

Canadian Pharmacists Conference 2015

Innovation and Collaboration

The role of the pharmacist in falls prevention

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Jointly presented by the Canadian Pharmacists Association (CPA) and the Ontario Pharmacists Association (OPA)

Disclosures

- None related to this topic



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Learning objectives

- Understand the epidemiology and patterns of falls
- Understand opportunities at transitions of care for identifying falls risk
- Review common medications causing falls
- Discuss various chronic disease states that increase the risk of falls
- Discuss tools to evaluate falls
- Identify opportunities for pharmacists in falls preventions



Falls end lives; Good balance saves them



The wisest doctor I know says this to his elderly patients:

“There are two keys to having a long and happy life: one is don’t fall; two is stay away from doctors.”

(Nicholas Capazzoli)

<http://www.consultantlive.com/articles/falls-end-lives-good-balance-saves-them-0?GUID=03E7E2A7-19A7-46B3-8FA4-F876B29E61D0&XGUID=&rememberme=1&ts=31032015>



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Tell a story . . .

- Paint a picture
 - Facts don't motivate people
 - Canadian Adverse Event study
 - 1 in 165 died from a preventable ADR
- Move and captivate people
 - Heroes triumphs and tragedies
- Touch people's emotions
 - Stories are multidimensional
 - Trigger experience and recollection
- Engage people with interaction
 - Listening to stories spurs imagination
 - Builds rapport and trust



Patient case 1

- BK is a 65-year-old female who lives in her own home with her husband in SW Ontario
- She was referred to the memory clinic for evaluation Dec 2014
- PMH is significant for CA cervix 1984, ADHD, Bells palsy 2013, type 2 diabetes with gastroparesis, hypertension, fibromyalgia
- She had to retire early from her position at a chemical plant because of inability to do her job properly due to her memory
- Adherence assessment: Takes most of her medications in the morning, has them in a pill box and does not miss meds – 10 pills/day per her count
- Falls: Three falls in the last 12 months with no correlation with medication timing
- Medication risk for falls: See list



Medications

- Lantus insulin
- Metformin
- Gliclazide MR
- Quinapril/HCT
- Desvenlafaxine
- Adderal XR
- OxyNeo 60 mg bid
- Percocet prn
- Hydromorphone prn
- Prochloroperazine
- Pantoprazole
- ASA EC 81 mg
- Glucosamine
- Zopiclone
- Vitamin B12 oral & IM
- OTC Gravol,
Robitussin



Labs/Vitals

- Hemoglobin 118
- TSH 2.56
- Na 136
- K 3.6
- Scr 84
- eGFR 59 mL/min/1.73 m²
- Blood glucose 9.8 fasting
- A1C 8.1%
- Alb 42
- LDL 1.95
- TG 1.29
- BP sitting 136/86
- BP standing 96/50
- Pulse 97
- MOCA score 25/30 during assessment



FROP-COM

- Falls Risk for Older People-Community Setting (FROP-COM)
- Takes into consideration history of falls, injury from falls, circumstances of falls, medications, medical conditions, sensory loss, feet and footwear, cognitive status, continence, nutritional status, environment, functional behaviour, function, balance, gait
- Provides grading of fall risk
- **BS FROP COM score=17**



Patient case 2

- DM is an 85-year-old male who lives alone in a house
- His chief complaint is that he is falling periodically
- He has a past history of spine fusion (2011) and is worried that he has damaged his back based on his last fall
- He is a vague historian so it is not really clear when the last fall occurred



Patient case 2

- **Other past medical history** from the patient includes a history of thyroid surgery, rotator cuff repair, endarterectomy, pacemaker (2010), eye laser surgery, cystoscopy, fluid on the lungs (drained 1-2 years ago).
- Other medical conditions based on medications and discussion with patient: hypertension, hypercholesterolemia, Type 2 Diabetes x 10 years, hypothyroidism, GERD, constipation, TIA
- He has gone to a physiotherapist in the past and exercises using elastic bands, weights, and has exercise machines present in the living room
- He does have a friend that visits him at times and his friend was present during the interview and helped to determine timelines of events



Patient case 2

- **Adherence assessment: Medications as per home medication review (18 medications)**
- He gets his blister packs filled four weeks at a time. He **does not seem to be adherent to** his medications based on viewing the current blister pack
- He is also two weeks behind based on the dates of the cards from the pharmacy
- He is currently on warfarin and does not have this included in the blister because of changing doses
- Many medications that increase risk of falls



Medications

- Amlodipine
- Atorvastatin
- Digoxin
- Furosemide
- Metoprolol
- Levothyroxine
- Metformin
- Warfarin
- Nitroglycerin patch
- Tylenol #3
- Fentanyl patch 50 mcg
- Zopiclone
- Ferrous gluconate
- Docusate sodium
- Lansoprazole
- Salbutamol
- Tiotropium
- Multivit with omega 3



Labs/Vitals

- BP 130/73 & pulse 105
- BP at 1 minute standing 130/75 & pulse 107
- BP at 3 minutes standing 156/80 pulse 108
- No orthostatic hypotension
- Blood glucose range in 6 (no self reports of hypoglycemia)



FROP-COM

- **Falls concerns and falls risk assessment FROP-COM = 33 - HIGH RISK OF FALLS**
- Recent falls, minor soft tissue injury/muscle soreness in back
- 18 medications including opiates x 2, sleep aid, digoxin, diuretic, warfarin, antihypertensives
- Several medical conditions that increase risk of falls
- Vision loss, sensory loss, drop foot and improper foot wear, continent but makes several trips to the washroom at night
- Does try to eat and uses protein supplements for diet



Patient case 2

- **Environment extremely unsafe**
 - Improper lighting, patient uses a stool to reach items in kitchen cupboards, clutter in house that would increase risk of tripping and patient already has balance problems, walks around in bare feet
 - He has stopped doing some activities because of his fear of falling
 - Steps at the back door are steep and have metal pieces on them. He comes in the back door from his car with his groceries.



Falls epidemiology



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Falls and injury

- Falls are the number one cause of injury, hospital visits due to trauma, and death from an injury among people age 65 and older
- Falls among older adults is a serious issue, but research has shown that many fall risks can be reduced
- It is estimated that one in three older adults falls each year
- Economic cost of falling in the elderly is significant



Causes of falls

- Most falls in elderly are multi-factorial in origin and difficult to predict
- Physical injury and psychological trauma after a fall causes a downward spiral of events
- Fear of failing contributes to disability due to decreased exercise
- Medications are commonly implicated as causative factors in falls in elderly

Keys P. Journal of Pharmacy Practice 2004; 17; 2:149-152



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Cochrane Review 2012

- **Interventions for preventing falls in older people living in the community**
- Background: Approximately 30% of people over 65 years of age living in the community fall each year.
- Objectives of the review: To assess the effects of interventions designed to reduce the incidence of falls in older people living in the community
- Primary outcome: Rate of falls, number of fallers
- Secondary outcomes: Number of participants sustaining falls, related fractures, adverse effects, economic outcomes

Cochrane Review CD 007146, 2012 Issue 9



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Cochrane Review 2012

Author's findings:

- Group and home-based exercise programs and home safety interventions reduced rate of falls and risk of falls
- Multi-factorial assessment and intervention programs reduced rate of falls but not risk of falling
- Tai Chi reduced risk of falling
- Overall vitamin D did not reduce rates of falls or risk of falling but may do so in people with lower vitamin D levels before treatment
- Gradual withdrawal of psychotropic medication reduced rates of falls but not risk of falling

Cochrane Review CD 007146, 2012 Issue 9



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Patterns of modifiable risks

P/P

- Mobilize Boston Study - 765 community dwelling patients over age 70 followed prospectively for falls over five years

I/C

- Baseline demographic and clinical data collected by questionnaire and comprehensive clinic exam
- Recorded falls, injuries and hospitalizations

O

- Four distinct trajectories: No Falls (30.1%), Cluster Falls (46.1%), Increasing Falls (5.8%) and Chronic Recurring Falls (18.0%)

Tchalla AE. PLoS One 2014; 9 (9): e106363



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Patterns of modifiable risks

- Predictors of Cluster Falls were faster gait speed and fall in the past year
- Predictors of Increasing Falls were diabetes mellitus and cognitive impairment
- Predictors of Chronic Recurring Falls were multi-morbidity and fall in the past year
- Symptoms of depression were predictive of all falls trajectories
- Target patients with multiple falls, multi-morbidity and depression for prevention measures

Tchalla AE, PLoS One. 2014 Sep 3;9(9):e106363



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Clinical consequences of polypharmacy

- Burden of taking multiple medications associated with greater health care costs, increased adverse drug events, drug interactions, medication non-adherence, reduced functional capacity and multiple geriatric syndromes
- Cognitive impairment
 - 33% of patients taking 6-9 medications
 - 54% taking 10 or more medications
- Falls
 - Use of four or more medications was associated with increased risk of falling and risk of recurrent falls
- Clinical pharmacist involvement in teams has helped to reduce unnecessary prescribing

Maher RL, Expert Opin Drug Saf. 2014 Jan;13(1):57-65



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Falls in hospitals and during transitions of care



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Fall risks in hospitalized patients

P/P

- Retrospective and quantitative study from June 2008 to December 2010 in a private hospital for acute patients in Portugal
- 214 episodes of all event notifications in 193 patients

I/C

- To assess fall risk and the medication related fall risk- Morse Fall Risk scale and Medication Fall Risk Score

O

- Patients who received CNS drugs from the therapy group are 10 times more likely to have fall risk (OR 9.9, 95% CI 1.6-60.63)
- Association found between falls and its recurrence among patients receiving haloperidol and tramadol

Costa-Dias MJ, Nurse Educ Today. 2014 Feb;34(2):171-6



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Transitions of care

P/P

- Prospective observational study was conducted of 351 patients discharged home from hospital with transitions of care program in Australia

I/C

- A comprehensive geriatric assessment was conducted at the transitions of care program admission and discharge using a interRAI tool and frailty index

O

- Polypharmacy (5-9 drugs) observed in 46,7% and hyperpolypharmacy (>10 drugs) in 39.2% of patients
- Increased meds with increased comorbidity – diabetes, CAD, COPD, dizziness, dyspnea, frailty

Runganga M, Clin Interv Aging. 2014 Sep 2;9:1453-62.



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Transitions of care

- At discharge from the program, the non-polypharmacy group (<5 drugs) had improved outcomes in ADLs and iADLs and fewer falls, which was mediated because of lower levels of frailty.
- The commonest drugs were analgesics (56.8%) and antiulcer drugs (52.7%).
- The commonest potentially inappropriate medications were tertiary tricyclic antidepressants like amitriptyline
- Polypharmacy is associated with frailty, **falls** and poor functional outcomes
- Regular medication reviews by pharmacists and geriatricians recommended

Runganga M, Clin Interv Aging. 2014 Sep 2;9:1453-62.



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Medications inducing falls



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Odds ratios of drugs that increase falls

Drugs

- Antidepressants SSRIs 1.66
- Tricyclic antidepressants 1.51
- Antipsychotics 1.50
- Benzodiazepines 1.48
- Opiates 0.97

Drugs

- Cardiovascular agents
- Antiarrhythmics 1.59
- Digoxin 1.22
- ACEI 1.20
- Central acting antihypertensives 1.16
- Nitrates 1.13
- Diuretics 1.08

Huang, A. Managing Medication Related Falls in Elderly. *Drugs Aging* 2012; 29(5):359-76



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Pharmacokinetics/dynamic considerations with medications

Fall-risk-increasing drugs (FRIDs)

- central nervous system-acting agents
- cough preparations
- nonsteroidal anti-inflammatory drugs
- anti-Alzheimer's agents
- antiplatelet agents
- calcium antagonists

Fall-risk-increasing drugs (FRIDs)

- diuretics
- α -blockers
- Digoxin
- hypoglycemic drugs
- neurotoxic chemotherapeutic agents
- nasal preparations
- antiglaucoma ophthalmic preparations

Chen Y, Ther Clin Risk Manag. 2014 Jun 13;10:437-48



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Pharmacokinetics/dynamic considerations

- The degree of medication-related fall risk was dependent on one or some of the following factors:
 - drug pharmacokinetic/pharmacodynamic properties (e.g., elimination half-life, metabolic pathway, genetic polymorphism, risk rating of medications despite belonging to the same therapeutic class)
 - and/or characteristics of medication use (e.g., number of medications and drug-drug interactions, dose strength, duration of medication use and time since stopping, medication change, prescribing appropriateness, and medication adherence)



Pharmacist-conducted clinical medication reviews

Recommendations to prevent falls:

- Pharmacists accurately identify all current medications given to the patient, consider appropriateness of each medication, actual adverse drug reactions and compliance issues
 - Establish computerized alerts of FRIDs
 - Seek alternative drug with lower fall risks
 - Withdraw FRIDS or reduce dose if clinically indicated
 - Simplify medication regimens, improve adherence
- Periodic reassessment of potential risk via pharmacist-conducted clinical medication review

Chen Y, Ther Clin Risk Manag. 2014 Jun 13;10:437-48



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Anticoagulants

P/P

- A total of 377,873 patient records met the inclusion criteria, 42,913 on OAC and 334,960 controls.
- Retrospective analysis of a California Database from 1995 to 2009. The mean age was 82.4 and 80.6 years, respectively.
- Most were female, with CHA2DS2-VASc scores between 3 and 5

I/C

- Elderly anticoagulated patients (age > 65 years) with known atrial fibrillation or flutter who fell were stratified by CHA2DS2-VASc score and compared with a non-anticoagulated control cohort

O

- Elderly patients with atrial fibrillation or flutter who experience ground-level falls are at risk for lethal head injuries
- Mortality among OAC patients after a first fall was 6%, compared with 3.1% among non-OAC patients
- Patients dying with a head injury constituted 31.6% of deaths within OAC patients compared with 23.8% among controls

Inui TS, J Trauma Acute Care Surg. 2014 Mar;76(3):642-9



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Anticoagulants and fall risk medications

P/P

- 112 patients at least age 65 admitted with outpatient fall
- Consecutive chart review of patients at level 2 trauma center in California over one year

I/C

- Patients on antithrombotics + fall risk meds (Beers, STOPP/Start) vs. antithrombotics alone in elderly fall patients
- Analyze severity score and occurrence of intracranial hemorrhage

O

- 39% of outpatients were prescribed antithrombotics plus fall-risk medications
- For outpatients over 80 years of age, the odds of experiencing a **post-fall intracranial hemorrhage are four times higher** when prescribed antithrombotics plus fall-risk medications compared to antithrombotics alone and injury severity is higher with combined use of these medications

Hohmann N, Geriatr Nurs. 2014 Jan-Feb;35(1):20-5.



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Starting antihypertensive medications

P/P

- Population-based self-controlled case series study
- 543,572 new users of antihypertensive drugs in the elderly aged 66 and older living in Ontario, Canada who suffered a fall from April 1, 2000 to March 31, 2009

I/C

- Risk period 45 days after start of antihypertensive therapy
- Thiazide diuretics, angiotensin-converting enzyme inhibitors, angiotensin II receptor blockers, calcium channel blockers or beta-adrenergic blockers

O

- Of the 543,572 new users of antihypertensive drugs among community-dwelling elderly, 8,893 experienced an injurious fall that required hospital care during the observation period
- New users had a 69 % increased risk of having an injurious fall during the first 45 days following antihypertensive treatment (all above except ARB) - IRR 1.69
- Increased falls risk during the first 14 days for all antihypertensives when initiated-IRR 1.94

[Butt DA, Osteoporos Int. 2013 Oct;24\(10\):2649-57](#)



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Antihypertensives and serious falls

P/P

- 4961 community living adults > 70 with hypertension
- Nationally representative Medicare Current beneficiary Survey Cohort during a three year follow up through 2009

I/C

- Antihypertensive medication intensity based on standardized daily dose for each medication class

O

- Main outcomes and measures – serious fall injuries, fractures, traumatic brain injuries, joint dislocations
- 14% not on antihypertensives, 55% on moderate intensity, 31% of high intensity antihypertensive groups
- During follow up, 9% had serious falls and 17% died

Tinetti, ME. JAMA Intern Med. 2014 Apr;174(4):588-95



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Antihypertensives and fall injury risk

P/P

- Meta-analysis reviewing published studies looking at the risk of fall injuries in the elderly aged ≥ 60 years receiving antihypertensives
- 62 articles included in two meta-analysis were identified using MEDLINE, EMBASE, SCOPUS and Cochrane

I/C

- Administration of any of five antihypertensive drug classes (thiazide diuretics, angiotensin-converting enzyme inhibitors, angiotensin receptor blockers, calcium channel blockers and β -blockers)

O

- No clear statistically significant clinical precedent indicating antihypertensive agents and risk of fall injuries in the elderly
- Opposite conclusions about the role of antihypertensive medications in fall injuries

Zang G, J Int Med Res. 2013 Oct;41(5):1408-17



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Association between use of antiepileptic drugs and fracture risk

P/P

- Random effects meta-analysis with 1,292,910 participants, with a mean/median age of 36-82 years to look at fracture risk among AEDs users

I/C

- 22 studies met inclusion criteria from a search of PUBMED, ISI Web of Science, Cochrane Library, EMBASE databases.

O

- Significant increase in fracture among users (RR 1.86)
- RR was still significant when ltd to osteoporosis related fracture
- Weak risk with CBZ, VPA, LTG, GPB
- Phenobarbiturate (PB), topiramate (TPM) and phenytoin (PHT) suggested an increase in fracture risk of 78%, 39% and 70%, respectively

[Shen C, Bone. 2014 Jul;64:246-53](#)



Pharmacists and mental health care

- Growing burden of mental health disorders worldwide
- Pharmacists are ideally positioned to play a greater role in supporting people with a mental illness
- The pharmacists' role in supporting quality use of medicines in medication review
 - pharmacist-led interventions designed to reduce inappropriate use of psychotropic medicines and improve medication adherence
 - management of antipsychotic polypharmacy

Rubio-Valera M, *Int J Environ Res Public Health*. 2014 Oct 21;11(10):10967-10990.



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Multiple psychoactive drugs

P/P

- A retrospective cohort study was conducted between July 2011 and June 2012 in the Australian veteran population who had been dispensed at least one psychoactive medicine within the previous year looking at risk of falls

I/C

- Psychoactive medicines with sedative properties included antipsychotics, anxiolytics, hypnotics, antidepressants, opioids, anti-epileptics, anti-Parkinson medicines and medicines for migraine and risk of hospitalization for falls

O

- Increased risk of falls when patients were on one or more psychoactive medicines or receiving 0.1-0.9 DDD or more per day.
- Incident rate ratios 1.22 for one drug, 1.7 for two drugs, 1.96 for three or four drugs, 3.15 for five or more
- Similar results with increased doses

Pratt NL, Drug Saf. 2014 Jul;37(7):529-35



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Different risk increasing drugs in recurrent versus single fallers

P/P

- Cross sectional design study looking at 2,258 patients who sustained a fall, were 65 years or older and who visited the ED between 2004 and 2010 to an academic medical

I/C

- FRIDS drugs

O

- 39% of patients had sustained two or more falls within the previous year
- After adjustment for the potential confounders, adjusted odds ratios identified, medications remained statistically significantly associated with ED visits due to falls
 - drugs for acid-related [aOR] 1.29
 - analgesics aOR 1.22
 - anti-Parkinson drugs aOR 1.59
 - nasal preparations aOR 1.49
 - ophthalmologicals aOR 1.51
 - antipsychotics aOR 2.21
 - antidepressants aOR 1.64

Askari M, Drugs Aging. 2013 Oct;30(10):845-51



Narcotics

P/P

- 13,354 patients aged 65 to 89 with a diagnosis of OA
- Nested case –control design using EMR from 2001-2009 looking at falls and fractures

I/C

- Rapid decline of COX-2 inhibitors (10% 2004 vs 4 % post 2004) and a similar increase in narcotic use
- Comparison of narcotics, COX-2 inhibitors and NSAIDS

O

- Narcotic analgesics were associated with a significantly greater risk of falls and fractures
- Likelihood of experiencing a fall/fracture – Odds ratio Narcotics (3.3) > COX-2 inhibitors (2.5-4.3) or NSAIDS (4.1)

Rolita L. J Am Geriatr Soc 2013; Mar; 61 (3): 335-40



Disease states leading to falls



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Chronic kidney disease

P/P

- 76 patients ages >65 on chronic peritoneal dialysis from April 2002 to April 2003 at UHN
- Prospective cohort study looking at falls and mortality

I/C

- Patients were followed biweekly and falls occurring within the first 15 months were recorded
- Outcomes collected until death, study end, transplantation or transfer to another dialysis centre

O

- 54% of peritoneal patients experiences 89 falls (1.7 falls per patient year)
- Patients with falls more likely to have previous falls, be more recently started on dialysis, men, older, higher comorbidity
- 28 patients died during follow up period

Farragher J. Clin J Am Soc Nephrol. 2014 Jul;9(7):1248-53



Frailty and inappropriate medications

- As a person grows older, their ability to tolerate medications becomes less due to age-related changes in pharmacokinetics and pharmacodynamics often heading along a path that leads to frailty
- Frail older persons often have multiple comorbidities with signs of impairment in activities of daily living
- Inappropriate prescribing in older patients can be detected using criteria
- Unfortunately, most current therapeutic guidelines are applicable only to healthy older adults and cannot be generalized to frail patients

Poudel A, QJM. 2013 Oct;106(10):969-75.



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Osteoporosis

Medication-induced osteoporosis screening

- Glucocorticoids
- Proton pump inhibitors
- SSRI
- Thiazolidinediones
- Anticonvulsants
- Medroxyprogesterone acetate
- Aromatase inhibitors
- Androgen deprivation therapy
- Heparin
- Calcineurin inhibitors
- Chemotherapy

Panday K, Ther Adv Musculoskelet Dis. 2014 Oct;6(5):185-202.



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Chronic disease

P/P

- Primary outcomes from 16,357 Canadian community-dwelling adults aged 65 years and over who self-reported falls in the previous 12 months and who had chronic conditions (Canadian Community Health Survey)

I/C

- A seven-cluster model was selected, including groups with low prevalence of chronic disease, or high prevalence of hypertension and arthritis, visual impairment, hypertension, chronic obstructive pulmonary disease (COPD), diabetes, or heart disease and hypertension

O

- Overall prevalence of falling and multi-morbidity (19.8% and 62.0% respectively)
- Fall risk was significantly greater in individuals with one, two, four, five and six or more chronic conditions relative to those with none (all $p < 0.05$).
- Increased falls in hypertension cluster (OR 1.2) and COPD cluster (OR 1.6)
- Both number and pattern of chronic condition related to falls
- COPD is a significant predictor of falls

Sibley KM, BMC Geriatr. 2014 Feb 14;14:22



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Available tools to assess falls



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FRIDS (Fall Risk Increasing Drugs)

- Swedish National Board of Health and Welfare has created a list of drugs considered to increase the fall risk (**FRIDs**) and drugs that might cause/worsen orthostatism (**ODs**)
- Association between number of FRIDs and the total number of drugs ($p < 0.01$), severe falls ($p < 0.01$) and female sex ($p = 0.03$)
- Association between number of ODs and both total number of drugs ($p < 0.01$) and being community dwelling ($p = 0.02$)
- No association was found between number of ODs and severe falls
- Antidepressants and anxiolytics were the most frequently dispensed FRIDs
- Fallers used on average more FRIDs (average 2.2 FRIDs and ODs (average 2.0 per patient)
- Interventions to reduce falls in the elderly should be focusing on reducing the total number of drugs and withdrawal of psychotropic medications to improve the quality and safety of drug treatment in primary care

Milos V, BMC Geriatr. 2014 Mar 27;14:40



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FRIDS or ODs

Increased fall risk

- Opioids
- Antipsychotics (not lithium)
- Anxiolytics
- Hypnotics and sedatives
- Antidepressants

Cause or worsen orthostatism

- Vasodilators
- Antihypertensives
- Diuretics
- Beta blockers
- Calcium channel blockers
- Renin angiotensin inhibitors
- Alpha antagonists
- Dopaminergic agents
- Antipsychotics
- Antidepressants

Milos V, BMC Geriatr. 2014 Mar 27;14:40



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FRIDS and risk of falls

- German epidemiological study looking at relationship between FRIDS and risk of falls in regard to fall related chronic disease
- Antihypertensives, non-steroidal anti-inflammatory drugs, hypnotics and sedatives, antidepressants and psychotropics were labelled as FRIDS
- FRIDS and seven chronic diseases were statistically associated with increased risk of falls
- The risk was highest for patients with a diagnosis abnormalities of gait and mobility, vertigo, visual -impairment and weight loss, and increased by 50-90% with arthritis, diseases of arteries, arterioles and capillaries and heart failure
- From patients (N = 425) with at least one diagnosis of fall, 219 patients were prescribed FRIDS
- In 100 (45.7%) of cases the diagnoses of fall was made before and in 105 (47.9%) of cases at least a month after the prescription of FRIDS

Heckenback K, Springerplus. 2014 Aug 29;3:483.



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Beers and unplanned hospitalizations



- Study looking at the association between PIMS from Beers list and unplanned hospitalizations in Australians
 - PIMS = potentially inappropriate medications
- Fifteen per cent of unplanned hospitalizations in exposed index subjects (1980 per year) were attributed to PIM exposure
- Patients taking meperidine (pethidine), nitrofurantoin, promethazine, indomethacin, and thioridazine appeared to be at particularly high risk of unplanned hospitalization
- Patients using temazepam, oxazepam, diazepam, digoxin, amiodarone, ferrous sulfate, and naproxen were attributed the greatest numbers of unplanned hospitalizations.

Price SD, Ann Pharmacother. 2014 Jan;48(1):6-16.



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Inappropriate prescribing and hospitalization in the UK - STOPP

- The Screening Tool of Older Persons' Potentially Inappropriate Prescriptions (STOPP) classifies 65 common drug issues found to contribute to inappropriate prescribing in the elderly
- International studies using STOPP criteria indicate high potentially inappropriate medication (PIM) prevalence rates
- No studies have been conducted in older patients in UK hospitals
- Published literature has not assessed whether prescribers attempt to minimize the potential risk of PIMs by putting in place follow-up or review plans

Onatade R, Drugs Aging. 2013 Sep;30(9):729-37.



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Inappropriate meds in hospitals

P/P

- 195 patient lists were assessed using a PIM index in a retrospective non-randomized study in a 950 bed acute hospital in the UK from June to July 2011 in patients > 65

I/C

- Comparing prevalence and types of PIMS in older patients admitted to and discharge from hospital and to determine how often PIMS prescribed on discharge had a follow up plan

O

- Mean number of admissions meds = 9; PIM prevalence = 26.7% (CNS, psychotropic drugs, drugs affecting patients at risk for falls and urogenital drugs)
- Mean number of discharge meds = 10; PIM prevalence = 22.6% (drugs affecting patients at risk for falls, CNS, psychotropics, urogenital drugs and cardiovascular agents)

Onatade R, Drugs Aging. 2013 Sep;30(9):729-37.



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STOPP criteria in frail older inpatients

P/P

- Randomized controlled study in 146 frail inpatients in 2011 using the STOPP criteria to see if PIMS are reduced at discharge

I/C

- 74 intervention patients vs. 72 control
- The intervention consisted of STOPP recommendations made by the geriatric consult team to ward physicians to discontinue PIMs, in addition to the standard geriatric advice

O

- At discharge, the reduction in PIMs was twice as high for the intervention group as for the control group (39.7 and 19.3 %, respectively; $p = 0.013$)
- Majority of PIMS stopped during hospital had not been restarted after discharge at follow up one year later

Dalleur O, Drugs Aging. 2014 Apr;31(4):291-8



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Beers vs. STOPP

- Cross sectional study in primary care and community dwelling patients over 65 from Spain to determine the prevalence of potentially inappropriate medications (PIMs) and related factors through a comparative analysis of the Screening Tool of Older Person's Potentially Inappropriate Prescriptions (STOPP), the 2003 Beers criteria, and the 2012 AGS update of the Beers criteria
- The primary endpoint was the percentage of participants receiving at least one PIM
- Potentially inappropriate medications were present in 24.3%, 35.4%, and 44% of participants, according to the 2003 Beers criteria, STOPP, and 2012 Beers criteria, respectively
- The 2012 Beers criteria detected the highest number of PIMs, and given the scant overlapping with the STOPP criteria, the use of both tools may be seen as complementary

Blanco-Reina E, J Am Geriatr Soc. 2014 Jul;62(7):1217-23.



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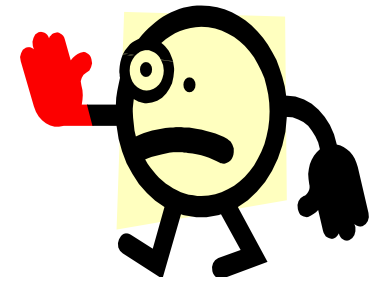
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CRIME – Criteria to assess appropriate medication use



- The occurrence of several geriatric conditions may influence the efficacy and limit the use of drugs prescribed to treat chronic conditions
- Functional and cognitive impairment, geriatric syndromes (i.e., falls or malnutrition) and limited life expectancy are common features of old age, which may limit the efficacy of pharmacological treatments and question the appropriateness of treatment
- However, the assessment of these geriatric conditions is rarely incorporated into clinical trials and treatment guidelines

Onder G, Drugs Aging. 2014 Jan;31(1):33-45. Review.



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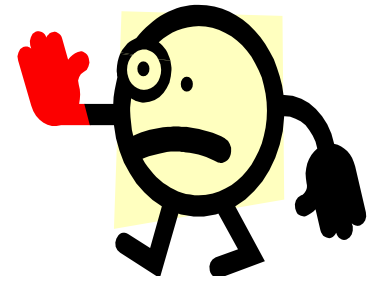
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CRIME – Criteria to assess appropriate medication use

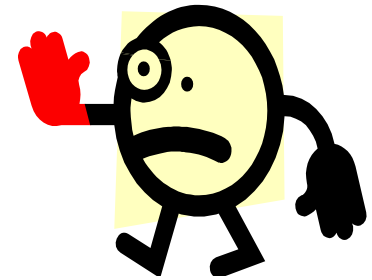


Diabetes recommendations

- R1. In patients with limited life expectancy (< 5 years) or functional limitations, intensive glycemic control (A1C < 7%) is not recommended
- R2. In patients with a history of falls or cognitive impairment or dementia, intensive glycemic control or use of insulin is not recommended
- R3. In patients with recent falls or high risk of falls or orthostatic hypotension, intensive blood pressure lowering (< 130/80) is not recommended



CRIME – Criteria to assess appropriate medication use



Hypertension

R4. In case of falls associated with orthostatic hypotension or symptomatic orthostatic hypotension, the number of antihypertensive drugs should be reduced and concomitant use of multiple antihypertensive agents should be avoided

Atrial Fibrillation

R4. In patients with non-valvular atrial fibrillation and high risk for falls or poor physical performance, the use of anticoagulants is not recommended if the risk for stroke is low



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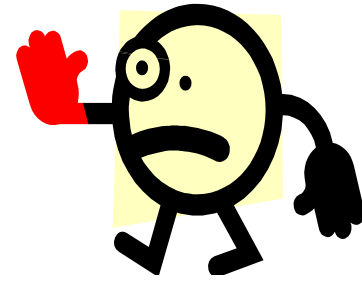
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CRIME – Criteria to assess appropriate medication use



Congestive Heart Failure

- R1. In the presence of orthostatic hypotension or falls, increasing the dose of antihypertensive drugs is not recommended; the reduction of drug dosages should be considered
- R2. The chronic use of diuretics in asymptomatic or minimally symptomatic older adults with a history of falls and increased fracture risk is not recommended



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Withdrawal of fall-risk increasing drugs

P/P

- 137 geriatric outpatients (age 77.7 +/- 5.7 years)
- Prospective cohort study between April 2003 and November 2004

I/C

- All patients underwent mobility testing at baseline
- Fallers with FRID withdrawal vs. non-fallers vs. fallers without FRID withdrawal

O

- In group of fallers with FRID withdrawal, all mobility tests improved as opposed to non-fallers and fallers without FRID withdrawal
- FRID withdrawal as a single intervention may reduce falls and improve walking test and Timed up and Go test over 6.7 months

Van Der Velde N, Drugs Aging. 2007;24(8):691-9



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Pharmacist role in fall prevention



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Simplify drug regimens and educate patients

P/P

- 75 patients engaged in a one-time face-to-face medication therapy management (MTM) session in Massachusetts

I/C

- Pre and post test with follow up design done in seniors centers, senior housing facilities and community centres

O

- Significant increase in patients taking medications 3 times daily or less versus > 3 times daily or more (73 vs 85%)
- Increased awareness post MTM visit about medications that can increase risk of falls (28 vs 56%)

Barlett D. The Consultant Pharmacist 2015: 30 (3): 141-152)



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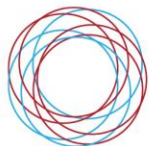
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Reducing unnecessary medications

- Systematic review to identify studies that reduced the use of unnecessary medications in frail older adults from January 1966 - September 2012
- The majority of studies (n = 21) used implicit criteria to identify unnecessary medications (including drugs without indication, unnecessary duplication, and lack of effectiveness)
- Only one study incorporated patient preference into prescribing criteria
- Most interventions were led by or involved pharmacists, four used academic detailing, two used audit and feedback reports targeting prescribers, and five involved physician-led medication reviews
- Very little rigorous research has been conducted on reducing unnecessary medications in frail older adults

[Tjia J, Drugs Aging. 2013 May;30\(5\):285-307.](#)



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Drug cessation in complex older adults

- Study to identify the effects and effectiveness of drug cessation on falls, delirium and cognitive impairment and end-of-life
- 11 articles in reviewed in total
- Withdrawal of psychotropics reduced fall rate
- A prescribing modification program for primary care physicians reduced fall risk
- Withdrawal of psychotropics and a systematic reduction of polypharmacy resulted in an improvement of cognition
- Very little rigorous research has been conducted on reducing inappropriate medications in patients approaching end of life

Van der Cammen TJ, Age Ageing. 2014 Jan;43(1):20-5.



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Vitamin D

P/P

- Cross sectional study of older adults who visited an ED of five hospitals because of a fall in the Netherlands

I/C

- Investigate whether serum 25-hydroxy vitamin D (24OHD) is associated with physical performance in men and women by measuring physical performance

O

- In men, higher serum vitamin D concentration was significantly associated with better handgrip strength, faster timed up and go test (TUG) time and faster five time sit to stand (FTSS) test vs. faster TUG time alone in women

Boye ND, J Am Geriatr Soc 2013; 61 (11):1948-52



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Risk factors pharmacists can identify

Non-modifiable

- Older adults
- Females
- Caucasians
- Chronic disease
- Mentally impaired
- Sensitive to cold temperature

Modifiable

- Muscle weakness
- Vision impairment
- Gait and balance problems
- Medications
- **Environmental**
 - Loose rugs
 - Dim lights
 - Items on floor

Limona D. Journal of Pharmacy Practice 2009; 22:344



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Development and implementation of a Pharmacy Fall Prevention Program

Table 1: Medication Fall Risk Scoring System

AFHS category	Risk for falls	Points	Mechanisms
Analgesics, antipsychotics, anticonvulsants, benzodiazepines	High	3	Sedation, dizziness, postural disturbances, altered gait and balance, impaired cognition
Antihypertensives, cardiac drugs, antiarrhythmics, antidepressants	Intermediate	2	Orthostasis, impaired cerebral perfusion, poor health status
Diuretics	Low	1	Increased ambulation, orthostasis

Beasley B, Hospital Pharmacy 2009; 44: 1095-1102



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Development and implementation of a Pharmacy Fall Prevention Program

Types of recommendations to reduce the risk for medication-related falls

- Discontinue medication
- Decrease the dosage
- Use an alternative therapeutic agent
- Monitor laboratory values
- Educate patient on how to minimize the risk of falls

Considerations in fall risk evaluation for elderly

- Type of medication
- Need for lab monitoring
- Disease states
- Orthopedic surgery
- Prior fall
- Education



Pharmacist assessment key points

- Vitals, height and weight
- Allergies, drug intolerances
- Total number of medications
- Indications for each medication, dosage, frequency of refills or other documentation of compliance
- History of medication response
- Timing of falls relative to drug administration; PK factors determining action and peak dose effect
- Use of as needed medications and OTC meds
- Assessment of labs, blood levels of monitored medications

Keys P. Journal of Pharmacy Practice 2004; 17; 2:149-152



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Quality assurance interventions

- Adequate Vitamin D and calcium supplementation
- Fall risk quality assurance evaluation form - conduct every three to six months
- Screen for medications causing osteoporosis or inducing hypotension

Limona D. Journal of Pharmacy Practice 2009; 22:344



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Screening tools

- FROP-COM screen and FROP-COM
 - National Aging Research institute
- CDC STEADI = Stopping elderly accidents, deaths and injuries
 - Stay Independent – Are you at risk?
 - CDC – Postural Hypotension
 - Measuring Orthostatic Hypotension
 - What it is and how it is managed
 - CDC Algorithm for Fall Risk Assessment and Interventions
 - Fell in the past year
 - Feels unsteady when standing or walking
 - Worries about falling
 - Scored ≥ 4 on Stay Independent brochure

<http://www.nari.unimelb.edu.au/> www.cdc.gov



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Understanding gait, strength and balance tests

- Start with the CDC Algorithm for Fall Risk Assessment and Interventions
- Review the following tests to evaluate gait, strength and balance
 - Timed up and go
 - 30 second chair stand
 - 4 stage balance test

www.cdc.gov



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Timed up and go (TUG) test

- Purpose: To assess mobility
- Equipment: Stopwatch
- Instructions: Patients to wear regular footwear and walk three meters or 10 feet away on the floor
- “When I say go, I want you to:
 - 1. Stand up from chair
 - 2. Walk to line on floor at your normal pace
 - 3. Turn
 - 4. Walk back to chair at normal pace
 - 5. Sit down again”
- Time: _____
- An older adult who takes \geq 12 seconds to complete TUG is at high risk of falling



30 second chair stand test

- Purpose: To test leg strength and endurance
- Instructions to patient:
 - 1. Sit in the middle of the chair
 - 2. Place your hands on the opposite shoulder crossed at the wrists
 - 3. Keep your feet flat on the floor
 - 4. Keep your back straight and keep your arms against your chest
 - 5. On “go,” rise to a full standing position and then sit back down again
 - 6. Repeat this for 30 seconds
- A below average score indicates a high risk of falls



4 stage balance test

- Purpose: To assess static balance
- Instructions to patient:
 - “I’m going to show you four positions”
 - “Try to stand in each of the following four positions for 10 seconds”
 - “You can hold your arms out or move your body to help keep your balance but don’t move your feet”
 - “Hold this position until I tell you to stop”
- For each stage, say “ready, begin” and begin timing
- After 10 seconds, say “stop”



Utilizing meals on wheels to teach falls assessment

- Study to design an innovative method to each falls risk assessment using community-based resources
- A falls prevention program was developed through a partnership with Meals on Wheels (MOW)
- Third year medical student accompanies a MOW client services association to a patients home and performs a falls risk assessment including history of falls, fear of falling, medication review, visual acuity, get up and go, MiniCoag, and a home safety evaluation
- Confidence of med students performing falls risk assessments increased from 30.6% to 87.3% ($p < 0.001$)
- A single education intervention effectively addressed geriatric competencies with minimal faculty effort

Demons JL, Gerontol Geriatr Educ 2014; 35(4): 409-20



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ImproveFall study

P/P

- Persons age > 65 who visit the Emergency Department due to a fall in the Netherlands
- Prospective, multi-center, randomized trial in hospitals

I/C

- Compare the effect of a structured medication assessment including the withdrawal of fall-risk increasing drugs on the number of new falls versus 'care as usual' in older adults presenting at the Emergency Department after a fall

O

- The successful completion of this trial will provide evidence on the effectiveness of withdrawal of fall-risk increasing drugs in older patients as a method for falls reduction

Hartholt KA, BMC Geriatr 2011; 21:48



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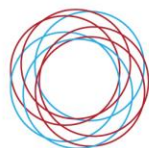
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Falls and the pharmacist

- **The Role of the Pharmacist in Educating Patients about Environmental Falls Risks During Home Visits**
 - Using the Falls Prevention Checklist from the Minnesota Safety Council, entitled "What you can do to prevent Falls," the pharmacist reviewed with the patient the various items on the checklist that could lead to falls in the bathroom, kitchen, bedroom, living area and stairs and steps and personal risk factors
 - At the end of the review, the pharmacist discussed the findings with the patient and family and left a copy of the tool with the patient to keep with the recommendations
 - From this pilot project, the pharmacist was able to make on an average of 13.33 recommendations per patient with half of them being related to personal risk factors

Riley K, Canadian Pharmacist Conference May 2015 Ottawa



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Falls and the pharmacist

- **A Pilot Project to Compare the Results of Various Tools to Identify Inappropriate Medications and Medications that Increase the Risk of Falls in Patients During Home Medication Reviews**
 - Based on the results, almost 52% of the DRPS in the home visit patient population were experiencing adverse drug reactions to the medications
 - 88% of all of the recommendations for the drug related problems were accepted.

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Falls and the pharmacist

- **A Pilot Project Using the Falls Risk Assessment Tool During Home Medication Reviews**
 - Based on the results, patients were taking on average 4.22 medications that could lead to falls (63% of patients were taking four to seven medications and 37% of patients were taking one to three medications)
 - 88% of patients were in the high risk category for falls based on the Falls Risk Assessment Instrument
 - **Conclusions:** Based on the high percent of patients receiving a high risk score on the Falls Risk Assessment, 88% of these patients would benefit from re-evaluation of their scores after six months of having the first risk assessment

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Patient case 1

- Memory clinic visit April 2015
- Medications:
 - Discontinued: Percocet, hydromorphone, prochlorperazine, glucosamine, zopiclone, OTC dimenhydrinate
 - Reduced: OxyNeo
- MOCA went from 25 to 29
- No falls in the last five months
- No orthostatic blood pressure drops
- KS looks like a new woman!



Patient case 2

- Several medication recommendations were made for this patient to family physician
- Called CCAC to provide more support
- Unfortunately, shortly after this patient was seen, he was admitted to hospital and later passed away before alternative living arrangements could be made for discharge



Multifactorial falls assessment

- Components of efficacious interventions
 - Home modification
 - Medication minimization including psychoactive agents
 - Postural hypotension
 - Foot evaluation
 - Exercise
- Exercise includes:
 - Balance, gait and strength training
 - Flexibility and endurance training
- Multifactorial and multicomponent interventions tailored to patient and implemented by qualified HCP

www.medcats.com/falls/frameaset.htm



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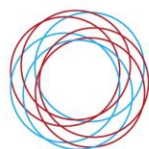
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The development journey



- Pharmacists can be a big part of the solution
- It is all about the people that we can help so take care of the other person first
 - Don Berwick IHI
- Strive to make a difference in the lives of your patients by helping to prevent falls starting today!



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Thanks for your attendance!

QUESTIONS?



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