Medication Review: Ways to help the older adults you work with

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Purpose

- The purpose of this program is to provide a basic understanding of changes in the aging body that may relate to medication effects and discuss various assessment tools to aid in the evaluation of medications in the older population.

Objectives

- Explain age-related changes in the body that relate to **medication effects**
- Summarize American Geriatric Society's 2015 updated **BEERs Criteria**
- List and describe other assessment tools including the **Anticholinergic Brochure** and **Steadi Toolkit**

Fun Facts & Stats

- Average life expectancy was 49.2 years at the turn of the 20th century….as of 2013, it is 78.8 years
- Maine is the eldest state in the nation
- More than 1/3 of elderly patients are on 5-9 medications and 1/8 are on >10 (polypharmacy)
- The use of inappropriate medications accounts for $7.2 billion in healthcare expenditures annually

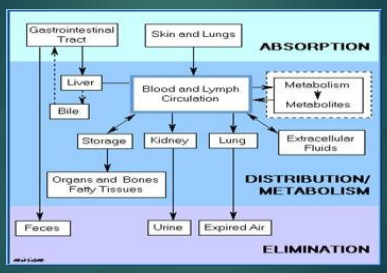
Lee JK, Slack MK, Martin J, et al. Geriatric Patient Care by U.S. Pharmacists in Healthcare Teams: Systemic Review and Meta-analysis. JAGS 2013; 61: 1119-1127.
The Associated Press "Maine is the nation's oldest state-and getting older" The Portland Press Herald June 2013

Pharmacokinetics

- Definition
  - How the body processes a specific drug after its administration
  - What the "body does to the drug"
  - Absorption
  - Distribution
  - Metabolism
  - Excretion

ADME

ADME



Drug Absorption

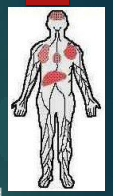
- **Oral** medications are absorbed in the gastrointestinal **(GI) tract**
- Many factors are involved for a medication to enter the blood stream after oral administration
- Most medications need to be **absorbed** into the blood stream and **delivered** to their site of action
- Absorption

Absorption in the Older Adult

Physiologic changes	Effect on drug absorption
↓ Gastric secretion, ↑ (pH)	reduced
↓ Gastric motility	increased
↓ Gastric blood flow	reduced
↓ First pass metabolism	increased

Wooten JM. South Med J. 2012; 105(8): 437-445

Distribution



- Where the drug goes after it enters the bloodstream
- Volume of distribution
  - Small-remains mostly in the blood without much distribution to the central nervous system (CNS) or other body fluids
  - Large-widely distributed into tissues, body fluids and CNS (crosses blood brain barrier)
- Influencing factors
  - Protein binding, pH, molecular size and water/lipid solubility
- Distribution

Wooten JM. Pharmacotherapy Considerations in Elderly Adults. South Med J. 2012; 105(8): 437-445

Drug Distribution in the Older Adult

- ↓ muscle mass
- Increase % fat ➡ lipophilic drugs will have larger distribution (sticks around longer)
- Decrease total body water ➡ drug with low volume of distribution will have higher concentration
- Normal doses in younger patients could be **toxic** in the older adult

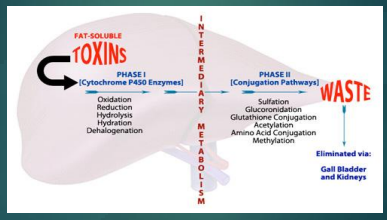
Wooten JM. South Med J. 2012; 105(8): 437-445

Metabolism

- **Liver** is organ mostly responsible for metabolism
  - Turning a drug into a form more easily eliminated by the body
- Liver utilizes various types of reactions
  - Oxidation, reduction, hydrolysis, CYP450 (phase I)
  - Conjugation
- **Hepatic blood flow decreased** in elderly
  - Large decrease in phase 1 metabolism

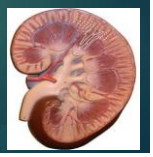
Wooten JM. South Med J. 2012; 105(8): 437-445

Metabolism



Excretion

- Elimination of drugs from the body
- Primarily via **kidney** (renal)
- By age 75-80, a person's **renal function has declined** by ~50% of previous function
  - ~1ml/min/1.73m2/year after age 30-35
- Excretion



Wooten JM. South Med J. 2012; 105(8) 437-445

Pharmacodynamics

- Definition: how the drug affects the body
- Changes in older adult can cause increase OR decrease sensitivity to certain drugs
  - Leads to increase adverse reactions
    - Dizziness, altered mental status, falls
- Certain medication classes may have more toxic effects in the elderly
  - Anticholinergics, antipsychotics, antihypertensives, sedatives, anticoagulants, etc

Wooten JM. South Med J. 2012; 105(8): 437-445.
Mangoni AA. Br J Clin Pharmacol 2003; 57(1): 6-14

Potentially Inappropriate Medications

- There are some medications classes that could have an increase side effect impact in the older adult

anticholinergics → confusion → delirium

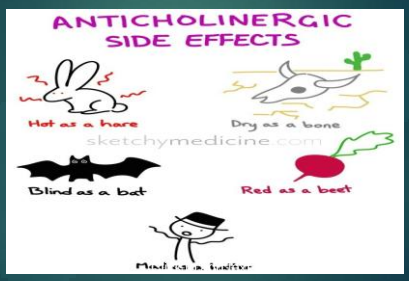
antihypertensives → Orthostatic hypotension → falls

Anticholinergics

- Medications with anticholinergic side effects include:
  - Antihistamines: diphenhydramine, loratadine*
  - Tricyclic antidepressants (TCAs): amitriptyline, nortriptyline*
  - Antipsychotics: clozapine, olanzapine, chlorpromazine
  - Paroxetine (SSRI with most)
  - Muscle relaxants: cyclobenzaprine
  - And many more!!!

*safer alternative in class

Anticholinergic Side Effects



Feinberg M. Drugs Aging. 1993; 3(4): 335-348

Anticholinergic Side Effects

- Side effects:
  - Urinary retention/constipation
  - Dry mouth
  - Confusion
  - Blurred vision
  - Increased heart rate

Antipsychotics

- Typical: haloperidol, perphenazine, chlorpromazine, etc
- Atypical (new)*: olanzapine, risperidone, ziprasidone, etc.
- Side effects:
  - Orthostatic hypotension, anticholinergic activity, cardiac conduction disturbances, sedation, cognitive slowing
- For agitation and delirium, use should only occur when non-pharmacologic treatments have failed!

Wooten JM. South Med J. 2012; 105(8): 437-445.
JAGS 2015; 63: 2227-2246

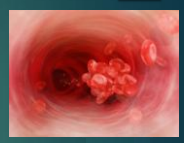
Sedatives

- Benzodiazepines
  - Diazepam, clonazepam, temazepam, alprazolam, lorazepam, chlordiazepoxide
  - Lorazepam, oxazepam, temazepam are preferable if a benzo is needed but all can be harmful
  - Must NOT be stopped "cold turkey"
- "Z" drugs
  - Zolpidem (Ambien), zaleplon (Sonata), eszopiclone (Lunesta)
- May cause dizziness, amnesia, drowsiness

Anti-hypertensives

- Many people need to be on a blood pressure medication
- Not all are equal in adverse effects--->some cause more orthostatic hypotension than others
  - Alpha blockers: terazosin, doxazosin
  - Clonidine
  - hydralazine

Anticoagulants



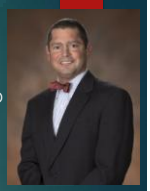
- Heparin, enoxaparin (Lovenox)
- Warfarin (Coumadin)
- NOACs (novel oral anticoagulants)
  - Dabigatran (Pradaxa)
  - Rivaroxaban (Xarelto)
  - Apixaban (Eliquis)
  - Edoxaban (Savaysa)
    - Renally cleared, drug-drug interactions, increased bleeding risk
    - **NON-REVERSIBLE!!!** (exception: dabigatran)

Assessing Appropriateness

- Many of these medications are indicated and necessary
- Need to balance risk/benefit

- Many tools to help assess these risks in the older adult
  - BEERS
  - Iowa Cert
  - STEADI toolkit

Mark H Beers, MD (1954-2009)



- 1982-graduated from University of VT with MD
- Geriatric fellowship, Harvard University
- Co-editor, Merck Manual of Geriatrics
- Faculty @UCLA
- Beers led a team from Harvard University that studied 850 residents of Boston-area nursing homes, looking at their medication history. This research found that many had symptoms of mental confusion and tremors that were caused by antidepressants, antipsychotics and sedatives/ This research was published in JAMA in 1988.

Beers Criteria

- What is Beers criteria?
  - Tool for clinical care and quality improvement
  - Serves as a "warning light" to ID medications that may have unfavorable balance of benefits and harms in older adults
  - Originally conceived by the late Dr. Beers
  - Now updated by the American Geriatric Society
  - Not for use in patients in hospice or palliative care

JAGS 2015; 63: 2227-2246

2015 Beers Criteria Update

- Last update 2012 (became evidence based)
  - Includes list of PIMS (potentially inappropriate medications)
- New additions with 2015 update
  - Lists of select drugs that should be avoided
  - Drugs to be modified based on renal function
  - Select drug-drug interactions associated with harm in older adults
  - Alternative medication lists

JAGS 2015; 63: 2227-2246

BEERS Criteria

GeriatricsCareOnline.org accessed 4/25/16

Example

AGS Beers Criteria for Potentially Inappropriate Medication Use in Older Adults

Drugs and Categories of Drugs	Why these drugs may be inappropriate for older adults	Recommendations
Anticholinergic drugs—these drugs can cause side effects such as confusion, hallucinations, sleepiness, blurred vision, difficulty urinating, dry mouth and constipation in older adults.		
Antihistamines—drugs that are typically prescribed for allergies, hives and eczema: • Brompheniramine • Carbinoxamine • Chlorpheniramine • Clemastine • Cyproheptadine • Dexbrompheniramine • Dexchlorpheniramine • Diphenhydramine (oral) • Doxylamine	These drugs cause many side effects in older adults, including confusion, drowsiness, blurred vision, difficulty urinating, dry mouth and constipation. Safer medications are available.	Avoid Use of diphenhydramine in special situations—such as for treating severe allergic reactions—may be appropriate.

JAGS 2015; 63: 2227-2246

Example

Table 3. 2012 AGS Beers Criteria for Potentially Inappropriate Medication Use in Older Adults Due to Drug–Disease or Drug-Syndrome Interactions That May Exacerbate the Disease or Syndrome

Disease or Syndrome	Drug(s)	Rationale	Recommendation	Quality of Evidence	Strength of Recommendation	References
Cardiovascular						
Heart failure	NSAIDs and COX-2 inhibitors Nondihydropyridine CCBs (avoid only for systolic heart failure) • Diltiazem • Verapamil Pioglitazone, rosiglitazone Cilostazol Dronedarone	Potential to promote fluid retention and/or exacerbate heart failure.	Avoid	NSAIDs: moderate; CCBs: moderate; Thiazolidinediones (glitazones): high; Cilostazol: low; Dronedarone: moderate	Strong	Cilostazol Package Insert Connolly 2011 Dronedarone Package Insert – revised Dec2011 Heerdink 1998 Goldstein 1991 Jessup 2009 Korber 2009 Lake 2011 Pioglitazone Package Insert Rosiglitazone Package Insert Bordier 2005
Syncope	Acetylcholinesterase	Increases risk of	Avoid	AChEIs	AChEIs	

Example-DDI

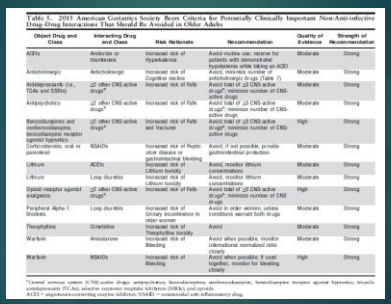


Table 5. 2015 American Geriatrics Society Beers Criteria for Potentially Clinically Important Non-Anti-infective Drug-Drug Interactions That Should Be Avoided in Older Adults

Object Drug and Class	Interacting Drug and Class	Risk Rationale	Recommendation	Quality of Evidence	Strength of Recommendation
ACEIs	Amiloride or triamterene	Increased risk of Hyperkalemia	Avoid routine use; reserve for patients with demonstrated hypokalemia while taking an ACEI	Moderate	Strong
Anticholinergics	Anticholinergic	Increased risk of Cognitive decline	Avoid; minimize number of anticholinergic drugs (Table 7)	Moderate	Strong
Antidepressants (i.e., TCAs and SSRIs)	☑ other CNS-active drugs*	Increased risk of Falls	Avoid total of ☑ CNS-active drugs*; minimize number of CNS-active drugs	Moderate	Strong
Antipsychotics	☑ other CNS-active drugs*	Increased risk of Falls	Avoid total of ☑ CNS-active drugs*; minimize number of CNS-active drugs	Moderate	Strong
Benzodiazepines and nonbenzodiazepine, benzodiazepine receptor agonist hypnotics	☑ other CNS-active drugs*	Increased risk of Falls and fractures	Avoid total of ☑ CNS-active drugs*; minimize number of CNS-active drugs	High	Strong
Corticosteroids, oral or parenteral	NSAIDs	Increased risk of Peptic ulcer disease or gastrointestinal bleeding	Avoid, if not possible, provide gastroprotective protection	Moderate	Strong
Lithium	ACEIs	Increased risk of Lithium toxicity	Avoid; monitor lithium concentrations	Moderate	Strong
Lithium	Loop diuretics	Increased risk of Lithium toxicity	Avoid, monitor lithium concentrations	Moderate	Strong
Opioid receptor agonist analgesics	☑ other CNS-active drugs*	Increased risk of Falls	Avoid total of ☑ CNS-active drugs*; minimize number of CNS drugs	High	Strong
Peripheral Alpha-1 blockers	Loop diuretics	Increased risk of Urinary incontinence in older women	Avoid in older women, unless conditions warrant both drugs	Moderate	Strong
Theophylline	Cimetidine	Increased risk of Theophylline toxicity	Avoid	Moderate	Strong
Warfarin	Amiodarone	Increased risk of Bleeding	Avoid when possible; monitor international normalized ratio closely	Moderate	Strong
Warfarin	NSAIDs	Increased risk of Bleeding	Avoid when possible; if used together, monitor for bleeding closely	High	Strong

*Central nervous system (CNS)–active drugs: antipsychotics, benzodiazepines, nonbenzodiazepine, benzodiazepine receptor agonist hypnotics, tricyclic antidepressants (TCAs), selective serotonin reuptake inhibitors (SSRIs), and opioids.
ACEI = angiotensin-converting enzyme inhibitor; NSAID = nonsteroidal anti-inflammatory drug.

Example-renal dosing

Table 6. 2015 American Geriatrics Society Beers Criteria for Non-Anti-Infective Medications That Should Be Avoided or Have Their Dosage Reduced with Varying Levels of Kidney Function in Older Adults

Medication Class and Medication	Creatinine Clearance, mL/min, at Which Action Required	Rationale	Recommendation	Quality of Evidence	Strength of Recommendation
Cardiovascular or hemostasis					
Amiloride	<30	Increased potassium, and decreased sodium	Avoid	Moderate	Strong
Apixaban	<25	Increased risk of bleeding	Avoid	Moderate	Strong
Dabigatran	<30	Increased risk of bleeding	Avoid	Moderate	Strong
Edoxaban	30–50	Increased risk of bleeding	Reduce dose	Moderate	Strong
	<30 or >95		Avoid		
Enoxaparin	<30	Increased risk of bleeding	Reduce dose	Moderate	Strong
Fondaparinux	<30	Increased risk of bleeding	Avoid	Moderate	Strong
Rivaroxaban	30–50	Increased risk of bleeding	Reduce dose	Moderate	Strong
	<30		Avoid		
Spironolactone	<30	Increased potassium	Avoid	Moderate	Strong
Triamterene	<30	Increased potassium, and decreased sodium	Avoid	Moderate	Strong

Alternative List

Table 1. Alternatives for Medications Included in the High-Risk Medications in the Elderly Measure

Therapeutic Class	High-Risk Medications	Alternatives	References (Appendix 1)
Anticholinergic:			
First-generation antihistamine	Brompheniramine Carbinoxamine Chlorpheniramine Cyproheptadine Dexbrompheniramine Dexchlorpheniramine Diphenhydramine (oral) Doxylamine Hydroxyzine Promethazine Trimeprazine Trimprazine	Intranasal normal saline Second-generation antihistamine (e.g., cetirizine, fexofenadine, loratadine) Intranasal steroid (e.g., beclomethasone, fluticasone, over the counter)	41–46
Parkinson disease	Benztropine (oral) Trihexyphenidyl	Carbidopa/levodopa	14–17
Antiplatelets	Dipyridamole (oral immediate release) Ticlopidine	Antithrombotic therapy for the secondary prevention of noncardioembolic stroke Clopidogrel, aspirin 25 mg with extended-release dipyridamole	47

Alternative Medications for Medications in the Use of High-Risk Medications. JAGS 2015.

How do I use Beers Criteria?

- Valuable tool but use caution not to misinterpret and implement in ways that cause harm
- There are situations when the drugs listed in Beers ARE appropriate
- The AGS convened to develop 7 principles to guide the optimal use of 2015 Beers Criteria

GeriatricsCareOnline.org
Complex Care. Access to Resources Simplified.

How to Use the AGS 2015 Beers Criteria. JAGS 2015

7 Guiding Principles

1. Meds in Beers Criteria are *potentially* inappropriate, not definitely
2. Read the rationale and recommendations for each criterion
3. Understand why meds are included in the list
4. Identify PIMS and offer safer non-pharm and pharm options when appropriate
5. Starting point for comprehensive process of identifying and improving med safety
6. Access to meds on list shouldn't be restricted by PA
7. Not equally applicable to all countries

How to Use the AGS 2015 Beers Criteria. JAGS 2015.

Role of Healthcare workers other than MD or PharmD

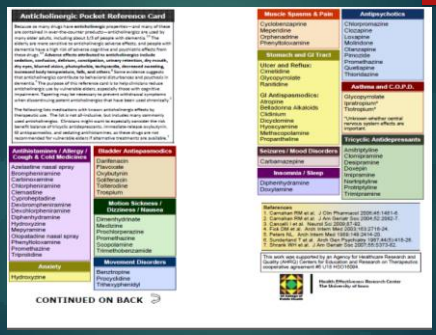
- Nurses often see and assess for medication problems in the home, hospital and long-term care settings
- PT/OT being aware of meds that cause orthostatic hypotension
- May often help in decision to give or not give as needed meds
- Important partners in identifying, addressing, and educating people about potential problems
- Start a conversation with provider if suspect patient is experiencing an adverse effect from a medication on the list

Iowa CERT

- Iowa CERT is a multidisciplinary center comprised of researchers within the University of Iowa Colleges of Public Health, Medicine, Pharmacy and Nursing, and the Veteran's Administration Medical Center
- Their goals include research and dissemination of information and clinical tools to patients and providers
- Anticholinergic reference card
  - Designed for clinician use to decrease anticholinergic burden on vulnerable elders
- Anticholinergic brochure/managing your medications guide
  - Designed for patients regarding anticholinergics

University of Iowa College of Public Health

Anticholinergic Reference Card

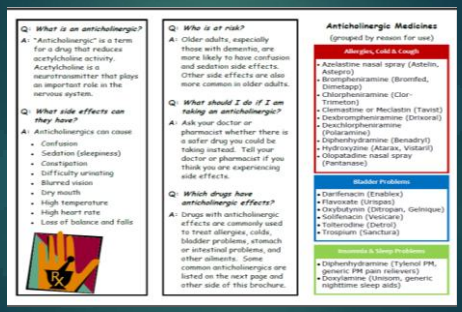


University of Iowa College of Public Health

Anticholinergic Brochure

University of Iowa College of Public Health

Anticholinergic Brochure



University of Iowa College of Public Health

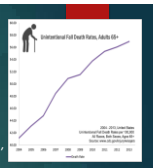
STEADI Toolkit

STEADI-Stopping Elderly Accidents, Deaths, & Injuries

- Toolkit designed by CDC for healthcare practitioners who care for older adults at risk for fall or who have fallen in the past
- The toolkit contains:
  - Case studies
  - Info about falls
  - Conversation starters
  - Standardized gait and balance assessment tests
  - Educational handouts for patients and family members

www.cdc.gov/steadi
Accessed 4/28/16

Fall Facts



- 1/5 falls results in serious injury (broken bones, head injury)
- 2.5 million/yr treated in ED for fall injuries
- >700,000 pts/yr are hospitalized due to fall injuries
- >95% hip fractures are due to falls
- Falls are the most common cause of TBI (traumatic brain injury)
- Direct medical costs from falls=$34 billion annually

www.cdc.gov/steadi
Accessed 4/28/16

Conditions Contributing to Falls

- Lower body weakness
- ? Vitamin D deficiency (controversial)
- Difficulties with walking and balance
- Use of certain medications such as sedatives, anticholinergics, and some OTC medications
- Vision problems
- Poor footwear or foot pain
- Some hazards such as no handrails, broken steps, throw rugs

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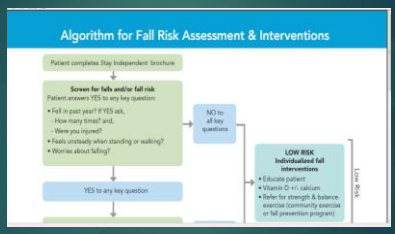
Accessed 4/28/16

STEADI Toolkit



www.cdc.gov/steadi
Accessed 4/28/16

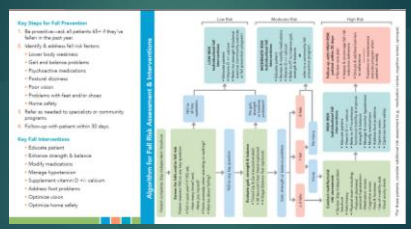
STEADI Toolkit

www.cdc.gov/steadi
Accessed 4/28/16

Provider Pocket Guide

www.cdc.gov/steadi
Accessed 4/28/16

Provider Pocket Guide (2/2)



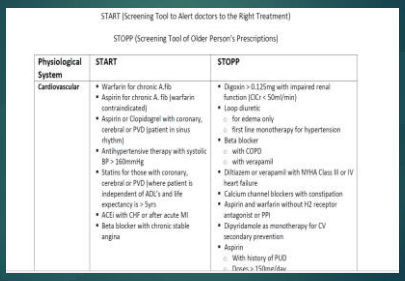
www.cdc.gov/steadi
Accessed 4/28/16

STOPP/START

- Originally conceived in 2008 and updated in 2014 by experts across Europe
- Aim to validate screening tool for older persons' prescriptions
- Screening Tool for Older Persons' Prescriptions (STOPP)
  - Identifies PIMS
- Screening Tool to Alert doctors to Right Treatment (START)
  - Identifies potentially indicated medications not prescribed

Int J Clin Pharmacol Ther. 2008 Feb; 46(2): 72-83
Age and Ageing 2014; 0: 1-6

STOPP/START



START (Screening Tool to Alert doctors to the Right Treatment)

STOPP (Screening Tool of Older Person's Prescriptions)

Physiological System	START	STOPP
Cardiovascular	• Warfarin for chronic A.fib • Aspirin for chronic A. fib (warfarin contraindicated) • Aspirin or Clopidogrel with coronary, cerebral or PVD (patient in sinus rhythm) • Antihypertensive therapy with systolic BP > 160mmHg • Statins for those with coronary, cerebral or PVD (where patient is independent of ADL's and life expectancy is > 5yrs • ACEI with CHF or after acute MI • Beta blocker with chronic stable angina	• Digoxin > 0.125mg with impaired renal function (CCr < 50ml/min) • Loop diuretic ○ for edema only ○ first line monotherapy for hypertension • Beta blocker ○ with COPD ○ with verapamil • Diltiazem or verapamil with NYHA Class III or IV heart failure • Calcium channel blockers with constipation • Aspirin and warfarin without H2 receptor antagonist or PPI • Dipyridamole as monotherapy for CV secondary prevention • Aspirin ○ With history of PUD ○ Dose > 150mg/day

There's an APP for that!

- AGS iGeriatrics app on all mobile devices
  - AGS Updated Beers Criteria
  - Geriatric Cultural Navigator
  - GeriPsych Consult
  - Guide to Common Immunizations
  - Management of Atrial Fibrillation
  - Prevention of Falls Guidelines
  - Small cost

AGS iGeriatrics

Take Away Points

- As the body ages, changes in how we absorb and metabolize medications occur which can increase unwanted effects of certain medications
- All members of a patients care team can play an important role identifying potentially inappropriate medications in the older adult
- There are many tools to help with this process
  - Beers Criteria-help identify PIMS and weigh risk/benefit
  - Iowa Cert anticholinergic brochure-patient friendly
  - STEADI Toolkit-fall risk assessments

Questions???