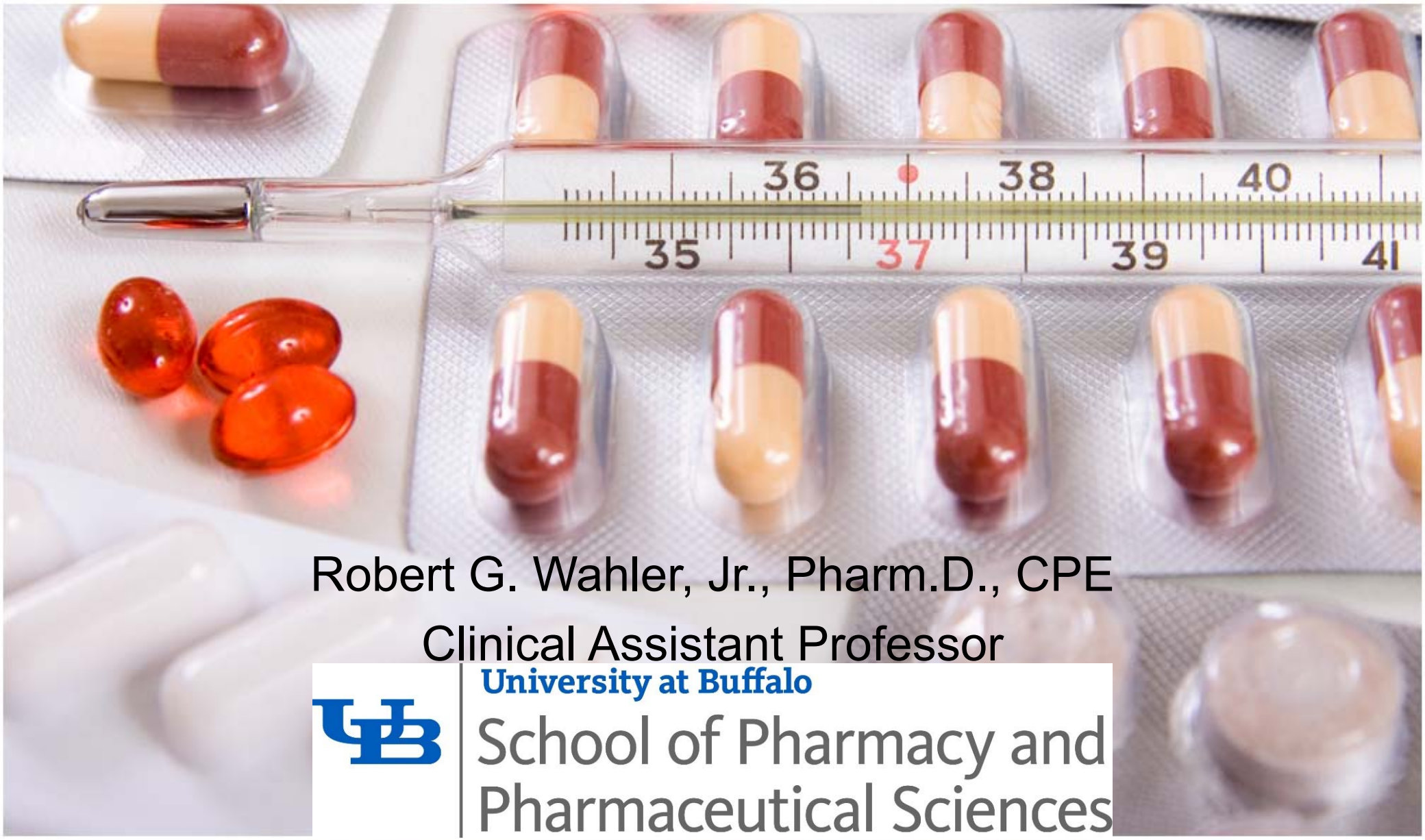
Medication Management and Fall Prevention in Older Adults



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Learning Objectives

- Identify the specific medication risks associated with falls in older adults.
- Identify health care system barriers related to medication usage and falls in older adults.
- Interpret case example(s) medication list to determine relative fall risk.
- Using strategies (including the ASCP-NCOA Toolkit) to address medication fall risks, analyze case example(s) to mitigate fall risk.

Falls Are Serious and Costly

- One out of five falls causes a serious injury such as broken bones or a head injury.
- Each year, 2.5 million older people are treated in emergency departments for fall injuries.
- Over 700,000 patients a year are hospitalized because of a fall injury, most often because of a head injury or hip fracture.
- Each year at least 250,000 older people are hospitalized for hip fractures.
- More than 95% of hip fractures are caused by falling,6 usually by falling sideways.
- Falls are the most common cause of traumatic brain injuries (TBI).
- Adjusted for inflation, the direct medical costs for fall injuries are $34 billion annually. Hospital costs account for two-thirds of the total.

Centers for Disease Control and Prevention. (2015, March 19). Falls Among Older Adults: An Overview. Retrieved from http://www.cdc.gov/HomeandRecreationalSafety/Falls/adultfalls.html

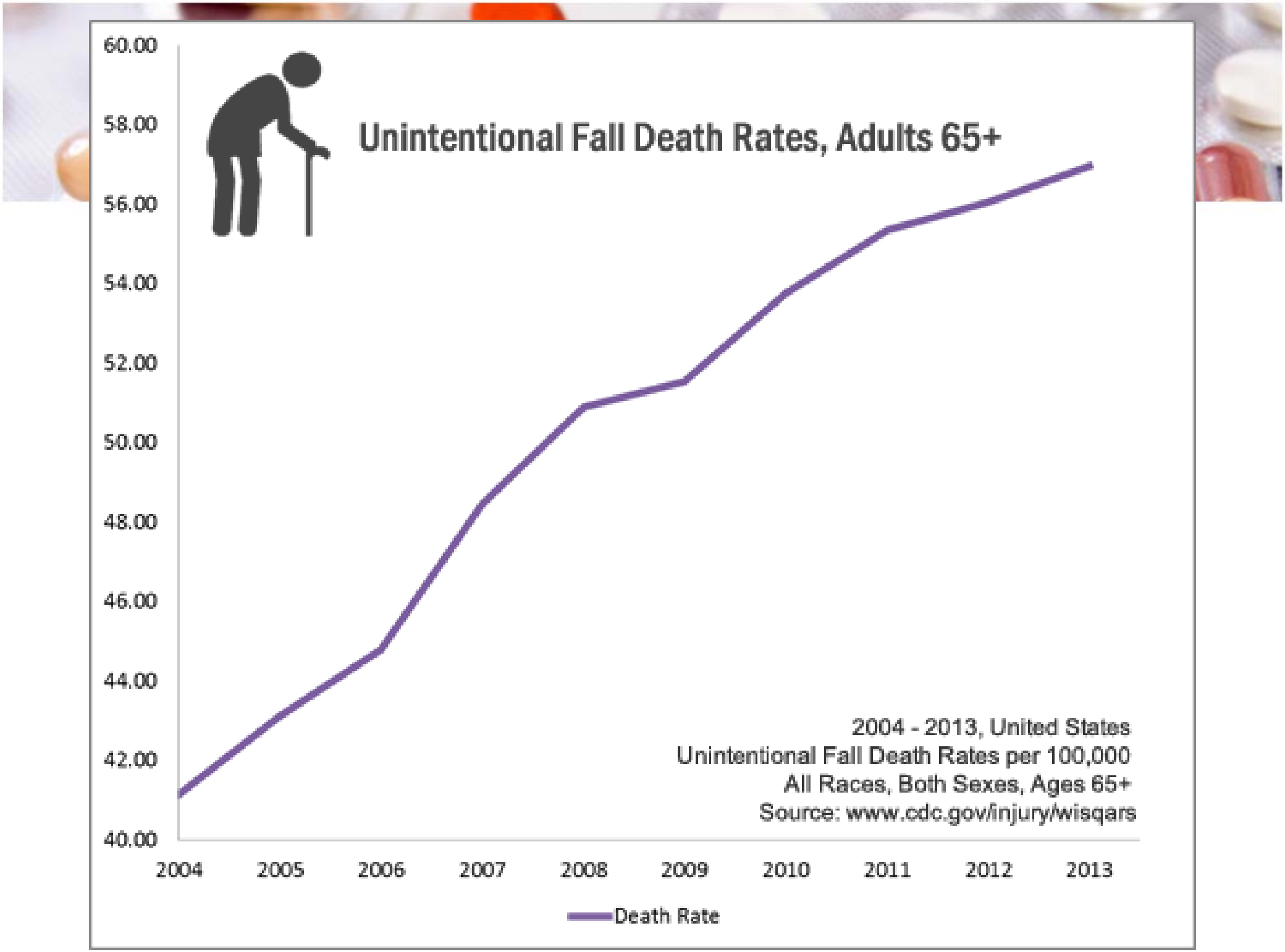

Unintentional Fall Death Rates, Adults 65+
60.00
58.00
56.00
54.00
52.00
50.00
48.00
46.00
44.00
42.00
40.00
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2004 - 2013, United States
Unintentional Fall Death Rates per 100,000
All Races, Both Sexes, Ages 65+
Source: www.cdc.gov/injury/wisqars
Death Rate

TABLE 11-1 Physiologic Changes with Aging

Organ System	Manifestation
Body composition	↓ Total body water
	↓ Lean body mass
	↑ Body fat
	↔ or ↓ Serum albumin
	↑ α_1-Acid glycoprotein (↔ or ↑ by several disease states)
Cardiovascular	↓ Myocardial sensitivity to β-adrenergic stimulation
	↓ Baroreceptor activity
	↓ Cardiac output
	↑ Total peripheral resistance
Central nervous system	↓ Weight and volume of the brain
	Alterations in several aspects of cognition
Endocrine	Thyroid gland atrophies with age
	Increased incidence of diabetes mellitus, thyroid disease
	Menopause
Gastrointestinal	↑ Gastric pH
	↓ Gastrointestinal blood flow
	Delayed gastric emptying
	Slowed intestinal transit
Genitourinary	Atrophy of the vagina because of decreased estrogen
	Prostatic hypertrophy because of androgenic hormonal changes
	Age-related changes may predispose to incontinence
Immune	↓ Cell-mediated immunity
Liver	↓ Hepatic size
	↓ Hepatic blood flow
Oral	Altered dentition
	↓ Ability to taste sweetness, sourness, bitterness
Pulmonary	↓ Respiratory muscle strength
	↓ Chest wall compliance
	↓ Total alveolar surface
	↓ Vital capacity
	↓ Maximal breathing capacity
Renal	↓ Glomerular filtration rate
	↓ Renal blood flow
	↓ Filtration fraction
	↓ Tubular secretory function
	↓ Renal mass
Sensory	↓ Accommodation of the lens of the eye, causing farsightedness
	Presbycusis (loss of auditory acuity)
	↓ Conduction velocity
Skeletal	Loss of skeletal bone mass (osteopenia)
Skin/hair	Skin dryness, wrinkling, changes in pigmentation, epithelial thinning, loss of dermal thickness
	↓ Number of hair follicles
	↓ Number of melanocytes in hair bulbs

From Kane et al.[38] and Masoro.[12]

Hajjar ER, Gray SL, Guay DR, Starner CI, Handler SM, Hanlon JT. Chapter 11. Geriatrics. In: DiPiro JT, Talbert RL, Yee GC, Matzke GR, Wells BG, Posey LM, eds. *Pharmacotherapy: A Pathophysiologic Approach*. 8th ed. New York: McGraw-Hill; 2011.

Risk factors

Intrinsic (non-modifiable) risk factors

- Age-related
  - muscle weakness
- Comorbidities
  - Impaired balance
  - Limited mobility
  - Impaired functional status
  - Arthritis, stroke, diabetes, hypertension, heart disease and dementia

extrinsic (modifiable) risk factors

- Medication use
- Poor foot care
- Unsafe footwear
- Gait deficit
- Impaired vision
- Hearing problems
- An unsafe environment
- Depression
- Postural hypotension
- Wandering behavior

Cesari, M., F. Landi, S. Torre, G. Onder, F. Lattanzio and R. Bernabei (2002). The Journals of Gerontology: Series A **57**(11): M722-M726.

Falls consequences

- Falls can result in
  - (i) fear of falling;
  - (ii) loss of confidence, mobility and the ability to live independently;
  - (iii) admission to hospital; and
  - (iv) eventual institutional relocation for 9–27%.
- 95% of all hip injuries occur when individuals fall.

Huang A, Mallet L, Rochefort C, Eguale T, Buckeridge D, Tamblyn R. Medication-Related Falls in the Elderly. Drugs & Aging. 2012;29(5):359-76

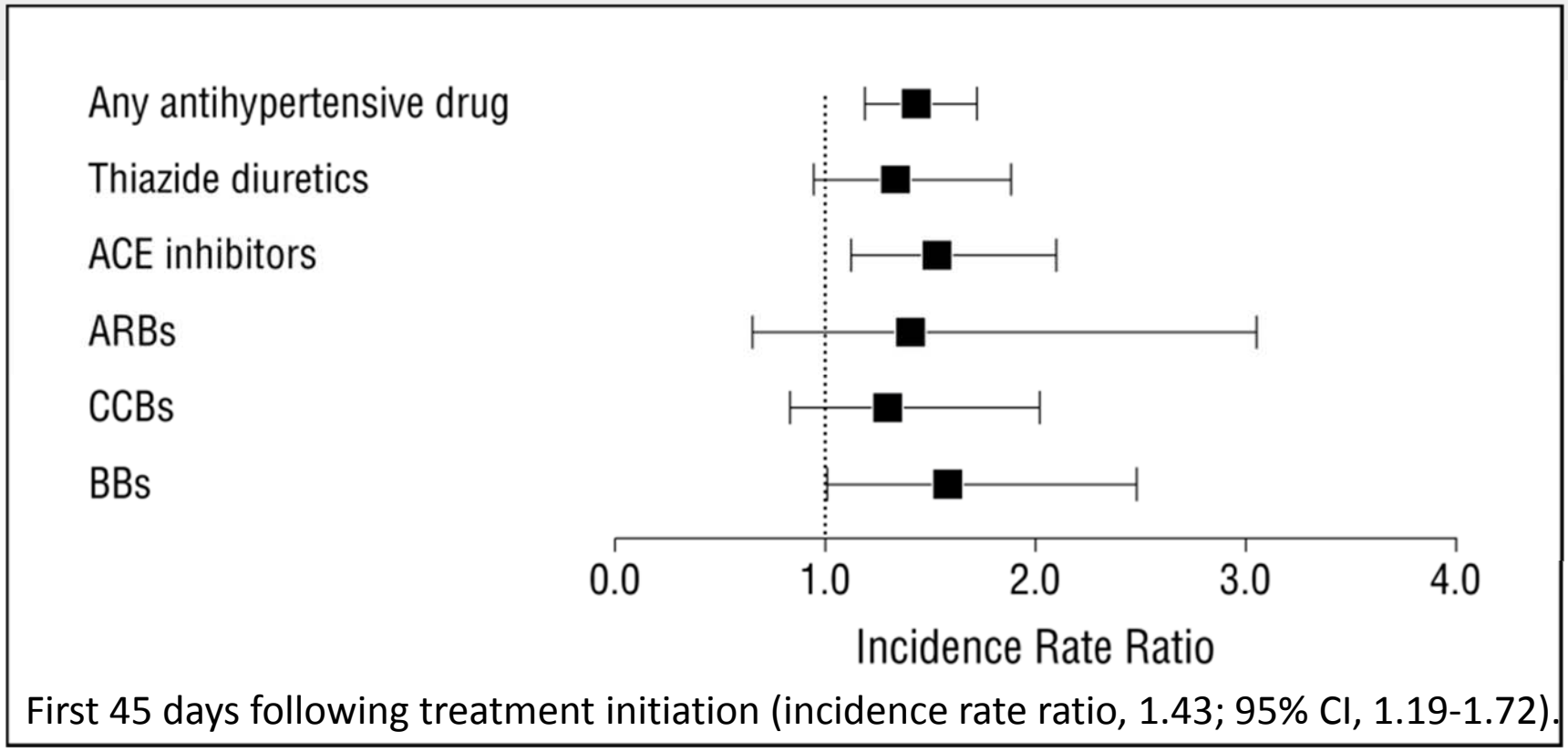
TABLE 11-2 Age-Related Changes in Drug Pharmacokinetics

Pharmacokinetic Phase	Pharmacokinetic Parameters
Gastrointestinal absorption	Unchanged passive diffusion and no change in bioavailability for most drugs
	↓ Active transport and ↓ bioavailability for some drugs
	↓ First-pass extraction and ↑ bioavailability for some drugs
Distribution	↓ Volume of distribution and ↑ plasma concentration of water-soluble drugs
	↑ Volume of distribution and ↑ terminal disposition half-life ($t_{1/2}$) for fat-soluble drugs
	↑ or ↓ Free fraction of highly plasma protein-bound drugs
Hepatic metabolism	↓ Clearance and ↑ $t_{1/2}$ for some oxidatively metabolized drugs
	↓ Clearance and ↑ $t_{1/2}$ for drugs with high hepatic extraction ratios
Renal excretion	↓ Clearance and ↑ $t_{1/2}$ for renally eliminated drugs and active metabolites

From Cusack[13] and Chapron.[15]

Hajjar ER, Gray SL, Guay DR, Starner CI, Handler SM, Hanlon JT. Chapter 11. Geriatrics. In: DiPiro JT, Talbert RL, Yee GC, Matzke GR, Wells BG, Posey LM, eds. *Pharmacotherapy: A Pathophysiologic Approach*. 8th ed. New York: McGraw-Hill; 2011.

From: **The Risk of Hip Fracture After Initiating Antihypertensive Drugs in the Elderly**
Arch Intern Med. 2012;172(22):1739-1744. doi:10.1001/2013.jamainternmed.469



First 45 days following treatment initiation (incidence rate ratio, 1.43; 95% CI, 1.19-1.72).

Figure Legend:

Figure 2. Forest plot of antihypertensive drugs and hip fracture risk using incidence rate ratios with 95% CIs. Each data point and 95% CI (error bars) represent results from the conditional Poisson regression analysis. The line at 1.0 represents no association; estimates to the right of the line represent an increased risk of hip fracture. ACE indicates angiotensin II converting–enzyme; ARB, angiotensin II receptor antagonist/blocker; BB, β-adrenergic blocker; and CCB, calcium channel blocker.

Benzodiazepines, Falls and Hips Fractures

- Hypnotics-anxiolytics long T½ (OR, 1.8; 95% CI, 1.3 to 2.4)
- Tricyclic antidepressants (OR, 1.9; 95% CI, 1.3 to 2.8)
- Antipsychotics (OR, 2.0; 95% CI, 1.6 to 2.6)

  - Ray WA, Griffin MR, Schaffner W, Baugh DK, Melton LJ III: Psychotropic Drug Use and the Risk of Hip Fracture. N Engl J Med 1987; 316:363-369

Benzodiazepines, Falls and Hips Fractures

- Long T½
  - OR 1.7 (95% CI, 1.5 to 2.0)
- Short T½
  - OR 1.1 (95% CI, 0.9 to 1.3)

- Ray WA, Griffin MR, Downey W: Benzodiazepines of long and short elimination half-life and the risk of hip fracture. JAMA 1989; 262:3303-3307

Benzodiazepines, Falls and Hips Fractures

- Doses >=3 mg/day in diazepam equivalents increased the risk of hip fracture by 50%.
- Increased risks of hip fracture
  - Initial 2 weeks of use (60% increase)
  - After more than 1 month of continuous use (80% increase)
- Short acting agents
  - Increased the risk of hip fracture by 50%.
    - Wang PS. Bohn RL. Glynn RJ. Mogun H. Avorn J. Hazardous benzodiazepine regimens in the elderly: effects of half-life, dosage, and duration on risk of hip fracture. Am J psych. 2001;158(6):892-8.

Is Nothing Safe? - Fall Risk of Antidepressants

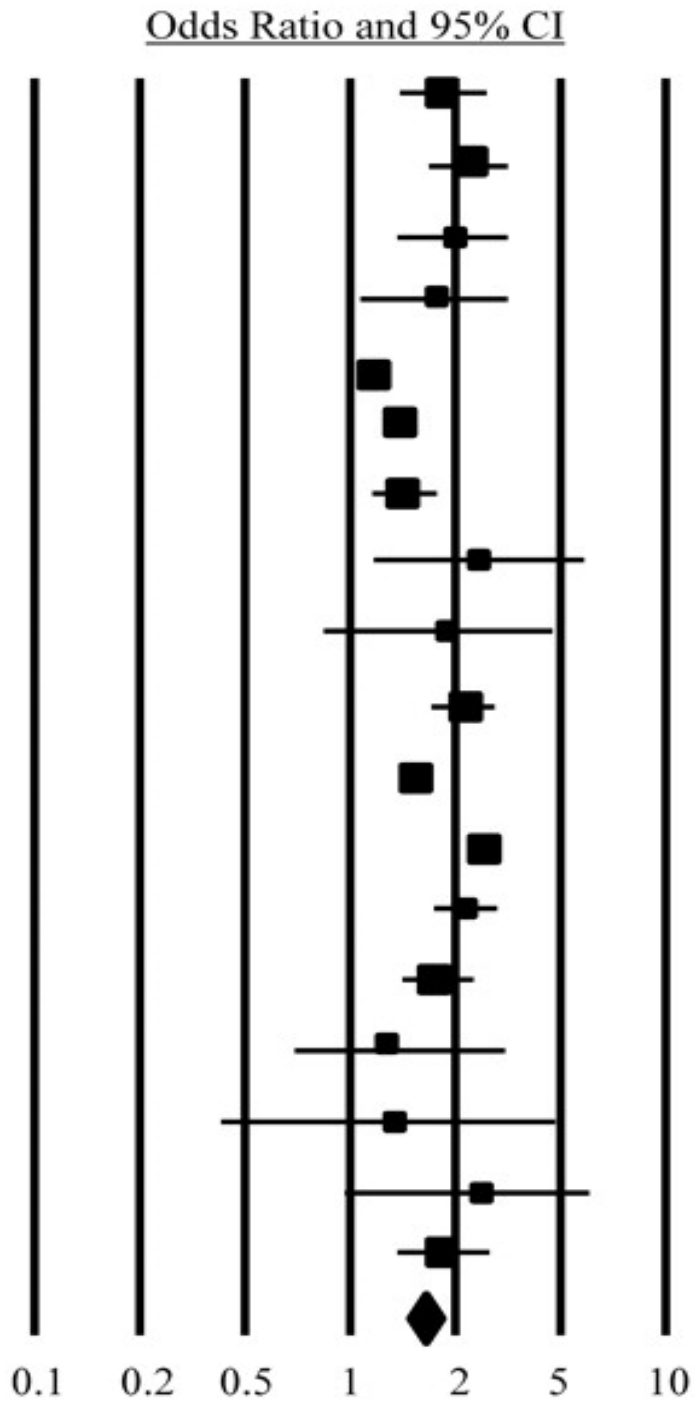
- Use of selective serotonin-reuptake inhibitors or tricyclic antidepressants and risk of hip fractures in elderly people.
  - OR 2.4 (95% CI 2·0–2·7) SSRIs, 2.2 (1.8–2.8) 2°-amine TCAs, and 1.5 (1.3–1.7) 3°-amine TCAs
  - The Lancet. 1998;351(9112):1303-7.
- Retrospective review of selective serotonin reuptake inhibitors and falling in older nursing home residents.
  - (1995 data). Older adults on SSRIs were more likely to fall than older adults not on antidepressants (p =.003) and were more likely to have an injurious fall (p =.03).
  - International Psychogeriatrics. 2001;13(1):85-91

Is Nothing Safe? - Fall Risk of Antidepressants

- Psychotropic-Related Hip Fractures: Meta-Analysis of First-Generation and Second-Generation Antidepressant and Antipsychotic Drugs
  - Oderda et. al. Ann Pharmacother July/August 2012 46:917-928; published ahead of print July 17, 2012.
- Dose-response relationship between Selective Serotonin Reuptake Inhibitors and Injurious Falls: A study in Nursing Home Residents with Dementia.
  - Sterke, C. S., G. Ziere, et al. (2012). British Journal of Clinical Pharmacology

All Antidepressants and Risk of Hip Fracture

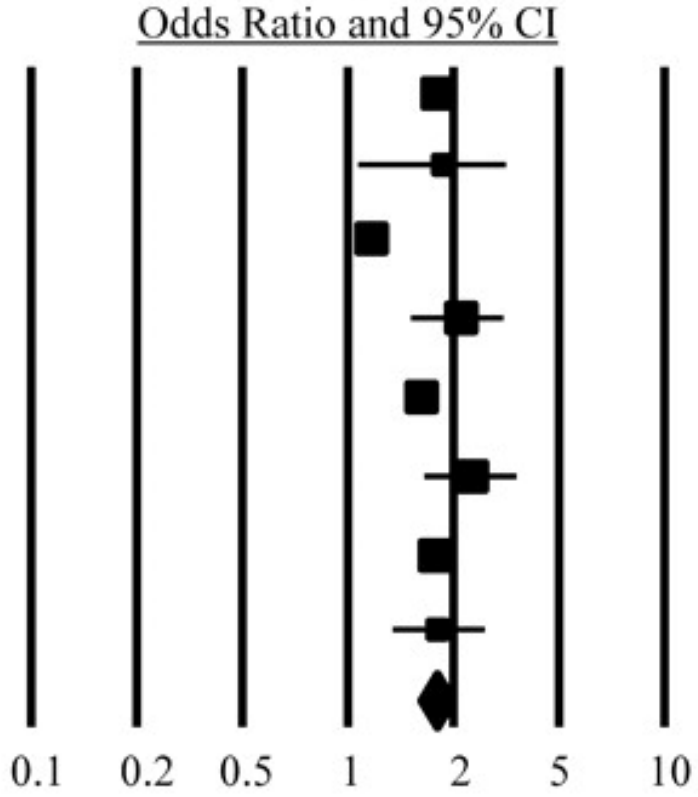
Study	Odds ratio	Lower limit	Upper limit
van den Brand, 2009[13] (First-generation)	1.760	1.445	2.143
van den Brand, 2009[13] (Second-generation)	2.350	1.942	2.843
Chang, 2008[29]	2.100	1.318	3.346
Ensrud, 2003[30]	1.650	1.055	2.581
Hubbard, 2003[31] (First-generation)	1.220	1.152	1.292
Hubbard, 2003[31] (Second-generation)	1.420	1.278	1.578
Wang, 2001[25]	1.460	1.219	1.749
Jacqmin-Gadda, 1998[32]	2.530	1.048	6.108
Guo, 1998[26]	1.790	0.650	4.930
Liu, 1998[33] (Secondary TCA)	2.199	1.728	2.798
Liu, 1998[33] (Tertiary TCA)	1.499	1.323	1.700
Liu, 1998[33] (Second-generation)	2.399	2.133	2.698
Johansson, 1996[34] (First-generation)	2.296	1.669	3.158
Lichtenstein,1994[27]	2.690	0.972	7.445
Cumming, 1993[28]	1.330	0.645	2.741
Jensen, 1991[36]	1.410	0.390	5.098
Ray, 1991[35]	1.600	1.347	1.901
Ray, 1987[6] (First-generation)	1.900	1.289	2.801
Summary Odds Ratio	1.778	1.530	2.066



Oderda et. al. *Ann Pharmacother July/August 2012 46:917-928; published ahead of print July 17, 2012.*

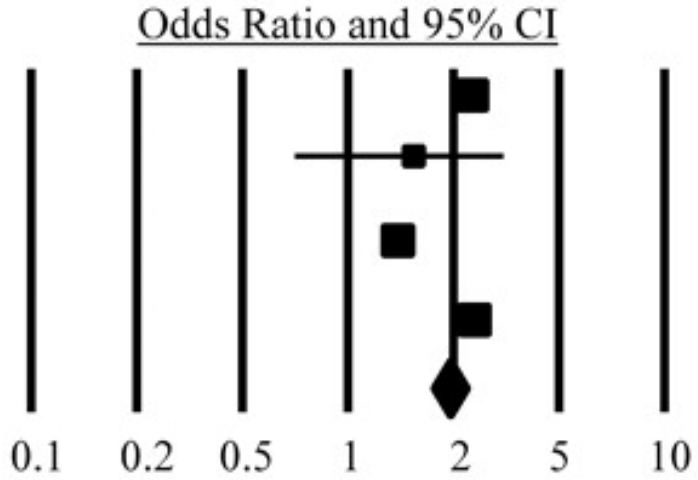
First-generation (Tricyclic) Antidepressants and Risk of Hip Fracture

Study	Odds ratio	Lower limit	Upper limit
van den Brand, 2009[13]	1.760	1.445	2.143
Ensrud, 2003[30]	1.830	1.082	3.095
Hubbard, 2003[31]	1.220	1.152	1.292
Liu, 1998[33] (Secondary TCA)	2.199	1.728	2.798
Liu, 1998[33] (Tertiary TCA)	1.499	1.323	1.700
Johansson, 1996[34]	2.296	1.669	3.158
Ray, 1991[35]	1.600	1.347	1.901
Ray, 1987[6]	1.900	1.295	2.788
Summary Odds Ratio	1.706	1.426	2.042



Second-generation Antidepressants and Risk of Hip Fracture

Study	Odds ratio	Lower limit	Upper limit
van den Brand, 2009[13]	2.350	1.942	2.843
Ensrud, 2003[30]	1.540	0.620	3.823
Hubbard, 2003[31]	1.420	1.278	1.578
Liu, 1998[33]	2.399	2.133	2.698
Summary Odds Ratio	1.942	1.366	2.760



Oderda et. al. *Ann Pharmacother July/August 2012 46:917-928; published ahead of print July 17, 2012.*

Table 4. Risk of Injury with Use of Skeletal Muscle Relaxants Versus No Use

Parameter	Cases (n = 27,974)	Controls (n = 104,303)	Unadjusted OR (95% CI)	Adjusted[a] OR (95% CI)	p Value[b]
All SMRs	365	801	1.73 (1.52-1.96)	1.32 (1.16-1.50)	<0.001
Specific SMRs					
carisoprodol	27	39	2.53 (1.54-4.15)	1.73 (1.04-2.88)	0.036
cyclobenzaprine	194	458	1.60 (1.35-1.90)	1.22 (1.02-1.45)	0.029
methocarbamol	142	300	1.79 (1.46-2.20)	1.42 (1.16-1.75)	0.001

SMRs = skeletal muscle relaxants.

[a]Adjusted for age, sex, previous injury, Diagnostic Cost Groups comorbidity score, medications, and concomitant diseases.

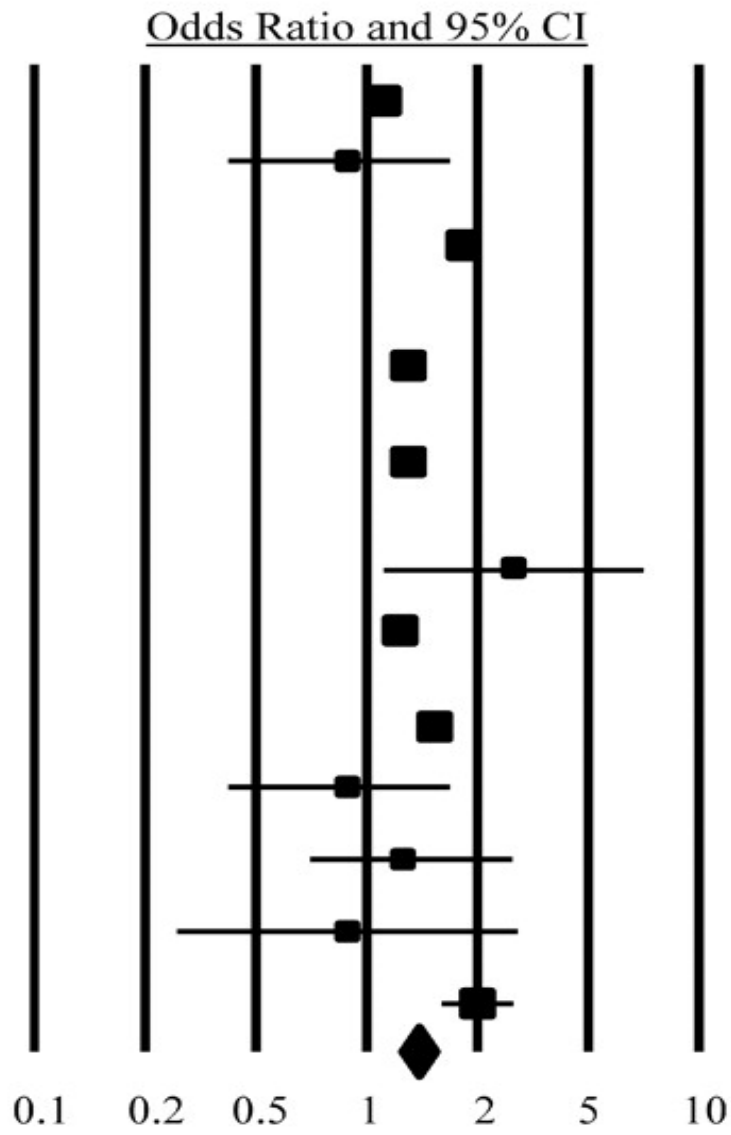
[b]p Values are for adjusted ORs.

Spence MM, Shin PJ, Lee EA, Gibbs NE. Risk of Injury Associated with Skeletal Muscle Relaxant Use in Older Adults. The Annals of Pharmacotherapy. 2013;47(7-8):993-8

Antipsychotics and Hip Fracture

All Antipsychotics and Risk of Hip Fracture

Study	Odds ratio	Lower limit	Upper limit
Jalbert, 2010[22]	1.260	1.047	1.516
Pouwels, 2009[23] (second-generation)	0.830	0.419	1.645
Pouwels, 2009[23] (first-generation)	1.760	1.485	2.086
Liperoti, 2007[24] (second-generation)	1.370	1.110	1.690
Liperoti, 2007[24] (first-generation)	1.350	1.063	1.715
Kolanowski, 2006[18]	2.640	1.039	6.711
Hugenholtz, 2005[11]	1.300	1.126	1.499
Wang, 2001[25]	1.610	1.290	2.010
Guo, 1998[26]	0.860	0.401	1.844
Cumming, 1993[27]	1.280	0.641	2.555
Lichtenstein, 1994[28]	0.790	0.228	2.732
Ray, 1987[6]	2.000	1.538	2.600
Summary Odds Ratio	1.443	1.276	1.632

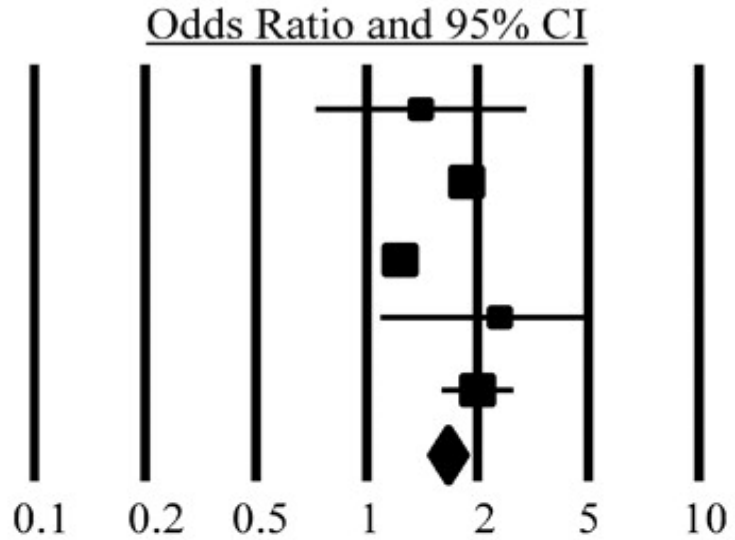


Oderda et. al. *Ann Pharmacother July/August 2012 46:917-928; published ahead of print July 17, 2012.*

Antipsychotics and Hip Fracture

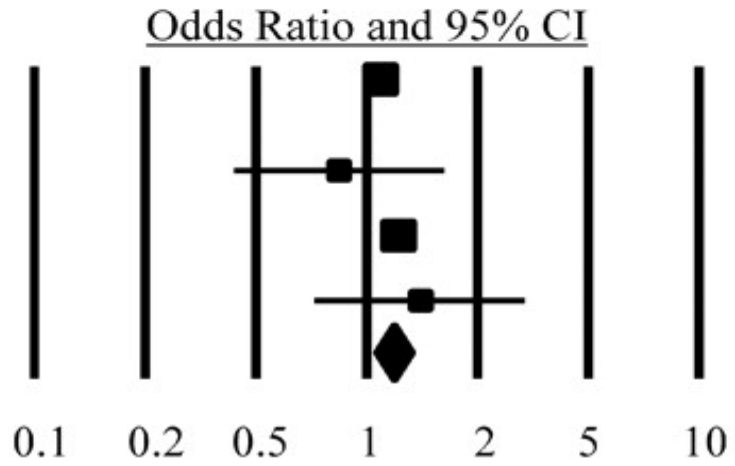
First-Generation (Conventional) Antipsychotics and Risk of Hip Fracture

Study	Odds ratio	Lower limit	Upper limit
Jalbert, 2010[22]	1.440	0.840	2.469
Pouwels, 2009[23]	1.760	1.485	2.086
Liperoti, 2007[24]	1.350	1.063	1.715
Kolanowski, 2006[18]	2.330	1.080	5.028
Ray, 1987[6]	2.000	1.538	2.600
Summary Odds Ratio	1.683	1.426	1.987



Second-Generation (Atypical) Antipsychotics and Risk of Hip Fracture

Study	Odds ratio	Lower limit	Upper limit
Jalbert, 2010[22]	1.270	1.049	1.538
Pouwels, 2009[23]	0.830	0.419	1.645
Liperoti, 2007[24]	1.370	1.110	1.690
Kolanowski, 2006[18]	1.470	0.818	2.643
Summary Odds Ratio	1.299	1.135	1.486



Oderda et. al. *Ann Pharmacother July/August 2012 46:917-928; published ahead of print July 17, 2012.*

Non-benzodiazepine Hypnotics

Table 2. Effect of Nonbenzodiazepine Hypnotic Drug Use on the Risk for Hip Fracture in a Case-Crossover Study of Nursing Home Residents

Hazard Period	No. of Exposed Participants	Odds Ratio (95% CI)
Any nonbenzodiazepine hypnotic drug use		
0-15 d Before the hip fracture	622	1.47 (1.24-1.74)
0-30 d Before the hip fracture	927	1.66 (1.45-1.90)
New nonbenzodiazepine hypnotic drug use		
0-15 d Before the hip fracture	366	2.20 (1.76-2.74)
0-30 d Before the hip fracture	564	1.90 (1.60-2.26)

Berry SD, et al. Nonbenzodiazepine Sleep Medication Use and Hip Fractures in Nursing Home Residents JAMA Intern Med. 2013;173(9):754-761

Opioids

Table III. Use of opioid medications and risk of hip fractures

Drug	Odds ratio (95% CI)	Reference
Morphine	1.47 (1.37, 1.58)	Vestergaard et al.[53]
Fentanyl	2.23 (1.89, 2.64)	Vestergaard et al.[53]
Methadone	1.39 (1.05, 1.83)	Vestergaard et al.[53]
Oxycodone	1.36 (1.08, 1.69)	Vestergaard et al.[53]
Nicomorphine	1.57 (1.38, 1.78)	Vestergaard et al.[53]
Ketobemidone	1.07 (1.02, 1.13)	Vestergaard et al.[53]
Codeine	1.16 (1.12, 1.20)	Vestergaard et al.[53]
Propoxyphene	2.01 (1.19, 3.40)	Guo et al.[73]

CI = confidence interval.

Huang A et al. Medication-Related Falls in the Elderly. Drugs & Aging. 2012;29(5):359-76

Meta-analysis of the Impact of 9 Medication Classes on Falls in Elderly Persons

Table 3. Pooled Bayesian Odds Ratios and Subgroup Sensitivity Analysis

Study Characteristic	Antihypertensives		Diuretics		β-Blockers		Sedatives/Hypnotics	
	No.[a]	OR (95% CI)	No.[a]	OR (95% CI)	No.[a]	OR (95% CI)	No.[a]	OR (95% CI)
No. of subjects	4976		10 145		8354		44 684	
No. taking drug	1482		2374		1432		1737	
All studies	6	1.24 (1.01-1.50)	9	1.07 (1.01-1.14)	4	1.01 (0.86-1.17)	7	1.47 (1.35-1.62)
Population								
Community	4	1.29 (1.00-1.65)	3	1.08 (1.01-1.16)	2	0.98 (0.79-1.18)[b]	5	1.50 (1.36-1.67)
<35% Fallers	3	1.34 (0.93-1.91)	2	1.09 (1.00-1.17)	1	0.94 (0.75-1.16)	3	1.62 (1.44-1.84)[b]
≥35% Fallers	1	1.11 (0.78-1.58)[c]	1	1.04 (0.87-1.24)	1	1.13 (0.72-1.70)	2	1.22 (1.00-1.48)[b]
Long-term care	1	0.80 (0.40-1.60)[c]	3	1.02 (0.84-1.25)	2	1.18 (0.83-1.88)[b]	1	1.38 (1.14-1.74)
Other	1	1.19 (0.77-1.83)[c]	3	1.06 (0.82-1.38)	0	0.43 (0.19-0.97)[b]	1	1.56 (1.19-2.05)
Mean age of study subjects, y								
≤75	4	1.33 (1.03-1.68)	4	1.11 (1.03-1.20)[b]	2	0.93 (0.71-1.18)	4	1.54 (1.39-1.72)
>75	2	1.04 (0.79-1.38)[c]	5	0.96 (0.84-1.08)[b]	2	1.02 (0.81-1.28)	3	1.37 (1.19-1.60)
Medication/falls ascertainment								
Good	1	1.19 (0.77-1.83)[c]	5	1.04 (0.89-1.23)	1	0.87 (0.69-1.07)	1	1.66 (1.25-2.22)
Poor	5	1.24 (0.97-1.54)	4	1.09 (1.02-1.16)	3	1.02 (0.84-1.21)	6	1.43 (1.30-1.58)
Study type								
Case-control	2	1.09 (0.80-1.50)[c]	5	1.11 (0.94-1.32)	1	0.87 (0.55-1.37)	1	1.62 (1.31-2.00)[b]
Cohort	3	1.34 (0.93-1.91)	1	1.05 (0.97-1.15)	0	1.00 (0.78-1.30)	3	1.24 (1.05-1.45)[b]
Cross-sectional	1	1.11 (0.78-1.58)[c]	3	1.11 (1.00-1.24)	3	1.02 (0.79-1.24)	3	1.56 (1.39-1.76)[b]

Figure Legend: Pooled Bayesian Odds Ratios and Subgroup Sensitivity Analysis

Arch Intern Med. 2010;170(5):477-477.
doi:10.1001/archinternmed.2009.510

Meta-analysis of the Impact of 9 Medication Classes on Falls in Elderly Persons

	Neuroleptics/ Antipsychotics		Antidepressants		Benzodiazepines		Narcotics		NSAIDs	
Study Characteristic	**No.[a]**	**OR (95% CI)**	**No.[a]**	**OR (95% CI)**	**No.[a]**	**OR (95% CI)**	**No.[a]**	**OR (95% CI)**	**No.[a]**	**OR (95% CI)**
No. of subjects	8617		20 469		32 684		12 811		7828	
No. taking drug	1303		3021		5050		1314		429	
All studies	4	1.59 (1.37-1.83)	9	1.68 (1.47-1.91)	11	1.57 (1.43-1.72)	4	0.96 (0.78-1.18)	4	1.21 (1.01-1.44)
Population										
Community	2	1.76 (1.41-2.18)[b]	4	1.68 (1.39-2.03)	6	1.55 (1.36-1.73)	2	1.22 (0.79-1.66)	1	1.12 (0.91-1.36)
<35% Fallers	1	1.75 (1.36-2.24)	3	1.62 (1.22-2.03)	5	1.53 (1.31-1.75)	2	1.32 (0.87-1.80)	1	1.08 (0.86-1.34)
≥35% Fallers	1	1.78 (1.33-2.38)[c]	1	2.30 (1.41-3.69)	1	1.58 (1.05-2.45)	0	0.71 (0.27-1.82)	0	1.34 (0.83-2.15)
Long-term care	1	1.55 (1.24-1.95)	3	1.63 (1.35-1.98)	2	1.43 (1.11-1.85)	1	1.03 (0.61-1.54)	1	1.41 (1.05-1.89)
Other	1	1.02 (0.65-1.61)[b]	2	1.70 (1.17-2.48)	3	1.91 (1.43-2.55)	1	0.94 (0.72-1.24)	2	1.62 (0.21-12.60)[c]
Mean age of study subjects, y										
≤75	1	1.72 (1.32-2.27)	2	1.66 (1.33-2.04)	5	1.55 (1.26-1.83)	1	0.96 (0.73-1.27)	2	1.26 (0.92-1.70)
>75	3	1.63 (1.27-2.03)	7	1.79 (1.47-2.16)	6	1.56 (1.39-1.77)	3	1.24 (0.75-1.65)	2	1.17 (0.95-1.43)
Medication/falls ascertainment										
Good	2	1.34 (1.05-1.68)[b]	4	1.68 (1.39-2.06)	5	1.65 (1.39-1.98)	2	0.81 (0.55-1.20)	3	1.59 (1.11-2.24)[b]
Poor	2	1.79 (1.46-2.17)[b]	5	1.64 (1.37-1.94)	6	1.54 (1.36-1.72)	2	1.11 (0.85-1.42)	1	1.12 (0.93-1.35)[b]
Study type										
Case-control	1	1.23 (0.92-1.63)	3	1.83 (1.42-2.35)	3	2.18 (1.57-3.12)[b]	1	0.21 (0.10-0.45)[b,c]	2	1.62 (0.21-12.60)[c]
Cohort	0	1.90 (1.35-2.67)	2	1.67 (1.36-2.02)	3	1.51 (1.29-1.75)[b]	1	1.49 (1.22-1.83)[b,c]	0	NA
Cross-sectional	3	1.67 (1.38-2.00)	4	1.57 (1.25-1.96)	5	1.49 (1.24-1.73)[b]	2	1.18 (0.90-1.53)[b,c]	2	1.44 (0.49-4.03)[c]

Abbreviations: CI, confidence interval; NA, not applicable; NSAIDs, nonsteroidal anti-inflammatory drugs; OR, odds ratio.

[a] Refers to new study only.

[b] Greater than 95% posterior probability that the difference between ORs is greater than 0.

[c] Attained by random-effects inverse-variance model (frequentist) owing to unstable Bayesian model.

Figure Legend: Pooled Bayesian Odds Ratios and Subgroup Sensitivity Analysis

Arch Intern Med. 2010;170(5):477-477.
doi:10.1001/archinternmed.2009.510

‘Fall-Risk Increasing Drug’ (FRID)

Table I. Risk of falling and drug use: results from meta-analyses, pooled odds ratios from Leipzig et al.[42,43]

Drugs	Odds ratio (95% CI)
Any psychotropic	1.73 (1.52, 1.97)*
Antipsychotics	1.50 (1.25, 1.79)*
Sedative/hypnotics	1.54 (1.40, 1.70)*
Benzodiazepines (any)	1.48 (1.23, 1.77)*
Short acting	1.44 (1.09, 1.90)*
Long acting	1.32 (1.09, 1.90)*
Antidepressants	1.66 (1.41, 1.95)*
TCAs	1.51 (1.14, 2.00)*
Type 1a anti-arrhythmics	1.59 (1.02, 2.48)*
Digoxin	1.22 (1.05, 1.42)*
Centrally acting antihypertensives	1.16 (0.87, 1.55)
Nitrates	1.13 (0.95, 1.36)
ACE inhibitors	1.20 (0.92, 1.58)
β-Blockers	0.93 (0.77, 1.11)
Calcium channel blockers	0.94 (0.94, 1.14)
Any diuretic	1.08 (1.02, 1.16)*
Thiazide diuretics	0.97 (0.78, 1.20)
Loop diuretics	0.90 (0.73, 1.12)
Opioids	0.97 (0.78, 1.12)
Non-opioids	1.09 (0.88, 1.34)
NSAIDs	1.16 (0.97, 1.38)
Aspirin	1.12 (0.80, 1.57)

ACE = angiotensin-converting enzyme; **CI** = confidence interval; **NSAIDs** = nonsteroidal anti-inflammatory drugs; **TCA** = tricyclic antidepressant; * indicates statistically significant odds ratio.

Huang A, Mallet L, Rochefort C, Eguale T, Buckeridge D, Tamblyn R. Medication-Related Falls in the Elderly. Drugs & Aging. 2012;29(5):359-76

Anti-Cholinergics

- "ACH medications were not found to be independently associated with an increased risk of falling, fractures, or BMD loss. Rather, factors associated with ACH medication use explained the apparent associations."
  - Fraser et al. (2014). Ann Pharmacother 48(8): 954-961.
- "Certain individual DACEs or increased overall DACE exposure may increase the risks of cognitive impairment, falls and all-cause mortality in older adults."
  - Ruxton, K., R. J. Woodman and A. A. Mangoni (2015). Br J Clin Pharmacol 80(2): 209-220.
- "The regular use of medications with anticholinergic activity is associated with subsequent injurious falls in older men."
  - Richardson et al. (2015). J Am Geriatr Soc 63(8): 1561-1569.
- "Increased point estimates suggest an association of anticholinergic use with recurrent falls, but the associations did not reach statistical significance."
  - Marcum et al. (2015). Ann Pharmacother 49(11): 1214-1221.
- "Overall, use of high-level anticholinergic medications was associated with greater risk of fracture than no use in elderly adults with depression."
  - Chatterjee et al. (2016). J Am Geriatr Soc 64(7): 1492-1497.

Other FRIDs

- Evidence exists (Refer to ASCP-NCOA bibliography)
  - Dopaminergic agents, Anticonvulsants, Hypoglycemia agents, Over-the-counter: diphenhydramine, doxylamine
- Evidence suggests
  - Statins
    - Scott D, Blizzard L, Fell J, Jones G. Statin therapy, muscle function and falls risk in community-dwelling older adults. QJM. 2009;102(9):625-33.
  - PPI's
    - Lewis JD, Epstein S, Metz DC. Long-term proton pump inhibitor therapy and risk of hip fracture. JAMA 2006;296(24):2947-53.
  - Cholinesterase Inhibitors and Memantine
    - French et al. (2006). "Drugs and falls in community-dwelling older people: a national veterans study." Clinical therapeutics 28(4): 619-630.

Absolute risk of an injurious fall per day for the use of SSRIs and hypnotics or sedatives in nursing home residents with dementia

Absolute risk of an injurious fall	No SSRIs	0.25 DDD SSRIs	0.50 DDD SSRIs	1.00 DDD SSRIs
		No co-prescribed hypnotics or sedatives		
p(f,80) (95% CI)	0.09 (0.06, 0.14)	0.12 (0.09, 0.18)	0.16 (0.11, 0.24)	0.28 (0.17, 0.45)
p(m,80) (95% CI)	0.13 (0.07, 0.17)	0.17 (0.10, 0.22)	0.22 (0.13, 0.29)	0.38 (0.20, 0.55)
p(f,85) (95% CI)	0.12 (0.08, 0.17)	0.15 (0.11, 0.22)	0.20 (0.14, 0.29)	0.35 (0.22, 0.56)
p(m,85) (95% CI)	0.16 (0.09, 0.22)	0.21 (0.12, 0.28)	0.28 (0.15, 0.38)	0.48 (0.24, 0.72)
Increase in absolute risk of an injurious fall*	ref	31%	73%	198%
Absolute risk of an injurious fall	**No SSRIs**	**0.25 DDD SSRIs**	**0.50 DDD SSRIs**	**1.00 DDD SSRIs**
		0.50 DDD hypnotics or sedatives		
p(f,80) (95% CI)	0.15 (0.09, 0.25)	0.20 (0.12, 0.33)	0.26 (0.15, 0.43)	0.44 (0.25, 0.80)
p(m,80) (95% CI)	0.20 (0.10, 0.30)	0.27 (0.14, 0.39)	0.35 (0.18,0.51)	0.61 (0.29, 0.96)
p(f,85) (95% CI)	0.19 (0.11, 0.31)	0.25 (0.15, 0.40)	0.32 (0.20, 0.53)	0.56 (0.31, 0.99)
p(m,85) (95% CI)	0.26 (0.13, 0.38)	0.34 (0.17, 0.50)	0.44 (0.22, 0.66)	0.76 (0.35, 1.23)
Increase in absolute risk of an injurious fall*	59%	109%	174%	373%
Absolute risk of an injurious fall	**No SSRIs**	**0.25 DDD SSRIs**	**0.50 DDD SSRIs**	**1.00 DDD SSRIs**
		1.00 DDD hypnotics or sedatives		
p(f,80) (95% CI)	0.24 (0.10, 0.58)	0.31 (0.13, 0.76)	0.41 (0.17, 1.00)	0.71 (0.28, 1.80)
p(m,80) (95% CI)	0.33 (0.12, 0.68)	0.43 (0.15, 0.89)	0.56 (0.20, 1.17)	0.97 (0.33, 2.11)
p(f,85) (95% CI)	0.30 (0.12, 0.72)	0.39 (0.16, 0.94)	0.51 (0.21, 1.23)	0.88 (0.35, 2.22)
p(m,85) (95% CI)	0.41 (0.14, 0.86)	0.53 (0.19, 1.13)	0.70 (0.25, 1.49)	1.21 (0.41, 2.69)
Increase in absolute risk of an injurious fall*	152%	232%	336%	651%

DDD, Defined Daily Dose; p(f,80), absolute risk of an injurious fall in percentages per day for females aged 80 years; p(m,80), absolute risk of an injurious fall in percentages per day for males aged 80 years; p(f,85), absolute risk of an injurious fall in percentages per day for females aged 85 years; p(m,85), absolute risk of an injurious fall in percentages per day for males aged 85 years. hypnotics or sedatives (N05C); SSRIs (N05AB). *The increase in absolute risk of an injurious fall is relative to a person of any age taking no SSRIs and no sedatives or hypnotics.

Sterke, C. S., G. Ziere, et al. (2012). British Journal of Clinical Pharmacology

Absolute risk of an injurious fall per day for the use of SSRIs and hypnotics or sedatives in nursing home residents with dementia

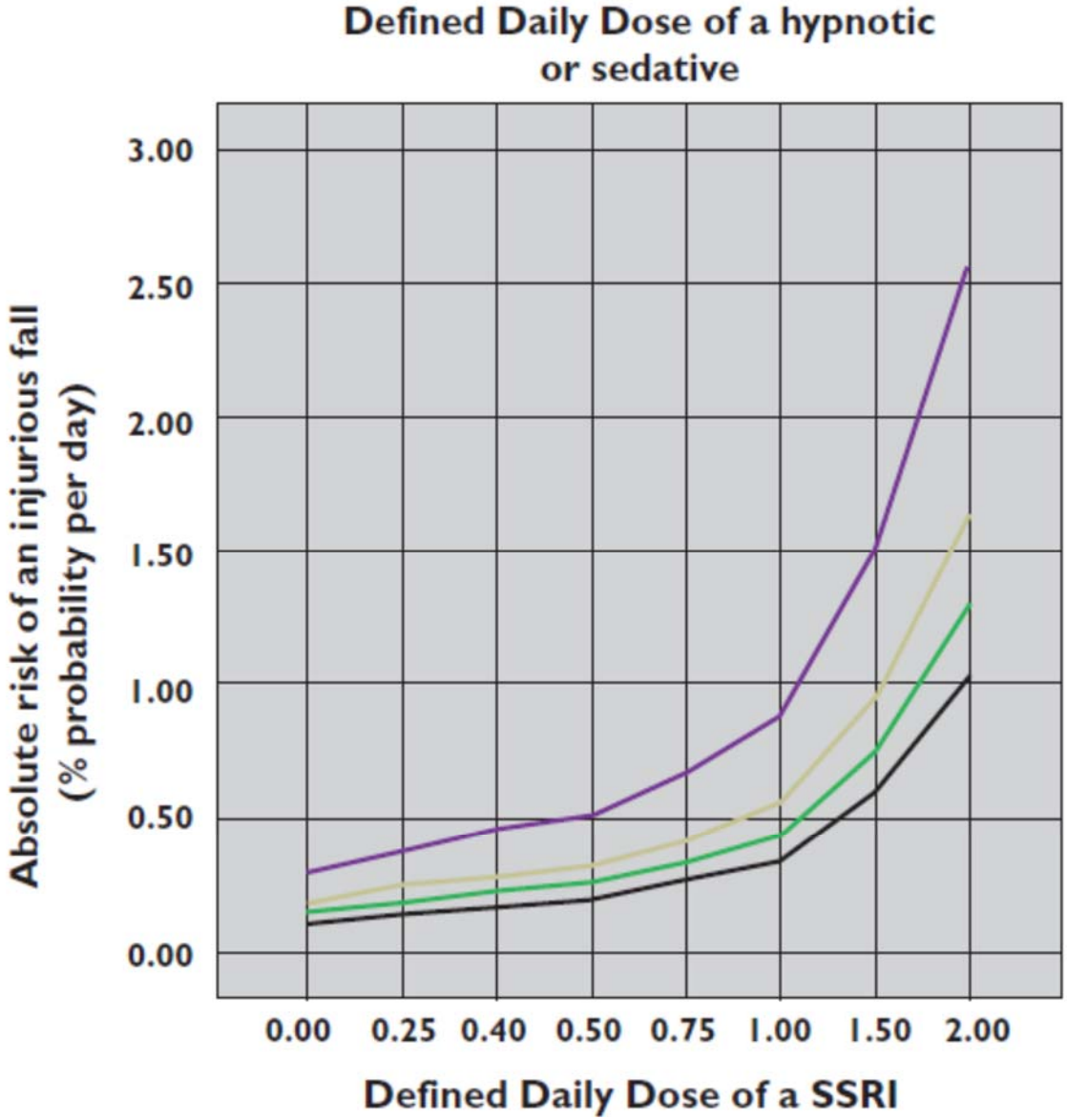


Figure 1

Absolute risk of an injurious fall (% per day) for a female resident aged 85 years by SSRI Defined Daily Dose and co-prescribed hypnotic or sedative Defined Daily Dose. None (—); 0.25 (—); 0.50 (—); 1.00 (—)

Sterke, C. S., G. Ziere, et al. (2012). British Journal of Clinical Pharmacology

Drug Burden Index (DBI) and Falls

- Drug Burden Index (DBI) is a method for measuring an individual's total exposure to anticholinergic and sedative drugs
- **CONCLUSION:** DBI is significantly and independently associated with falls in older people living in RACFs. Interventional studies designed for this population are needed to determine whether reducing DBI, through dose reduction or cessation of anticholinergic and sedative drugs, can prevent falls.
  - Wilson NM, Hilmer SN, March LM, Cameron ID, Lord SR, Seibel MJ, et al. Associations Between Drug Burden Index and Falls in Older People in Residential Aged Care. Journal of the American Geriatrics Society. 2011;59(5):875-80

Barriers

- Strategy effectiveness equivocal
- A major determinant of the effectiveness of a fall prevention strategy is the degree to which the intervention team has control over the implementation of the intervention; strategies in which one team recommends preventive interventions for a patient and a different team implements them have generally been ineffective.

http://grants.nih.gov/grants/guide/rfa-files/RFA-AG-14-009.html

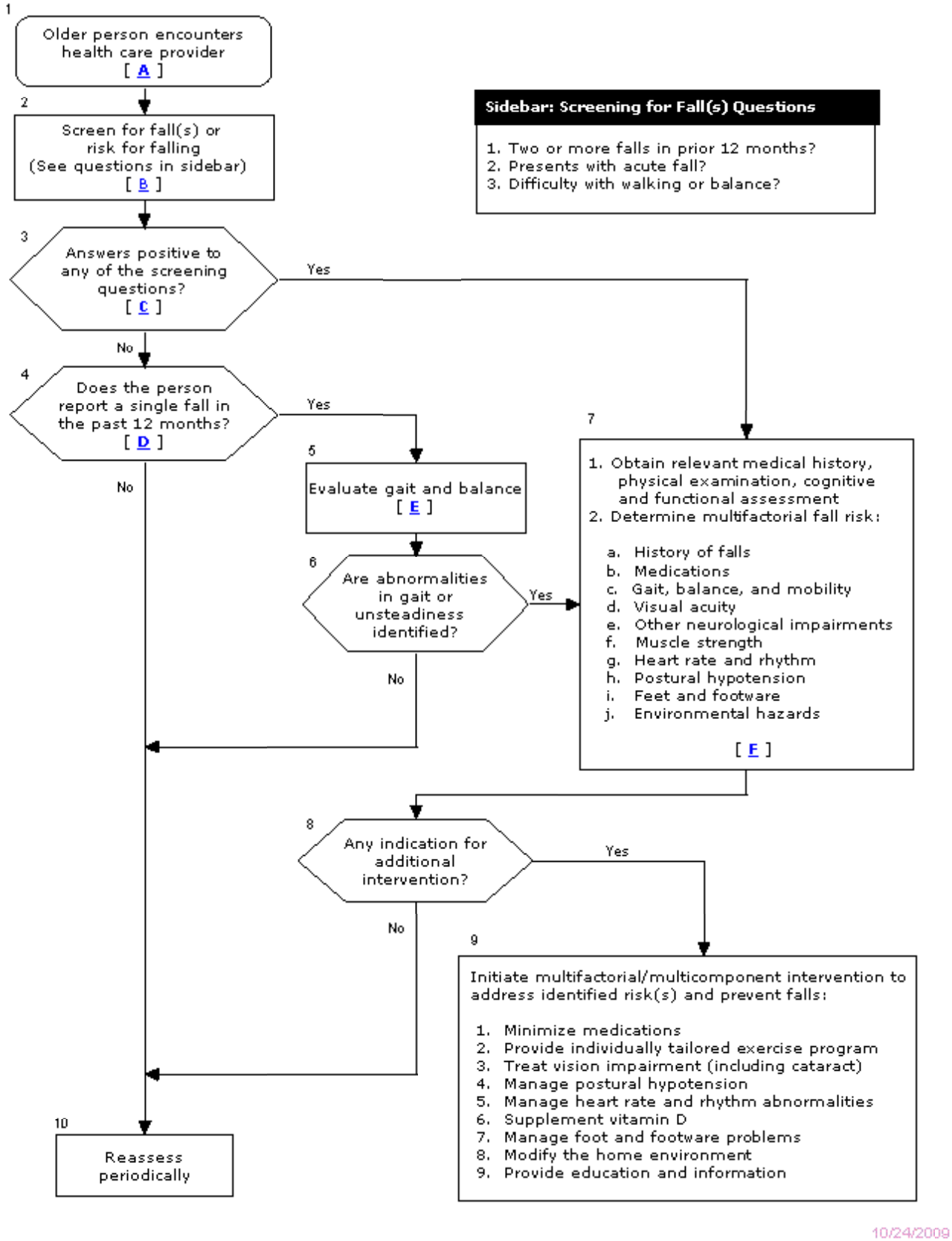
Barriers

- Providers' lack of relevant knowledge, expertise and/or adherence to guidelines;
- Geographic barriers to patients visiting healthcare providers and to providers' ability to assess and improve patients' home safety;
- Patients' incomplete adoption of recommended self-management of risk-modifying behaviors; and
- Lack of financial and organizational support required for planning, communication, and coordination among the providers of the risk-reducing healthcare, which is often needed to implement multifactorial strategies. In particular, the coordination of medication adjustment among several prescribers has proven difficult.

http://grants.nih.gov/grants/guide/rfa-files/RFA-AG-14-009.html

- AGS/BGS Clinical Practice Guideline*: Prevention of Falls in Older Person (2010)*
  - *http://www.medcats.com/FALLS/frameset.htm*
- Psychoactive medications (including sedative hypnotics, anxiolytics, antidepressants) and antipsychotics (including new antidepressants or antipsychotics) should be minimized or withdrawn, with appropriate tapering if indicated. [B]
- A reduction in the total number of medications or dose of individual medications should be pursued. All medications should be reviewed, and minimized or withdrawn. [B]

[x] = Annotation link (Click to see recommendations)



10/24/2009

AHRQ: Preventing Falls in Hospitals: A Toolkit for Improving Quality of Care

	Medication Fall Risk Score	
Point Value (Risk Level)	AHFS Class	**Comments**
3 (High)	Analgesics,* antipsychotics, anticonvulsants, benzodiazepines†	Sedation, dizziness, postural disturbances, altered gait and balance, impaired cognition
2 (Medium)	Antihypertensives, cardiac drugs, antiarrhythmics, antidepressants	Induced orthostasis, impaired cerebral perfusion, poor health status
1 (Low)	Diuretics	Increased ambulation, induced orthostasis
Score ≥ 6		**Higher risk for fall; evaluate patient**

* Includes opiates.

† Although not included in the original scoring system, the falls toolkit team recommends that you include non-benzodiazepine sedative-hypnotic drugs (e.g., zolpidem) in this category.

AHRQ: Preventing Falls in Hospitals: A Toolkit for Improving Quality of Care

- **How to use this tool:**
  - On admission and at regular intervals thereafter.
  - Tally points
    - If >1 med/risk category, multiply by # of meds
      - (risk level score) x (number of medications in that risk level category)
    - For a patient at risk, a pharmacist should use the evaluation tools to determine if medications may be tapered, discontinued, or changed to a safer alternative.
- **Reference:** Used with permission: Beasley B, Patatanian E. Development and implementation of a pharmacy fall prevention program. *Hosp Pharm* 2009;44(12):1095-1102. ©2009, Thomas Land Publishers, www.hosp-pharmacy.com.
- http://www.ahrq.gov/professionals/systems/hospital/fallpxtoolkit/index.html

	Medication Fall Risk Evaluation Tools
Indicator	**Comments**
Medications	Beers criteria, dose adjustment for renal function or disease state, overuse of medications, IV access
Laboratory	Therapeutic drug levels (digoxin, phenytoin), international normalized ratio, electrolytes, hemoglobin/hematocrit
Disease states	Comorbidities, hypertension, congestive heart failure, diabetes, orthopedic surgery, prior fall, dementia, other†
Education	Patient's ability/willingness to learn, patient's mental status

Use the tools above when evaluating patients found to have high medication-related risk for falls. The comments section provides information on how to evaluate the indicators.

† Age 65 years or older.

Interventions for preventing falls in older people living in the community

- Multifactorial interventions reduced rate of falls (RaR 0.76, 95% CI 0.67 to 0.86; 19 trials; 9503 participants), but not risk of falling (RR 0.93, 95% CI 0.86 to 1.02; 34 trials; 13,617 participants).
  - Rate ratio (RaR): rate of falls (e.g. falls per person year). Risk ratio (RR): # of fallers in each group.
- Gradual withdrawal of psychotropic medication reduced rate of falls (RaR 0.34, 95% CI 0.16 to 0.73; 1 trial; 93 participants), but not risk of falling.
- Of 19 multifactorial interventions, only 1 included medication evaluation.

Gillespie LD, Robertson MC, Gillespie WJ, Sherrington C, Gates S, Clemson LM, et al. Interventions for preventing falls in older people living in the community. Cochrane Database Syst Rev. 2012;9

Quality Use of Medicines program

- Education
  - clinical pharmacist met 2X w/ MD, how to conduct medication reviews, 1-page laminated desk-size sheets, # of targeted drugs used by their patients
- Medication risk assessment
  - Completed by patients
- Medication review checklist.
  - For “at-risk” patients
- Practice Incentive Payments
  - 10 reviews, reimbursed pharmacist time

Pit SW, Byles JE, Henry DA, Holt L, Hansen V, Bowman DA. A Quality Use of Medicines program for general practitioners and older people: a cluster randomised controlled trial. Medical Journal of Australia. 2007;187(1):23

Quality Use of Medicines program

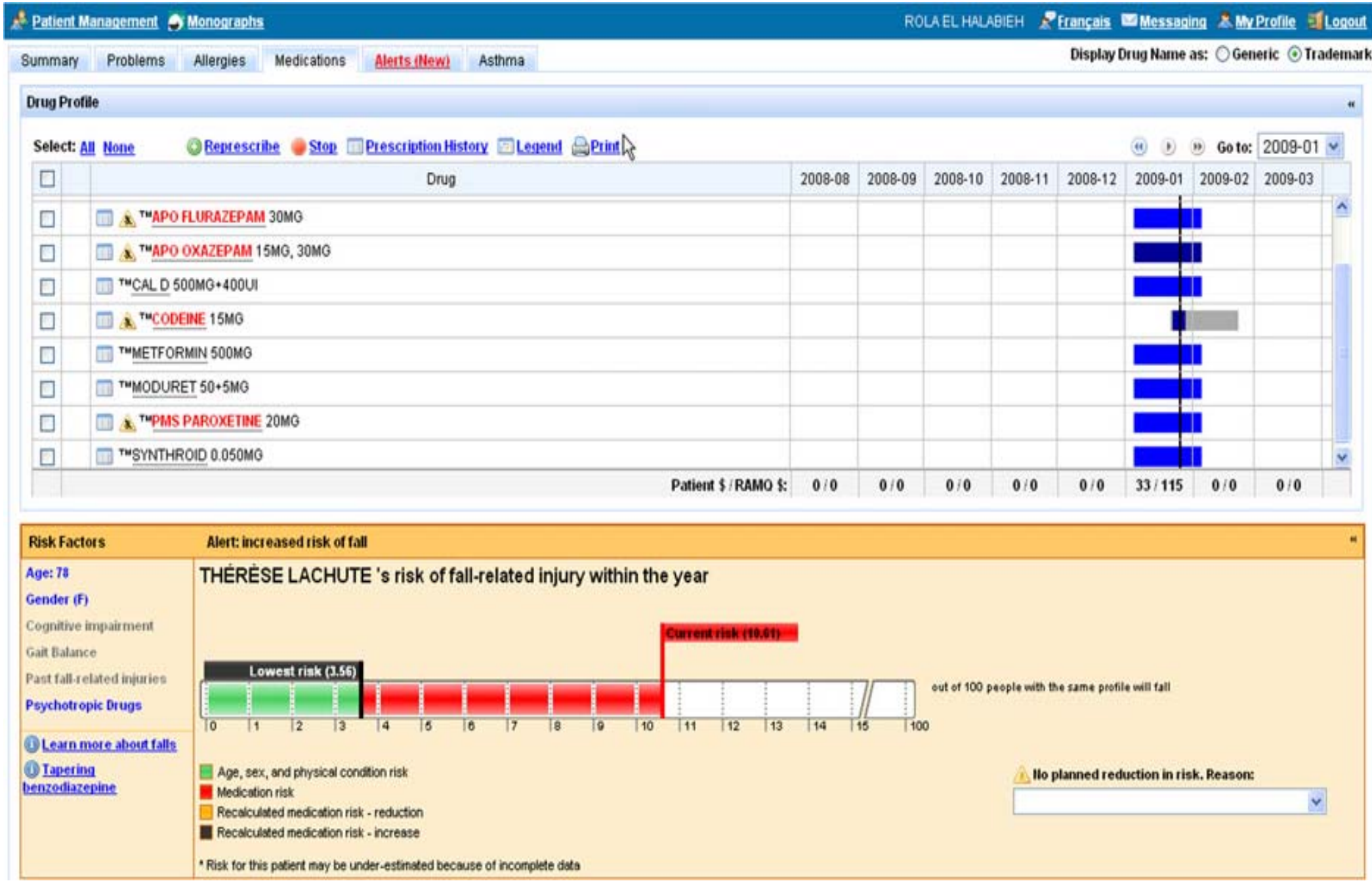
- At 12 months,
  - participants had lower adjusted ORs (AORs) for having a fall (AOR, 0.61; 95% CI, 0.41– 0.91), injury (AOR, 0.56; 95% CI, 0.32–0.96), and injury requiring medical attention (AOR, 0.46; 95% CI, 0.30–0.70).
- Conclusion: Education and systems for medication review conducted by GPs can be used to improve use of medicines. These interventions are associated with a reduction in falls among older people, without adverse effects on quality of life.

Pit SW, Byles JE, Henry DA, Holt L, Hansen V, Bowman DA. A Quality Use of Medicines program for general practitioners and older people: a cluster randomised controlled trial. Medical Journal of Australia. 2007;187(1):23

Computerized Drug Alerts

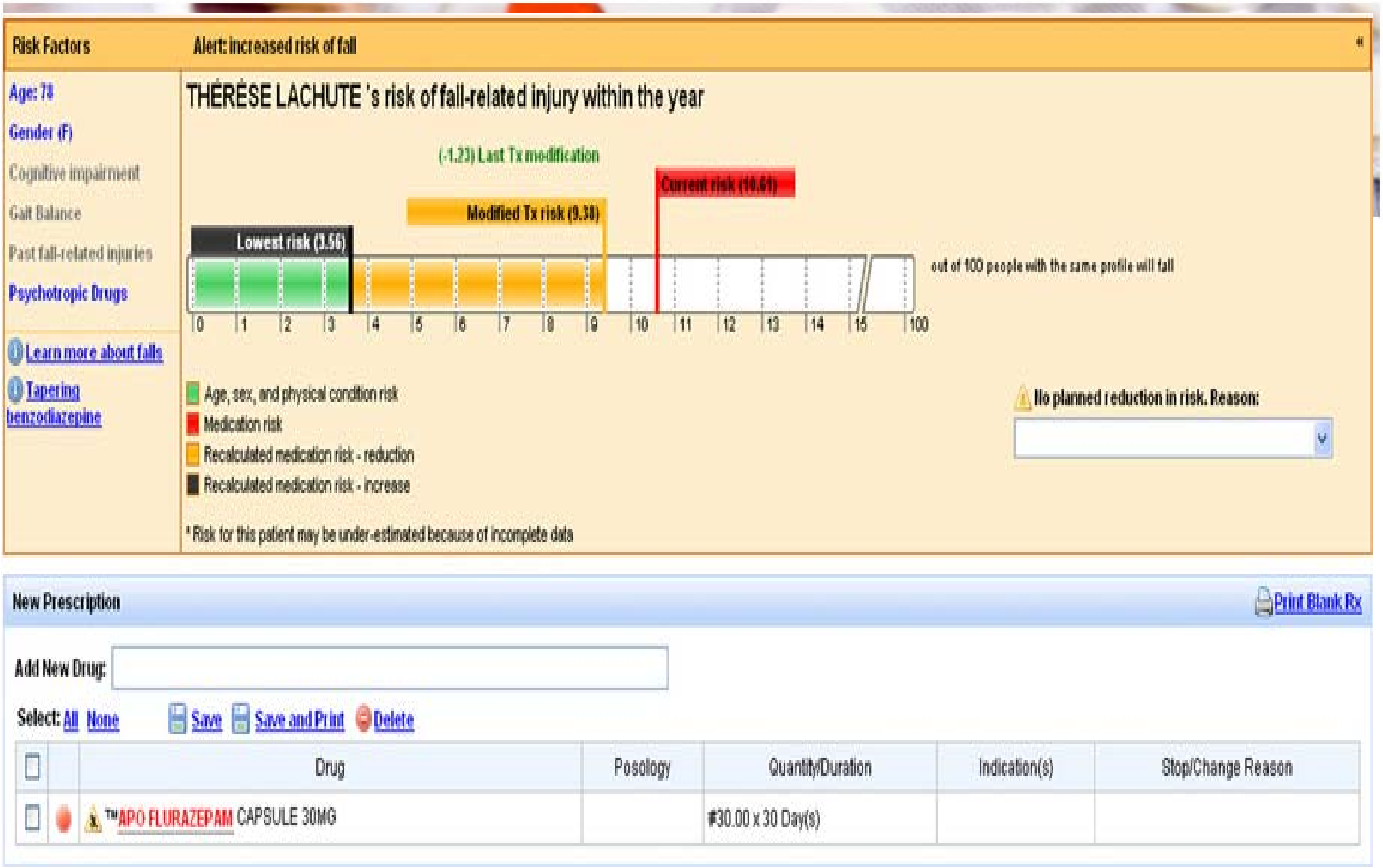
- Baseline risk of injury was 3.94 per 100 patients per year.
- The intervention reduced the risk of injury by 1.7 injuries per 1000 patients (95% CI 0.2/1000 to 3.2/1000; p=0.02).
  - The effect of the intervention was greater for patients with higher baseline risks of injury ($p<0.03$).
- Conclusion: Patient-specific risk estimates provide an effective method of reducing the risk of injury for high-risk older people.

Tamblyn R, et al. The effectiveness of a new generation of computerized drug alerts in reducing the risk of injury from drug side effects: a cluster randomized trial. Journal of the American Medical Informatics Association. 2012;19(4):635-43.



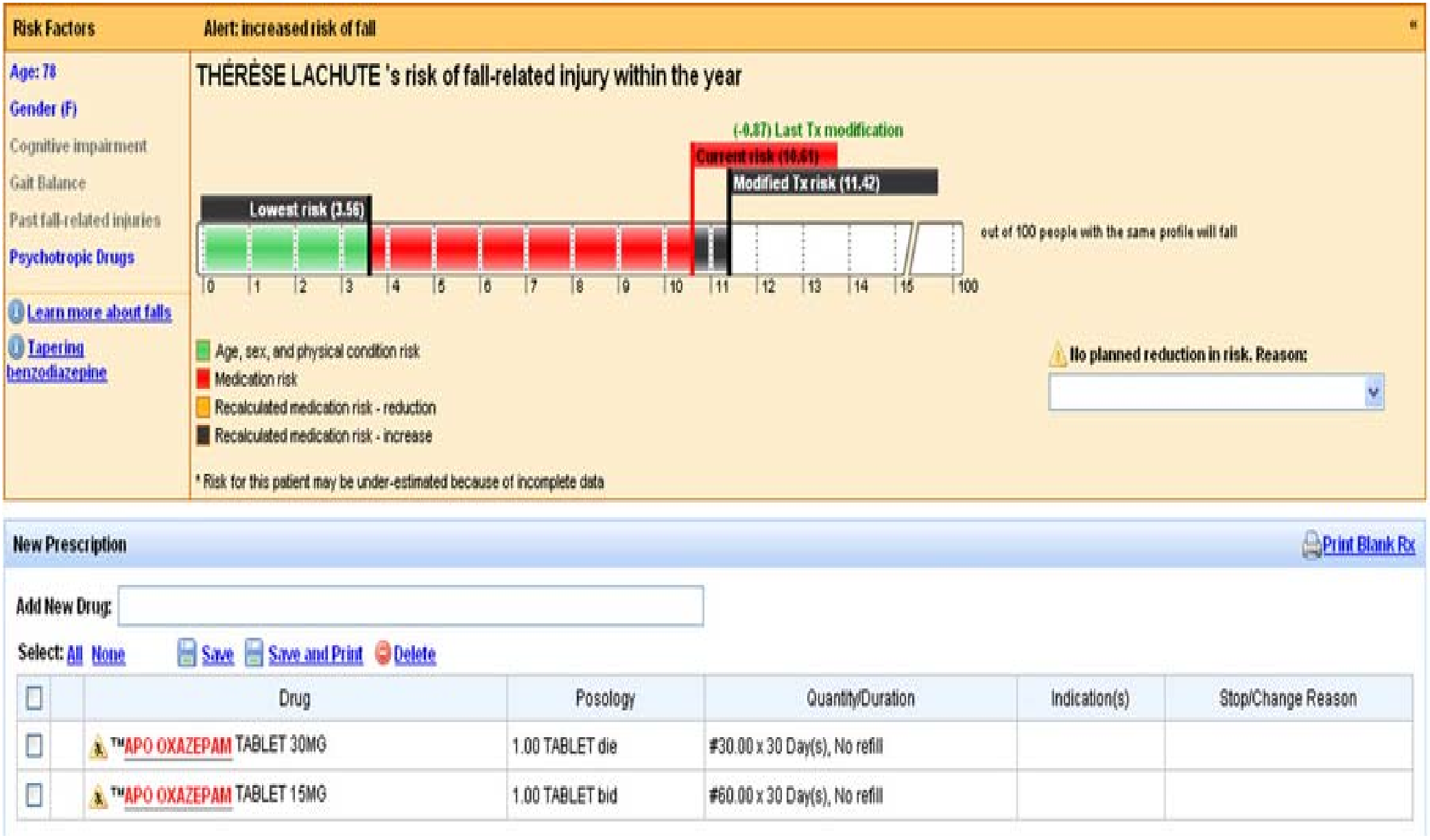
Screenshot of the user interface for the ‘risk of injury alert’ showing current risk and lowest possible risk.

J Am Med Inform Assoc 2012;19:635e643. doi:10.1136/amiajnl-2011-000609



Screenshot of the user interface for the risk of injury alert showing a reduction in risk due to modified treatment.

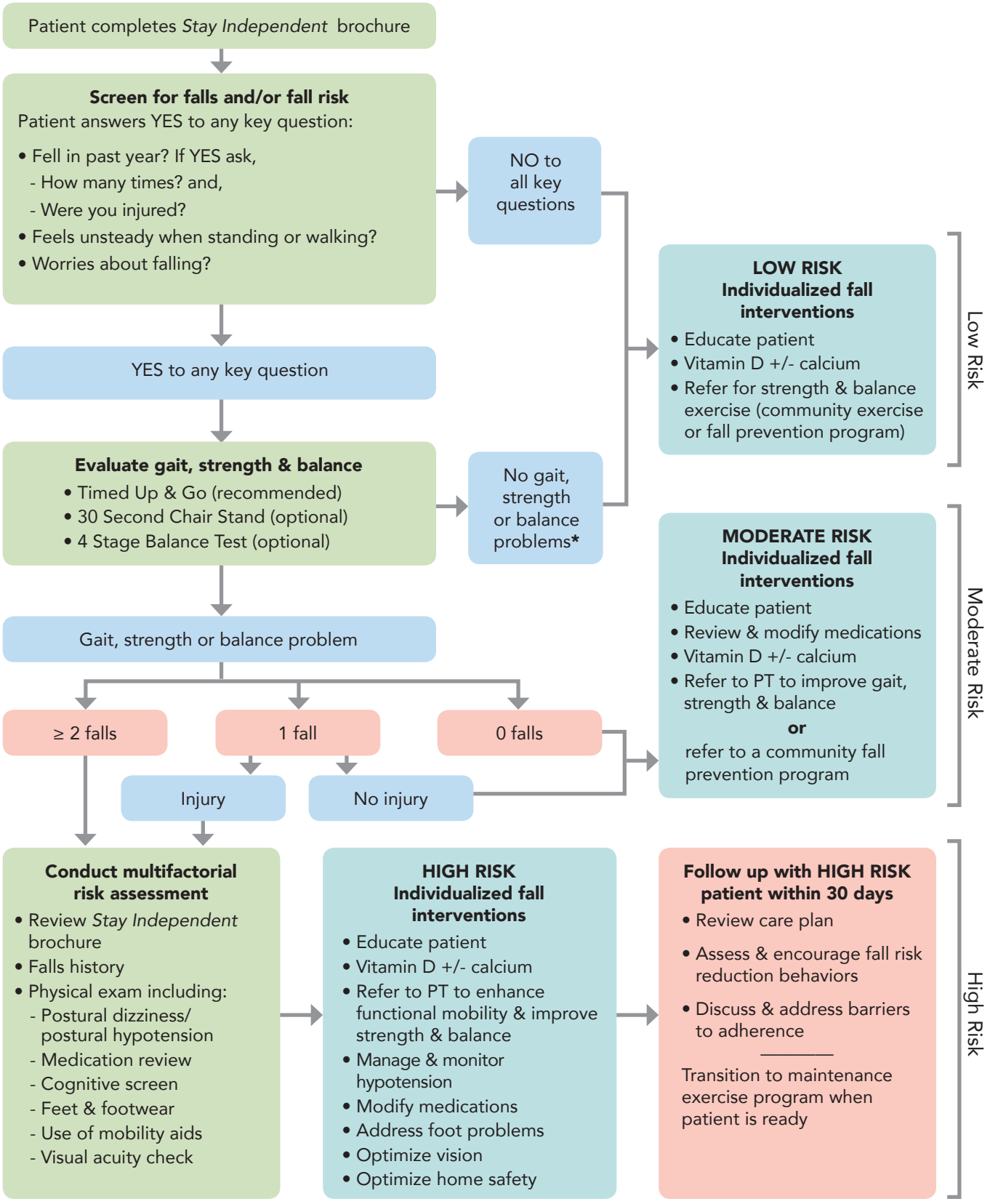
J Am Med Inform Assoc 2012;19:635e643. doi:10.1136/amiajnl-2011-000609



Screenshot of the user interface for the risk of injury alert showing risk increase with modified treatment.

J Am Med Inform Assoc 2012;19:635e643. doi:10.1136/amiajnl-2011-000609

Algorithm for Fall Risk Assessment & Interventions



*For these patients, consider additional risk assessment (e.g., medication review, cognitive screen, syncope)

Centers for Disease Control and Prevention
National Center for Injury Prevention and Control

STEADI Stopping Elderly Accidents, Deaths & Injuries

Medications Linked to Falls

Medication management can reduce interactions and side effects that may lead to falls. Although many medication classes have been linked to falls, the evidence is strongest for a few drug categories.

Review medications for patients 65 and older to:

- Eliminate medications if there is no active indication to use them.
- Reduce doses of necessary medications (e.g., antihypertensives) to the lowest effective dose.
- Avoid prescribing medications for an older person where the risk from side effects outweighs the benefit (e.g., skeletal muscle relaxants).

MOST importantly, reduce or eliminate:

- Psychoactive drugs, especially any benzodiazepines.
- Any medications with side effects like drowsiness, sedation, blurred vision, or confusion.
- Sedating over-the-counter (OTC) medications, specifically Benadryl and Tylenol PM, which contains Benadryl.

The American Geriatrics Society has additional information about medications and older adults. This information can be found at:

www.healthinaging.org/medications-older-adults/

geriatricscareonline.org/toc/2012_beer_criteria/CL001/?param2=search

Centers for Disease Control and Prevention
National Center for Injury Prevention and Control

STEADI Stopping Elderly Accidents, Deaths & Injuries

STEADI Program

Medication Review

Select each task that is part of the medication review.

- Reduce or eliminate medications linked to falls
- Medication review for indication

Review all medications the patient is taking, including OTCs. Explain to the patient that, because of age-related changes, they may need a lower dose, or to stop taking it altogether. Discontinue any medication without a current indication. Stopping certain medications, such as benzodiazepines and pain medications, may require tapering. A pharmacist can help with this. Consider non-pharmacologic approaches for symptom management, such as sleep hygiene measures for insomnia.

- Medication review for dosage
- Learn more about medications linked to falls

What Do You Think?

Who within your practice could be involved in fall prevention?
Select all that apply.

- [x] A) Physicians
- [x] B) Physicians Assistants
- [x] C) Nurse Practitioners
- [x] D) Nurses
- [x] E) Medical Assistants
- [x] F) Receptionists
- [x] G) Pharmacists

Correct. Everyone in the practice can play a role in implementing fall prevention strategies.

Submit

Falls Free®: 2015 National Falls Prevention Action Plan

National Falls Prevention Resource Center

ncoa
National Council on Aging

https://www.ncoa.org/healthy-aging/falls-prevention/

Falls Free®: 2015 National Falls Prevention Action Plan

- Goals, Strategies, and Action Steps
  A. Physical Mobility
  B. Medications Management
  C. Home Safety
  D. Environmental Safety in the Community

Medications Management

- **Goal A: All older adults will become aware that falling is a common adverse effect of some prescription and nonprescription medications and discuss these effects with their health care provider.**
- **Strategy 1 -** Increase the numbers of adults who have a **medication review** conducted by a qualified health care provider, such as a **pharmacist, at least on an annual basis**, and insure this review includes an adequate **focus on falls and fall-related injury prevention**, with the goal of reducing, altering, or eliminating medications that increase falls risk.

Medications Management – Goal A

- **Strategy 2 -** Conduct a strategically planned consumer education campaign to increase awareness of falls risks associated with medication use (prescription and nonprescription medications).
- **Strategy 3 -** Assure that falls self-management programs include a component on medications use and falls risk.
- **Strategy 4 -** Develop strategies to empower older adults and family members to take responsibility for medications management.

Medications Management

- **Goal B: Health care providers will be aware that falling is a common adverse effect of some prescription and nonprescription medications, and therefore will adopt a standard of care that balances the benefits and harms of older adult medication use.**
- **Strategy 1 -** Support health care provider efforts in the implementation of periodic medication review and modifications prior to each new prescription that is written for an older adult.

Medications Management – Goal B

- **Strategy 2 -** Develop a **systematic method for predicting how various combinations of medications interact with patient characteristics to increase risk of falls**, and then add to existing **pharmacy software** to check for drug interactions and contraindicated medications.
- **Strategy 3 -** Improve the education of health care professionals regarding the adverse effects of some medications in relation to increased fall risks among older adults, and about the correct use of medications that can reduce the risks of fractures due to falls for older adults.
- **Strategy 4 -** Maximize the opportunity to address falls issues as part of the **Medication Therapy Management Services** within the Medicare Part D benefit.

ASCP-NCOA
Falls Risk Reduction
TOOLKIT

Checklist

This resource is the primary assessment tool in the Toolkit and serves as the basis for the recommendations by pharmacists and other clinicians using this Toolkit. Download »

Bibliography

This resource provides references to research and best practices related to getting to know your patient, medical conditions, medication assessment, falls risk inducing drugs (FRIDs) and alternatives to FRIDs. This bibliography, which will be updated annually, provides the evidence-base for the Checklist. Download »

Interprofessional and Older Adult/Caregiver Communication Templates

These templates are intended to convey pharmacist findings and recommendations to other clinicians and to serve as a follow-up communication with the older adult and/or caregiver. These templates can be customized for the clinician's practice. Download »

Case Studies

Three case studies apply the use of the Checklist in reducing falls risk associated with medical conditions and medications. Download »

Authorization for Release of Medical Information

This form can be used by pharmacists and other clinicians to obtain additional medical information about their patients. It can also be used to obtain patient authorization to share personal health information. Download »

Community Resources and Referral

This section provides information about key clinical collaborators and community-based programs that pharmacists and other clinicians need to know about to develop a collaborative falls prevention service including cross-referrals. Download » Coming soon.

Consumer Resources

This section provides links to booklets, brochures and other handouts related to falls prevention and medications that can be given to older adults/caregivers for educational purposes. Download »

https://www.ascp.com/default.asp?page=fallstoolkit

Falls Risk Checklist

Check all that apply:

General Patient Factors

- ☐ Age over 65
- ☐ Age over 80
- ☐ Frail

Transition Status

- ☐ Pending transition
- ☐ Recent transition

Living Arrangements

- ☐ Lives alone
- ☐ Lives with spouse or other
- ☐ In home care, full-time
- ☐ Assisted living facility
- ☐ In home care, part-time
- ☐ Skilled care facility

Substance Use

- ☐ Alcohol, ___ drinks per day
- ☐ Marijuana
- ☐ Other Illicit substances

Vital Signs

Postural hypotension:

- ☐ Systolic BP falls ≥ -20 mm Hg
- ☐ Diastoic BP falls ≥ -10 mm Hg
- ☐ Dizzy or lightheaded with standing

Pulse:

- ☐ Irregular
- ☐ < 50bpm

Temperature:

- ☐ Over 98.6° F

Pain:

- ☐ Complaint of pain

Pain location(s):_____

Pain score ____ (0-10)

Ambulation Status

- ☐ Cane
- ☐ Front wheel walker
- ☐ Crutches
- ☐ Rollator
- ☐ Standard walker
- ☐ Wheelchair

Use appears correct: ☐ Yes ☐ No Correction provided: _____

Referral planned: _____

Sensory Function

Vision:

- ☐ Acuity < 20/40
- ☐ Blurred vision
- ☐ No eye exam in last year
- ☐ Corrected vision
- ☐ Regular use of glasses/contacts
- ☐ Sporadic use glasses/contacts

Hearing:

- ☐ Hearing deficit
- ☐ Regular use hearing aid
- ☐ Sporadic use hearing aid

Taste/smell:

- ☐ Changes in taste
- ☐ Changes in smell

Feet/lower extremities:

- ☐ Altered lower extremity sensation
- ☐ Foot pain
- ☐ Bunion
- ☐ Hammer toe
- ☐ Plantar fasciitis
- ☐ Heel spur
- ☐ Ingrown toenail

Medication Self Management

- ☐ Medications disorganized
- ☐ Evidence of adherence issues

If yes, explain: _____

_____

Falls History

- ☐ Any falls in past year
- ☐ Expresses worry about falling
- ☐ Number of falls in past year _____ Injury? _____
- ☐ Feels unsteady standing or walking

Medical Conditions

- ☐ Arrhythmia (e.g. a fib)
- ☐ Cerebellar ataxia
- ☐ Depression
- ☐ Impaired renal function
- ☐ Lower extremity arthroplasty
- ☐ Malnutrition, dehydration
- ☐ Pain
- ☐ Arthritis (osteo, rheumatoid)
- ☐ CVA/Stroke
- ☐ Hemophilia
- ☐ Incontinence
- ☐ Lower extremity (LE) injury/pain
- ☐ Multiple sclerosis
- ☐ Parkinson's disease
- ☐ Cardiovascular disease/MI
- ☐ Dementia
- ☐ Impaired hepatic function
- ☐ Infection (e.g. UTI)
- ☐ LE neuropathy - ☐ monofilament
- ☐ Obesity
- ☐ Seizures

Medication Assessment

Number of medications (Rx, prn, OTC, vitamin, supplement, herbal) ☐ ≥ 5 ☐ ≥ 10

Recent medication regimen change ☐ within last week ☐ within last month

Falls risk Medication-Related-Problems detected:

- ☐ Suboptimal dose*
- ☐ Interactions between medications, food, medical conditions
- ☐ Allergies and intolerances within current regimen
- ☐ Dose too high**
- ☐ Lacking medication therapy for all medication-requiring indications
- ☐ Unnecessary medication
- ☐ Safer evidence-based therapy available
- ☐ Difficulty administering any medication (eye drops, inhalers, large dosage forms)

* suboptimal dose - check doses based on renal and hepatic function

** dose too high - causing adverse effects and/or unnecessary risk

Falls Risk Checklist

Check all that apply:

Medications

- ☐ Anticholinergics (e.g. oxybutinin, trihexiphenidyl, amitryiptyline)
- ☐ Antihypertensives/CV meds (especially α-blockers, nitrates)
- ☐ Dopaminergic agents
- ☐ Opioids
- ☐ Anticonvulsants
- ☐ Antipsychotics/neuroleptics - typical or atypical
- ☐ Hypoglycemia agents
- ☐ Sedative/hypnotics
- ☐ Antidepressants
- ☐ Benzodiazepines (short or long t 1/2)
- ☐ Muscle relaxants
- ☐ Over-the-counter: diphenhydramine, doxylamine

Gait, Strength, & Balance

Timed Up and Go (TUG) Test ≥12 seconds — Score: _____ seconds

30-Second Chair Stand Test Below Average Score — Score: _____ number

4-Stage Balance Test <10 seconds

- Parallel Stance — Score: _____ seconds
- Semi-Tandem Stance — Score: _____ seconds
- Tandem Stance — Score: _____ seconds
- One-legged Stance — Score: _____ seconds

Observed gait problems or difficulty standing — ☐ Yes ☐ No

(See STEADI for instructions for the above functional assessments)

Fall Prevention Recommendations (prioritized)

Telephone Call, Letter or Fax Talking Points for Pharmacist Communication With Physicians or Other Health Care Providers

[Name]
[Address]
[Address 2]

[Date]

- Introduce yourself and the name of the pharmacy that you are calling from.
- Our pharmacy has a Falls Prevention Program, based on the **Centers for Disease Control and Prevention's STEADI Tool Kit. STEADI stands for Stopping Elderly Accidents, Deaths and Injuries** and it was developed by the CDC's National Center for Injury Prevention and Control.
- Using the CDC's STEADI tool kit, we can identify patients at low, moderate and high risk for a fall; identify modifiable risk factors; and offer effective interventions for prevention.
- Your patient, [Name of Patient], requested that I contact you to discuss the recommendations that came out of our falls risk assessment, which are for your consideration.
- Based on the falls risk assessment I conducted, there are some findings and falls prevention recommendations that I want to share with you for your consideration.
    - Finding #1 and related recommendation
    - Finding #2 and related recommendation
    - Finding #3 and related recommendation
    - Other findings and recommendations (if needed)
- Next steps (describe next steps and specific follow-up activities related to the findings and recommendations described above).
- Please do not hesitate to contact me if you have any questions about the information I have shared with you today. I can be reached at (XXX) XXX-XXXX.
- I look forward to collaborating with to prevent falls among older adults in our community.

Sincerely,

[Signature]
[Printed Name]

Telephone Call Talking Points or Written Communication Outline
For Family Representative/Caregiver

[Name]
[Address]
[Address 2]

[Date]

- Introduce yourself and indicate the name of the pharmacy that you are calling from.

- Our pharmacy has a Falls Prevention Program, based on the **Centers for Disease Control and Prevention's STEADI Tool Kit. STEADI stands for Stopping Elderly Accidents, Deaths and Injuries.** It was developed by the CDC's National Center for Injury Prevention and Control.

- Using the CDC's STEADI Tool Kit, we can identify people at low, moderate and high risk for a fall; identify factors that can increase the risk of falling, such as certain medications; and offer effective interventions for prevention.

- Your family member, [Name of Family Member], requested that I give you a call to discuss the recommendations that came out of our Falls Risk Assessment. I (will be communicating/have communicated) with the patient's primary care physician, as well.

- Based on the falls risk assessment I conducted, there are some findings and recommendations to decrease [Name of Family Member] falls risk that I want to share with you. As I mentioned, these findings and recommendations (will/have been) shared with [Name of Family Member] physician.

    - Finding #1 and related recommendation
    - Finding #2 and related recommendation
    - Finding #3 and related recommendation
    - Other findings and recommendations (if needed).

- Next steps (describe next steps and specific follow-up activities related to the findings and recommendations described above).

- Please do not hesitate to contact me if you have any questions about the information I just shared with you. I can be reached at (XXX) XXX-XXXX.

Sincerely,

[Signature]
[Printed Name]

Health Foundation
for Western & Central New York

Falls Prevention
STEP UP TO STOP FALLS

This easy-to-use falls prevention toolkit contains a variety of resources for health care professionals who work with older adults, older adults themselves, as well as their caregivers. Examples include exercises to improve strength and balance, a home safety assessment checklist, and professional screening and competency guides.

Toolkit Contents

- Balance and Exercise
- Home and Environment Safety
- Health Care Professionals
- Community Education
- Video Clips
- Logo

How do I use the ASCP-NCOA Falls Risk Reduction Toolkit?

1. To begin, it is recommended that Toolkit users listen to the following two webinars that provide needed background on falls among older adults, national and state falls prevention efforts, medical conditions and medications as a risk factor for falls:
    - A Collaborative Approach to Falls Prevention: Introduction to the ASCP-NCOA Toolkit
    - National and State Efforts to Reduce Falls Among Older Adults
2. Familiarize yourself with each of the components in the ASCP-NCOA Toolkit as well as the components in the STEADI Toolkit.
3. Determine which components may work best and what falls risk reducing role you will assume, while taking into consideration your practice setting, patient population, interprofessional colleagues, and institutional or community resources.
4. Establish a process to help identify patients most in need of a more comprehensive falls risk assessment. Consider training technicians, frontend office workers, or in-the–field case managers to use basic falls screening tools such as the "Stay Independent" brochure or appropriate components of the check list in the STEADI toolkit.
5. Set up a means by which individuals with positive screens can be referred to you for a more comprehensive assessment. Take into consideration referral processes both internal and external to your practice setting. Determine what patient information should accompany the referral.
6. Start the comprehensive assessment by filling in what information you have for the patient on the ASCP-NCOA falls risk Checklist.
7. Interview patient/caregiver using ASCP-NCOA falls risk Checklist to finish gathering pertinent information.
8. Use materials available in STEADI to provide instruction for orthostasis, gait and balance assessments, or refer patient to other member of healthcare team for these assessments.
9. Prioritize, document and share your findings with patient/caregiver and other members of the patient's healthcare team using communication sample in Toolkit.
10. Include in your documentation a plan to address findings, including alternative medications and/or non-pharmacologic strategies.
11. Use citations from the bibliography to support findings and alternative strategies, as necessary.
12. Provide additional educational materials from STEADI to patient/caregiver, when appropriate, to assist in conducting an in-home falls hazards assessment and to provide information on how to further reduce falls risk.
13. Develop your referral base for falls risk reduction services and refer patients based on individual needs to appropriate resources. Examples: neurologist, geriatrician, physical therapist, occupational therapist, contractor/handyman, community programs such as Stepping On and TaiChi.
14. Follow-up with patients on implementation of recommendations and improvement of falls status.

Medication Therapy Management (MTM) fall risk wellness clinic

- Measure 1
  - Presentation on falls
- Measure 2
  - Conduct MTM
    - P3's - APhA certificate
    - Focus on falls

Impact and Outcomes

Fall Risk Assessment Results

Fall Risk Score

- Fall Risk Score ≥ 6: 29 Participants
- Average Risk Score: 6.75
- Highest Fall Risk Score: 16
- Cumulative # of Medications Recorded as:
  - "Low Risk" 31
  - "Medium Risk" 104
  - "High Risk" 36

Medication Report Card (MaRCs)

University at Buffalo School of Pharmacy and Pharmaceutical Sciences

Name: John Q. Public DOB: 6/4/1945 Date: 7/6/2015

	Normal	Borderline		High Risk			
Subject	A	B	C	D	F	GPA	Grade
Falls Risk					F	0.16	F
Cognitive Risk	A					3.95	A
Potentially Inappropriate M		B				3.25	B
Adherence			C			2.25	C

Cumulative Grade: **C+**

2.40

GPA

Grade	Scale
A+	4.00
A	3.85
A-	3.70
B+	3.30
B	3.00
B-	2.70
C+	2.30
C	2.00
C-	1.70
D+	1.30
D	1.00
F	0.00

Understanding your medication related falls risk grade

Medications have been implicated in contributing to falls and fractures in the elderly since the early 1980's. This grade has been calculated based upon the best current medical evidence. Use this information to work with your provider and pharmacist to reduce your risk and improve your grade. Since some medications can't be stopped as they are needed to control certain chronic conditions, a low grade can be offset by participating in strength and balance programs. Do NOT stop any medications until authorized by your doctor.

Medications contributing to your medication related falls risk grade and possible alternatives.

Medication name	Grade deduction	Potential Alternative
Escitalopram	1	
fentanyl transdermal system	0.97	
diazepam	0.63	
ASPIRIN	0.33	
Doxazosin	0.3	
Digoxin	0.29	
cyclobenzaprine HCl	0.22	
metoprolol succinate	0.09	
	0.01	
0		

Falls Risk Grade: **F**

0.16

GPA

Have you fallen in the past year?

Do you feel unsteady when standing or walking?

Do you worry about falling?

Actions that you should take:

- ☐ Vitamin D, at least 800 IU/day
- ☐ Ask your MTM pharmacist about safer alternatives to your high risk drugs
- ☐ Enroll in the _____ Strength and Balance program.
- ☐ Use your Medication Action Plan (MAP)
- ☐ Consult with a Physical/Occupational Therapist to make your living environment safer.
- ☐ Use assistive devices where appropriate.

Summary and Questions

- Aging is multifactoral risk factor for falls.
  - Medications can cause falls. (Modifiable)
  - Medications can effect systems/deficits
- Barriers
  - Just as complex as the problem
- Interventions
  - Answers are elusive, complex and a significant drain on resources
  - Tools are in development
    - ASCP-NCOA Falls Risk Reduction Toolkit offers a multimodal approach with focus on medications.
- rgwahler@buffalo.edu