; however, the decline in the renal clearance of gabapentin with age can largely be explained by the decline in renal function. Reduction of gabapentin dose may be required in patients who have age related compromised renal function. (See PRECAUTIONS, Geriatric Use, and DOSAGE AND ADMINISTRATION.)

[https://www.accessdata.fda.gov/drugsatfda\\_docs/label/2009/020235s041,020882s028,021129s027lbl.pdf](https://www.accessdata.fda.gov/drugsatfda_docs/label/2009/020235s041,020882s028,021129s027lbl.pdf)

*Table 5 Continued*

<b>Medication Class and Medication</b>	<b>Creatinine Clearance, mL/min, at Which Action Required</b>	<b>Recommendation, Rationale, QE, SR</b>
<i>Central nervous system and analgesics</i>		
Duloxetine	<30	<b>Avoid</b> Increased gastrointestinal adverse effects (nausea, diarrhea) <i>QE = Moderate; SR = Weak</i>
Gabapentin	<60	<b>Reduce dose</b> CNS adverse effects <i>QE = Moderate; SR = Strong</i>

<http://geriatriccareonline.org/ProductAbstract/american-geriatrics-society-updated-beers-criteria-for-potentially-inappropriate-medication-use-in-older-adults/CL001>

# Pharmacodynamic Differences with Aging

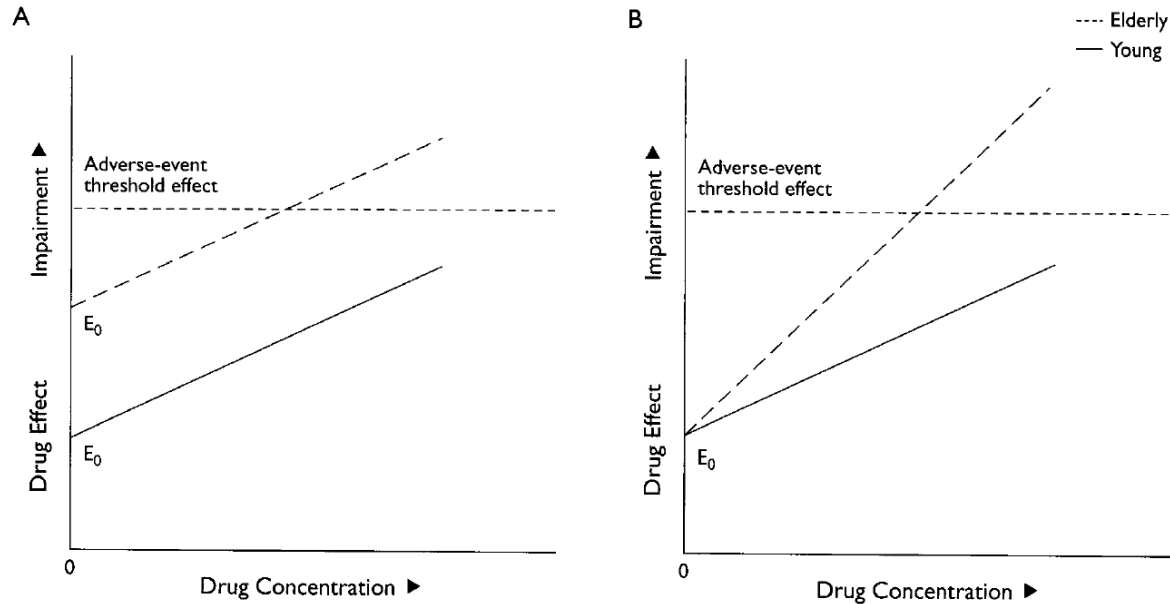


Figure. (A) Baseline and (B) sensitivity differences between young and elderly adults.  $E_0$  = baseline effect before drug administration when drug concentrations are zero.

From THE AMERICAN GERIATRICS SOCIETY

## A POCKET GUIDE TO THE 2019 AGS BEERS CRITERIA®

This guide has been developed as a tool to assist healthcare providers in improving medication safety in older adults. The role of this guide is to *inform* clinical decision-making, research, training, quality measures and regulations concerning the prescribing of medications for older adults to improve safety and quality of care. It is based on *The 2019 AGS Beers Criteria® for Potentially Inappropriate Medication Use in Older Adults*.

Originally conceived of in 1991 by the late Mark Beers, MD, a geriatrician, the Beers Criteria catalogues medications that cause side effects in the elderly due to the physiologic changes of aging. In 2011, the AGS sponsored its first update of the criteria, assembling a team of experts and using an enhanced, evidence-based methodology. Since 2011, the AGS has been the steward of the criteria and has produced updates using an evidence-based methodology and rating each Criterion (quality of evidence and strength of evidence) using the American College of Physicians' Guideline Grading System, which is based on the GRADE scheme developed by Guyatt et al.

The full document, along with accompanying resources can be found in their entirety online at [geriatricscareonline.org](http://geriatricscareonline.org).

### INTENDED USE

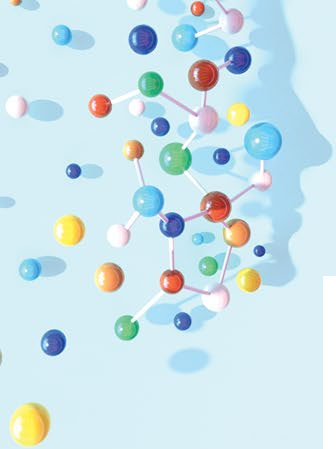
The goal of this guide is to improve care of older adults by reducing their exposure to Potentially Inappropriate Medications (PIMS).

- This should be viewed as a guideline for identifying medications for which the risks of their use in older adults outweigh the benefits.
- These criteria are not meant to be applied in a punitive manner.
- This list is not meant to supersede clinical judgment or an individual patient's values and needs. Prescribing and managing disease conditions should be individualized and involve shared decision-making.
- These criteria also underscore the importance of using a team approach to prescribing and the use of non-pharmacological approaches and of having economic and organizational incentives for this type of model.
- A companion piece that addresses the best way for patients, providers, and health systems to use (and not use) the AGS Beers Criteria® was also developed. The

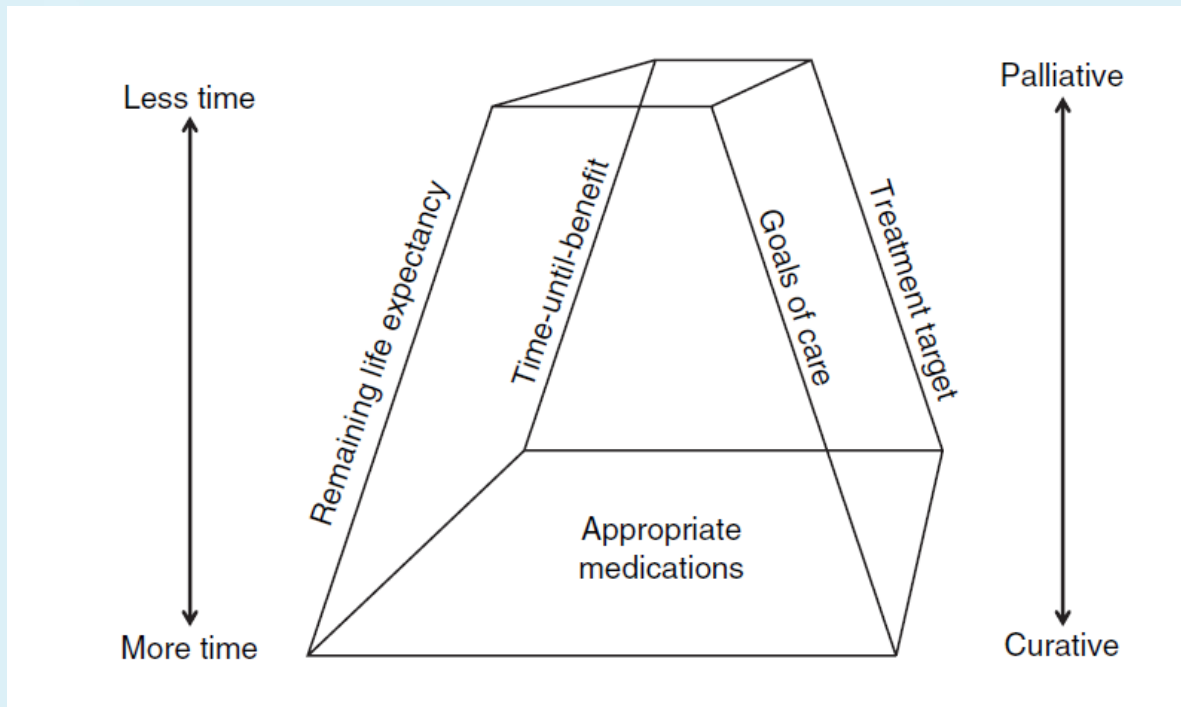
**TABLE 1.** 2019 American Geriatrics Society Beers Criteria® for Potentially Inappropriate Medication Use in Older Adults

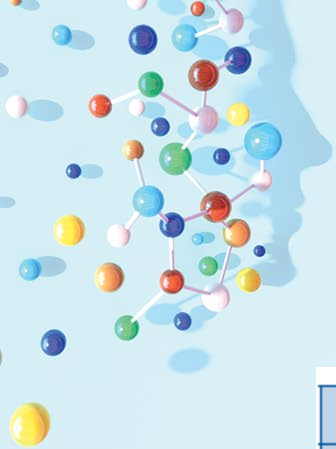
Organ System, Therapeutic Category, Drug(s)	Recommendation, Rationale, Quality of Evidence (QE), Strength of Recommendation (SR)
<b>Anticholinergics *</b>	
First-generation antihistamines:	<b>Avoid</b>
■ Brompheniramine	Highly anticholinergic; clearance reduced with advanced age, and tolerance develops when used as hypnotic; risk of confusion, dry mouth, constipation, and other anticholinergic effects or toxicity
■ Carbinroxamine	
■ Chlorpheniramine	
■ Clemastine	
■ Cyproheptadine	
■ Dexbrompheniramine	Use of diphenhydramine in situations such as acute treatment of severe allergic reaction may be appropriate
■ Dexchlorpheniramine	QE = Moderate; SR = Strong
■ Dimenhydrinate	
■ Diphenhydramine (oral)	
■ Doxylamine	
■ Hydroxyzine	
■ Meclizine	
■ Promethazine	
■ Pyrilamine	
■ Triprolidine	
<b>Antiparkinsonian agents</b>	
■ Benztropine (oral)	<b>Avoid</b>
■ Trihexyphenidyl	Not recommended for prevention of extrapyramidal symptoms with antipsychotics; more effective agents available for treatment of Parkinson disease
	QE = Moderate; SR = Strong
<b>Antispasmodics:</b>	
■ Atropine (excludes ophthalmic)	<b>Avoid</b>
■ Belladonna alkaloids	Highly anticholinergic, uncertain effectiveness
■ Clidinium-	QE = Moderate; SR = Strong
Chlordiazepoxide	
■ Dicyclomine	
■ Homatropine (excludes ophthalmic)	
■ Hyoscyamine	
■ Methscopolamine	
■ Propantheline	
■ Scopolamine	

<http://geriatricscareonline.org/ProductAbstract/american-geriatrics-society-updated-beers-criteria-for-potentially-inappropriate-medication-use-in-older-adults/CL001>



# Prescribing Decisions in Patients with Reduced Life Expectancy





# Guiding Principles for the Care of Older Adults with Multimorbidity

<b>Guiding Principle II: Interpreting the Evidence Domain</b>	
Recognizing the limitations of the evidence base, interpret and apply the medical literature specifically to older adults with multimorbidity.	
How to Use in Clinical Practice	
<b>Goal</b>	<b>Implementation Strategies &amp; Resources</b>
Consider certain key principles in evaluating clinical evidence.	Consider: <ul style="list-style-type: none"><li>• Applicability and quality of evidence;</li><li>• Outcomes;</li><li>• Harms and burdens;</li><li>• Absolute risk reduction;</li><li>• Time horizon to benefit.</li></ul>



# Guiding Principles for the Care of Older Adults with Multimorbidity

## Guiding Principle V: Optimizing Therapies and Care Plans Domain

Frame clinical management decisions within the context of risks, burdens, benefits, and prognosis (e.g., remaining life expectancy, functional status, quality of life) for older adults with multimorbidity.

### How to Use in Clinical Practice

Goal	Tools, Resources, Strategies
<p>Identify interventions that should not be initiated or should be stopped. Identify interventions that should be started.</p>	<ul style="list-style-type: none"> <li>• Factors to consider include:               <ol style="list-style-type: none"> <li>1. Likelihood of benefit in terms of altering the person's baseline risk for the particular outcome;</li> <li>2. Risk of harm;</li> <li>3. Difference between the time horizon to benefit and the patient's likely remaining life expectancy (prognosis).</li> </ol> </li> </ul>

## What Do We Need to Support Better Prescribing? A Call to Action

- Biomarkers of “physiological age”
- Evidence for likelihood of benefit and/or harm
- Evidence for time until benefit and/or time until harm
- Evidence for understanding treatment interactions
- Evidence to optimize dosing in multimorbidity
- Evidence to support optimal deprescribing
  - [Deprescribing.org](https://www.deprescribing.org)