



## Mobility and Osteoporosis

**Alexandra Papaioannou BScN, MD, MSc,  
FRCP(C), FACP**

*Professor of Medicine/Geriatric Medicine, McMaster University*

*Executive Director, GERAS Centre, Hamilton Health Sciences*

*AMDA 2020*



2

**Reduce: immobility, pain and transfers to acute care**

**Improve quality of life for residents in long-term care**



## Presenter Disclosure

- **Relationships with commercial interests:**
  - **Grants/Research Support:** Amgen, Osteoporosis Canada
  - **Speakers Bureau/Honoraria:** Advisory Board member for Amgen
  - **Employment:** McMaster University



## Mitigating Potential Bias

- Pharmacological therapy will be presented only as part of clinical recommendations
- Clinical recommendations were determined using the GRADE approach - an evidence-based approach to guideline development
- All pharmacological therapy will be presented in its generic form.



## Mobility defined

- » Mobility is conventionally synonymous with movement, the transition from point A to B (Gergen & Gergen, 2018)
- » (Im)mobility is a strong determinant of physical, mental and social well-being (Grenier et al. 2019)
- » Participant quote - Movement to me is very different, turning from side to the other in bed, that's movement .



## Objectives

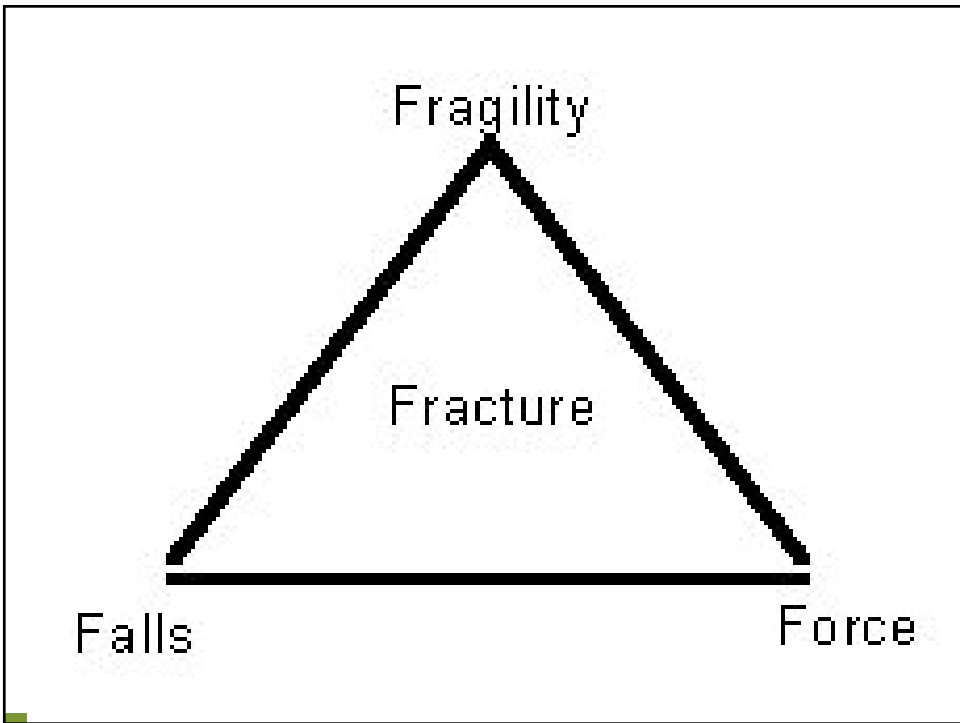
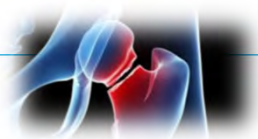
6

1. To recognize and assess for potential risk factors for fractures for frail older adults living
2. To identify the impact of fractures on mobility
3. To apply the LTC Fracture Prevention guideline recommendations for frail older adults.



6

**What do we know about fractures in older adults?**



## How often do fractures happen in long-term and home care?

- In 1 year, 5% of LTC residents will experience any fracture (hip, wrist, spine, humerus, pelvis)
  - 3% will experience a hip fracture
- In 1 year, 3.6% of home care recipients will experience any fracture
  - 1.5% will experience a hip fracture

**Table 1**  
The Odds of Experiencing a Fracture in Home Care vs Long-Term Care, Adjusted for Clinical Characteristics and the Competing Risk of Death

One-Year Incident Fractures Location	Number (%) of Fractures		Home Care vs Long-Term Care (Ref = Long-Term Care) Odds Ratio* (95% Confidence Interval)
	Home Care N = 317,626	Long-Term Care N = 34,070	
Any	11,453 (3.6)	1690 (5.0)	0.77 (0.72–0.84)
Hip	4888 (1.5)	1026 (3.0)	0.65 (0.58–0.72)
Other	6565 (2.1)	664 (1.9)	1.03 (0.93–1.14)
Wrist	2696 (0.8)	351 (1.0)	0.68 (0.58–0.80)
Spine	2127 (0.7)	146 (0.4)	1.47 (1.19–1.83)
Humerus	1157 (0.4)	134 (0.4)	0.98 (0.76–1.26)
Pelvis	1315 (0.4)	117 (0.3)	1.45 (0.76–1.26)

The sum of wrist, spine, humerus, and pelvis does not equal the value of other fractures as some people experienced multiple other fractures within the same hospital visit.  
\*Adjusted for age, sex, cognitive performance scale, walking ability, transfer ability, Changes in Health, End-Stage Disease, Signs and Symptoms Scale score, medication use, diagnoses (Alzheimer's disease, traumatic brain injury, Parkinson's disease, diabetes, osteoporosis, multiple sclerosis, depression, chronic obstructive pulmonary disease, renal failure), previous fall, previous fracture, unintentional weight loss.  
McArthur et al. 2020. JAMDA 21 (2) 289-290.

## Ten Year Probability of Fracture using BMD

**FRAX<sup>®</sup> WHO Fracture Risk Assessment Tool**  
<http://www.shef.ac.uk/FRAX/tool.aspx?country=31>

### Calculation Tool

Please answer the questions below to calculate the ten year probability of fracture with BMD.

Country: **Australia** Name/ID:  [About the risk factors](#)

**Questionnaire:**

1. Age (between 40 and 90 years) or Date of Birth  
 Age:     Date of Birth: Y:  M:  D:

2. Sex     Male  Female

3. Weight (kg)

4. Height (cm)

5. Previous Fracture     No  Yes

6. Parent Fractured Hip     No  Yes

7. Current Smoking     No  Yes

8. Glucocorticoids     No  Yes

9. Rheumatoid arthritis     No  Yes

10. Secondary osteoporosis     No  Yes

11. Alcohol 3 or more units/day     No  Yes

12. Femoral neck BMD (g/cm<sup>2</sup>)  
 Select BMD:

**Weight Conversion**  
 Pounds → kg

**Height Conversion**  
 Inches → cm

**00105396**  
 Individuals with fracture risk assessed since 1st June 2011

## Fracture Risk Factors in Home Care

Risk Factor	Hazard ratio (95% confidence interval)
Increasing age	1.02 (1.02-1.03)
Sex (Female)	1.74 (1.66-1.83)
Cognitive impairment (mild/moderate vs none)	1.27 (1.21-1.34)
ADL impairment (mild/moderate vs none)	1.10 (1.05-1.16)
Difficulty with stair climbing	1.06 (1.00-1.18)
Unsteady gait	1.16 (1.10-1.23)
Wandering	1.36 (1.28-1.48)
Alcohol use	1.47 (1.28-1.68)
Tobacco use	1.37 (1.28-1.48)
Previous fracture in the last 6 months	1.21 (1.18-1.24)
Parkinson's disease	1.31 (1.19-1.45)
Previous fall in the last 6 months	1.57 (1.49-1.66)
Any psychotropic medication use (antidepressant, antipsychotic, anxiolytic, hypnotic)	1.18 (1.13-1.23)
Factors unique to home care, not captured in FRAX	

McArthur et al. in preparation.

## Biomechanics of falls



Yang et al 2020 JBMR,  
Robinovitch Lancet 2013



## What is the impact of Fracture?



13

### Systematic Review – 28 studies with mobility outcomes

- Mobility 1 to 2 years following hip fracture is significantly worse than for matched control
- Number of people disabled after 2 years was 26 per 100 people with hip fracture for walking 10 feet and 22 per 100 for bed transfers
- People experiencing hip fracture were four times more likely to be unable to ambulate 2 years after fracture

**Table 3** Outcomes for hip fracture patients and control participants not experiencing hip fracture

Study	Outcome	Follow-up time	Controls matched for	Hip Fracture	Control	P-value
<b>Activity - Mobility</b>						
Roonen 2004 [19]	Unable to walk independently	1 year	age, residence	30 %	7 %	<0.001
	<80 years			56 %	15 %	<0.001
Magaziner 2003 [21]	Disabled walking 3 m (SE)	1 year	age, gender, walking ability	54 % (2)	21 % (2)	<0.01
Marottoli 1992 [16]	Walk independently across room	6 mo (HF)	age, gender, physical function	15 %		NR
		1 year (Con)			72 %	
Norton 2000 [22]	Retain community mobility	2 years	age, gender	54 %	87 %	P < 0.001*
Wolinsky 1997 [17]	Mean increase in no. lower body limitations	Median 2.3 years	nil	1.75	0.75	P ≤ 0.0001
	Mean increase in no. upper body limitations			0.50	0.27	P < 0.001

Dyer et al. BMC Geriatrics, 2016;16:158.

14

## Mobility recovery – 7 studies

- The bulk of recovery of walking ability occurred within 6 months after fracture.

Supplementary Table 1 Outcomes from studies reporting activity, participation and accommodation outcomes at multiple follow-up times after hip fracture

Study	Outcome	Pre-fracture	Follow-up time						
			3-5 mo	6-9 mo	9-18 mo	19 mo – 2 yrs	3-5 years	6-10 years	
<b>Activity - Mobility</b>									
Borgquist 1990	Walking (% survivors)	95%	73%		80%		80%	76%	
Griffin 2015	Walking regularly:								
	indoors without aids ≤80 years	66%	37%		49%				
	indoors without aids >80 years	46%	14%		20%				
	outdoors without aids ≤80 years	51%	16%		26%				
	outdoors without aids >80 years	29%	6%		8%				
Kitamura 1998	Walking alone outdoors (+ assistive device)	68%	51%		58%	56%			
	Walk alone outdoors + helper	8%	13%		10%	8%			
	Walk alone indoors (+ assistive device)	11%	10%		7%	9%			
	Walk alone indoors + helper	8%	10%		8%	6%			
	Sitzweelchar	3%	11%		9%	11%			
	Bedröden	2%	5%		8%	8%			
Tauboi 1998	Walking alone outdoors (+ assistive device)	68%	51%		56%				
Magaziner 1990	Walk independently or with 1 stick	87%	26% <sup>f</sup>		54%				
Magaziner 2003	Walking 3m without assistance	74%			46%	47%			
Neuman	New total locomotion dependence		28%		27%				
Samuelsson 2009	Walking independent <sup>g</sup> stick	51%	25%		28%				
	2 sticks/frame	45%	61%		54%				
	Non-walking	4%	15%		18%				

Dyer et al. BMC Geriatrics, 2016;16:158.

## Mobility recovery

- Between 40 and 60 % of study participants recovered their pre-fracture level of mobility

Table 4 Proportion of survivors that recover their pre-hip fracture levels of activity, participation or health outcomes

Study	Outcome measure	Pre-fracture residence	Surgical cohort	3-4 months	6 months	1 year	2 years
<b>Activity – Mobility</b>							
Bentler 2009 [14]	Mobility activities without difficulty <sup>a</sup>	NR	N				47 %
Crotty 2000 [49]	Level of ambulation <sup>b</sup>	Community	Y	69 %			
		LTC	Y	58 %			
Holt 2008 [62]	Walk unaided and unaccompanied	Mixed	Y				
	Ages 75–89			22 %			
	Ages ≥95			2 %			
Keene 1993 [41]	Walk unaided	Mixed	N				40 %
Koval 1998 [44] <sup>a</sup>	Ambulatory ability	Community	Y	22 %	38 %		47 %
Shah 2001 [47] <sup>a</sup>	Ambulation independence	Community	Y				44 %
Magaziner 2000 [43]	Walk 3 m without assistance <sup>h, d</sup>	Community	N			60 %	63 %
Norton 2000 [22]	Retain community mobility <sup>a</sup>	Mixed	U				54 %
Osnes 2004[25]	Walking independence <sup>f</sup>	Mixed	U				44 %
Pereira 2010 [39]	Remain stable on BOAS <sup>d</sup>						55 %
Vochteloo 2013 [37]	Mobility	Mixed	Y	46 %			48 %
	Mobility without aid		Y	27 %			40 %
	Mobility with aid		Y	58 %			58 %

Dyer et al. BMC Geriatrics, 2016;16:158.



### Poor functional outcomes

- Hip fracture survivors are more likely to be functionally dependent and have more difficulties with ADLs 2 years post-fracture.
- 20% - 60% of people independent in self-care pre-fracture, required assistance for various tasks 1 and 2 years after fracture.

**Table 4** Proportion of survivors that recover their pre-hip fracture levels of activity, participation or health outcomes

Study	Outcome measure	Pre-fracture residence	Surgical cohort	3-4 months	6 months	1 year	2 years
Activity – Composite measure of Basic ADLs							
Bentler 2009 [14]	ADLs without difficulty <sup>a</sup>	NR	N				49 %
Beaupre 2005 [50] <sup>b</sup>	ADL level (MBI)	Mixed	Y	34 %	42 %		
Beaupre 2007 [48] <sup>b</sup>	ADL level (MBI)	Community	Y		71 %		
		LTC	Y		22 %		
Givens 2008 [52]	ADL no decline <sup>b, c</sup>	Mixed	Y		71 %		
Koval 1998 [51] <sup>d</sup>	ADL level	Community	Y	59 %	71 %	73 %	
Shah 2001 [47] <sup>e</sup>	ADL level	Community	Y			70 %	
Norton 2000 [22]	Functional Independence <sup>d</sup>	Mixed	U				72 %
Osnes 2004 [25] <sup>f</sup>	Living at home receiving assistance, assistance received at same frequency	Mixed	U				49 %
	Living at home without assistance						45 %
Vergara 2014 [38]	ADL (MBI) <sup>g</sup>	Mixed	U		29 %		

Dyer et al. BMC Geriatrics, 2016;16:158.



### LTC: Hip Fractures, mortality and mobility impairment

By 180 days post-hip fracture (N = 60,111):

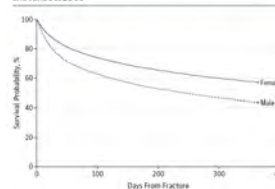
- 36% died
- 28% new total dependence in mobility\*

By 365 days post-hip fracture (N = 52,914)

- 47% died
- 27% total dependence mobility\*

\* Independent at baseline

Figure 1. Survival at up to 365 Days Among 60 111 US Long-term Care Residents Hospitalized With Hip Fracture Between July 1, 2005, and June 30, 2009



Male patients demonstrate a lower probability of survival than women at all time points after fracture (P < .001 by log-rank test).

1  
8



Neuman MD, et al. JAMA, 2014; 174(8):1273-1280.

Increased mortality was associated with:

- Male sex
- Increasing age (> 90 years)
- White race
- High comorbidity (Charlson score ≥ 5)
- Cognitive impairment
- Mobility dependence
- ADL dependence
- Non-operative management

Neuman MD, et al. JAMA, 2014; 174(8):1273-1280.

Predictor	Adjusted HR (95% CI) for Deaths After Admission for Fracture (95% CI)*	P Value	Adjusted HR (95% CI) for Death or New Total Discharge in Location at 300 Days After Hip Fracture†	P Value
Sex				
Female	1 (Reference)		1 (Reference)	
Male	1.54 (1.51-1.58)	<.001	1.14 (1.12-1.16)	<.001
Age y				
<75	1 (Reference)		1 (Reference)	
76-80	1.20 (1.15-1.25)	<.001	1.08 (1.05-1.13)	<.001
81-85	1.40 (1.34-1.45)	<.001	1.18 (1.14-1.22)	<.001
86-90	1.85 (1.78-1.92)	<.001	1.24 (1.21-1.27)	<.001
≥91	2.17 (2.09-2.26)	<.001	1.42 (1.37-1.46)	<.001
Race				
White	1 (Reference)		1 (Reference)	
Black	0.77 (0.73-0.80)	<.001	1.05 (1.02-1.09)	.002
Other	0.74 (0.70-0.79)	<.001	0.94 (0.90-0.98)	.03
Charlson score				
0	1 (Reference)		1 (Reference)	
1	1.05 (1.03-1.07)	<.001	1.05 (1.02-1.09)	.006
2	1.22 (1.17-1.28)	<.001	1.06 (1.03-1.10)	<.001
3	1.35 (1.29-1.41)	<.001	1.11 (1.07-1.15)	<.001
4	1.84 (1.77-1.91)	<.001	1.13 (1.09-1.18)	<.001
≥5	1.66 (1.58-1.73)	<.001	1.20 (1.16-1.25)	<.001
Baseline cognitive performance				
Intact	1 (Reference)		1 (Reference)	
Borderline intact	1.01 (0.96-1.06)	.85	1.01 (0.97-1.05)	.83
Mild impairment	1.09 (1.05-1.14)	<.001	1.07 (1.04-1.11)	<.001
Moderate impairment	1.14 (1.10-1.19)	<.001	1.18 (1.14-1.22)	<.001
Moderate-severe impairment	1.32 (1.27-1.38)	<.001	1.34 (1.29-1.40)	<.001
Severe impairment	1.29 (1.23-1.35)	<.001	1.42 (1.37-1.47)	<.001
Very severe impairment	1.18 (1.07-1.29)	<.001	1.60 (1.56-1.77)	<.001
Baseline dependence in locomotion				
Independent	1 (Reference)		1 (Reference)	
Requires supervision	1.02 (0.93-1.05)	.25	1.02 (1.00-1.05)	.061
Requires limited assistance	1.08 (1.04-1.11)	<.001	1.08 (1.06-1.11)	<.001
Requires extensive assistance	1.16 (1.12-1.20)	<.001	1.16 (1.13-1.19)	<.001
Total dependence	1.12 (1.08-1.17)	<.001	NA	
No. out of 6 nonrecognition ADLs with functional independence at baseline†				
6	1 (Reference)		1 (Reference)	
4-5	1.13 (1.09-1.18)	<.001	1.17 (1.11-1.23)	<.001
2-3	1.23 (1.17-1.30)	<.001	1.20 (1.14-1.27)	<.001
0-1	1.27 (1.20-1.33)	<.001	1.30 (1.24-1.37)	<.001
Fracture location				
Femoral neck	1 (Reference)		1 (Reference)	
Intertrochanteric	1.10 (1.07-1.13)	<.001	1.10 (1.07-1.12)	<.001
Subtrochanteric	1.08 (1.03-1.15)	.006	1.18 (1.12-1.23)	<.001
Multiple locations	1.13 (1.08-1.18)	<.001	1.13 (1.10-1.17)	<.001
Acute fracture management				
Internal fixation	1 (Reference)		1 (Reference)	
Total hip arthroplasty	1.15 (1.06-1.23)	<.001	1.10 (1.03-1.18)	.003
Humeral arthroplasty	1.10 (1.07-1.14)	<.001	1.12 (1.10-1.15)	<.001
Nonoperative management	2.08 (2.01-2.15)	<.001	1.48 (1.45-1.51)	<.001

Reduced health related quality of life (HRQoL; N = 23,655)

- LTC and community dwelling
- For all fracture types, HRQoL decreased immediately following fracture
- Rebounded after the first month, but at 36 months never returned to pre-fracture levels.

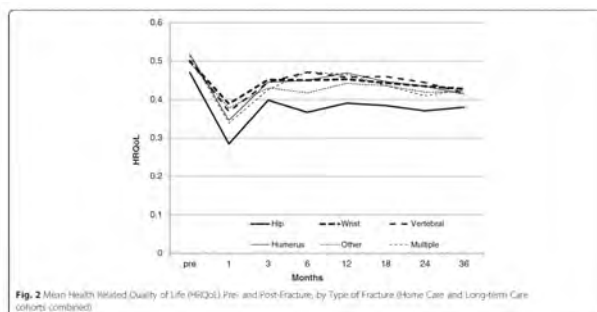


Fig. 2 Mean Health Related Quality of Life (HRQoL) Pre- and Post-Fracture, by Type of Fracture (Home Care and Long-term Care cohorts combined)

Tarride et al. BMC Geriatrics, 2016;16:84

## What tools are available to support fracture prevention in LTC?

### Recommendations for Fracture Prevention in LTC<sup>1</sup>

- Published in 2015; first of its kind aimed at LTC
- Integration of osteoporosis and falls assessment and management to reduce fractures
- Developed using GRADE approach,<sup>2</sup> considering:
  - Quality of evidence
  - Balance of benefits and harms
  - Values and preferences
  - Resources



## Recommendations for Fracture Prevention in LTC<sup>1</sup>



- Directed at interprofessional teams in LTC
- Includes recommendations related to:
  - Pharmacologic therapies for those at high risk for fracture
  - Hip protectors
  - Exercise
  - Multifactorial interventions
  - Calcium and vitamin D
- Goals:
  - Reduce pain, immobility, and hospital transfers
  - Improve quality of life for residents in LTC



1. Papaioannou, A. et al. CMAJ, 2015; 187(15): 1135-44.  
 2. Guyatt, GH. Et al.. BMJ 2008; 336:1049-51.

## Interpreting the Recommendations

Implications	Strong Recommendation "we recommend"...	Conditional Recommendation "we suggest" ...
<b>for patients/residents</b>	Most individuals in this situation would want the recommended course of action, and only a small proportion would not	The majority of individuals in this situation would want the suggested course of action, but many would not
<b>for clinicians</b>	Most individuals should receive the intervention	Clinicians recognize that different choices will be appropriate for each individual and that clinicians must help each individual arrive at a management decision consistent with his/her values and preferences

## Safe Administration Tool

SAFE ADMINISTRATION THERAPY TOOL FOR OSTEOPOROSIS			
For patients who are at HIGH RISK of fracture, bone conditions are exacerbated or FRAX™ shows strong recommendation			
Therapy	Frequency	Safe Administration Guidelines / Life Essentiality - Yes	Key Cautions*
Teriparatide (1-33)	Daily Oral	• Use liquid with 200mL water 30 min before the injection • Do not use if you are pregnant or planning to get pregnant	For All Dose Regimens • Do not use if you are pregnant or planning to get pregnant • Do not use if you are taking or plan to take any of the following: • Do not use if you are taking or plan to take any of the following: • Do not use if you are taking or plan to take any of the following: • Do not use if you are taking or plan to take any of the following:
Denosumab (60 mg)	Every 6 months subcutaneous injection	• Do not use if you are pregnant or planning to get pregnant • Do not use if you are taking or plan to take any of the following: • Do not use if you are taking or plan to take any of the following:	• Do not use if you are pregnant or planning to get pregnant • Do not use if you are taking or plan to take any of the following: • Do not use if you are taking or plan to take any of the following:
Zoledronic acid (5 mg IV)	Once yearly intravenous infusion (IV)	• MUST drink 2 glasses of fluid 1-2 hours before and after the infusion • MUST stop the medication 1-2 hours before and after the infusion • Do not use if you are pregnant or planning to get pregnant • Do not use if you are taking or plan to take any of the following: • Do not use if you are taking or plan to take any of the following:	For Intravenous use only therapy, there are key cautions: • Do not use if you are pregnant or planning to get pregnant • Do not use if you are taking or plan to take any of the following: • Do not use if you are taking or plan to take any of the following:

SAFE ADMINISTRATION THERAPY TOOL FOR OSTEOPOROSIS			
How to use this tool			
<ol style="list-style-type: none"> <li>Assess risk for fracture - ON ADMISSION</li> <li>The 2016 National Osteoporosis Foundation recommendations for high bone density indicate high-risk individuals are those who meet one of the following:                     <ul style="list-style-type: none"> <li>• Had a prior hip fracture</li> <li>• Had a prior vertebral fracture</li> <li>• Had more than one prior fracture (excluding hands, feet and ankle)</li> <li>• Received acute glucocorticoids (e.g. steroids, prednisone) and had one prior fracture</li> </ul> </li> <li>Pharmacotherapy is not appropriate for individuals with a disease &lt; 1 year.</li> <li>Recommendations for calcium and vitamin D intake:                     <ul style="list-style-type: none"> <li>• 1200 mg/day of calcium through dietary interventions or calcium supplementation up to 360 mg/day if natural sources are insufficient.</li> <li>• Vitamin D supplementation, 800 - 2000 IU/day</li> </ul> </li> </ol>			
What does a strong/conditional recommendation mean?			
Implications	Strong Recommendation (RECOMMEND)	Conditional Recommendation (SUGGEST)	
For patients receiving:	Most individuals in this situation would benefit from the suggested course of action, but many would not	The majority of individuals in this situation would benefit from the suggested course of action, but many would not	
For clinicians:	Most individuals should receive the intervention.	Clinicians recognize that different choices will be appropriate for each individual and they need help with decision making as a management option involves both fracture risk and preferences.	
What do I need to know about Limited Use Codes? (Policy)?			
<b>HIGH RISK FOR FRACTURE*</b> <b>DEXAMETHASONE</b> LIMITED USE CODE 428 (bottle 0.5L vial) For treatment of osteoporosis in postmenopausal women or men with osteoporosis due to exogenous glucocorticoid therapy (including intravenous or oral) (see package insert for details) LIMITED USE CODE 429 (bottle 0.5L vial) For treatment of osteoporosis in postmenopausal women or men with osteoporosis due to exogenous glucocorticoid therapy (including intravenous or oral) (see package insert for details)			

www.gerascentre.ca  
www.osteoporosis.ca



## Order Set

**LTC Fracture Prevention Order Set**

The LTC Fracture Prevention Order Set is to be used for all new residents who are at high risk of fracture.

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**RESIDENT HISTORY**

Prior fracture: Vertebral, Hip

More than one prior fracture (excluding hands, feet, or ankle)

Recently used systemic glucocorticoids and/or used systemic glucocorticoids (including hands, feet, or ankle)

Previously had multiple high risk or fractures and has received osteoporosis treatment (prior to admission)

Dementia

Resident is at risk of falling

Resident uses (past or present) oral or intravenous anti-epileptic drugs, anti-psychotics, anti-depressants, sedative/hypnotics, muscle relaxants, respiratory inhibitors (CPAP), antiemetics, antiemetics, or other medications that increase the risk of falls

**PHYSICIAN INVESTIGATIONS**

DX of Fall: confirm the medical history

Trauma: Current (give physician) or past one vertebral fracture

CBI, Calcium, Creatinine, Albumin, Alkaline Phosphatase, TSH

Screen prior medications for possible self-vertebral fracture

V/LX/lymphocyte count

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**PHARMACOLOGY**

Calcium \_\_\_\_\_ mg once daily

Vitamin D \_\_\_\_\_ IU once daily

Inactivated B12 2000 UNTS

Aromatase Inhibitor: \_\_\_\_\_ mg once weekly

Denosumab (Prolia) 120mg subcutaneous every 6 months

Risedronate (Actonel) 35mg oral once weekly

Teriparatide (Forsteo) 20ug oral once weekly

Teriparatide (Forsteo) 20ug oral once weekly

Zoledronic Acid (Zometa) 5mg IV once per year

**INITIALS**

\*Calcium supplement up to 3000 mg total daily  
\*Vitamin D supplement 4000 IU total daily  
\*Denosumab (Prolia) 120mg subcutaneous every 6 months  
\*Risedronate (Actonel) 35mg oral once weekly  
\*Teriparatide (Forsteo) 20ug oral once weekly  
\*Zoledronic Acid (Zometa) 5mg IV once per year

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**PHYSICIAN**

Physician responsible for resident care

**LONG-TERM MEDICAL & FRAGILITY HISTORY**

Document weight and functional history (mobility, strength, balance) at high risk of fracture. Consider other elements of functional assessment to support fall and fracture risk.

\_\_\_\_\_ kg, \_\_\_\_\_ inch

\_\_\_\_\_ measured functional history

\_\_\_\_\_ Measure of physical or chemical restraint, in restraint if all possible

\_\_\_\_\_ Side effects, delirium

\_\_\_\_\_ Side handling devices and techniques

Disposition for any condition

Long-term or temporary condition

Name: \_\_\_\_\_ MDP# \_\_\_\_\_ Date: \_\_\_\_\_

Name: \_\_\_\_\_ MDP# \_\_\_\_\_ Date: \_\_\_\_\_

13

## Quick Reference Guide



## Worth watching...

<p><b>Series 1: Personal Support Workers</b></p> <p>This 4-part series is for personal support workers who work in long term care. It demonstrates how to help residents transfer in and out of bed safely, sit properly in wheelchairs, and how to do sit to stands with residents to keep their legs strong</p> <p><a href="#">WATCH &gt;</a></p>	<p><b>Series 2: Physiotherapists &amp; Physiotherapy Assistants</b></p> <p>This series focuses on the role of physiotherapists and physiotherapy assistants for preventing falls and fractures in long term care by completing balance assessments and communicating with the team, doing balance and strength exercises with the resident, and involving their family members.</p> <p><a href="#">WATCH &gt;</a></p>	<p><b>Series 3: Group Exercise Trainers &amp; Exercise Professionals</b></p> <p>Group exercise providers have a huge role to play in providing exercise to help prevent falls and fractures. This video series gives ideas for how to modify exercises for residents who can't stand, working with residents with dementia or cognitive impairment, and incorporating postural exercises.</p> <p><a href="#">WATCH &gt;</a></p>	<p><b>Series 4: Restorative Care</b></p> <p>The restorative care team can help prevent falls and fractures through practising spine sparing strategies, incorporating simple balance and strength exercises into walking programs, and providing postural cues through range of motion exercises.</p> <p><a href="#">WATCH &gt;</a></p>

<https://www.gerascentre.ca/fracture-prevention-toolkit>  
<https://osteoporosis.ca/health-care-professionals/clinical-practice-guidelines/long-term-care/>



## Functional strength training



Sit to stand exercises



29

## An example of an effective exercise program: randomized control trial in LTC

- Individually prescribed progressive resistance and balance training
  - Group setting (leaders:participants, 1:5)
  - 1 hour 2x/week
- Reduced rate of falls by 55%, and improved physical performance
  - Intervention (n=113) – 1.31 falls per person years or 142 falls
  - Control (n=277) – 2.91 per person years or 277 falls
- Caution:
  - Only included residents with MMSE>15, who were mobile
  - Did not reduce the number/rate of fractures



43

Hewitt et al. J Am Med Dir Assoc. 2018 19(4):361-369.

## How is fracture risk assessed?



### Meet Mrs. Andrews

87 year old woman just admitted to LTC – six months following the death of her husband; she was unable to care for herself at home

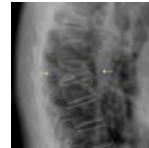




## Mrs. Andrews

- History:

- moderate dementia
- wrist fracture 8 years ago – from a fall while walking
- prescribed antidepressant for 2 years; PPI recently prescribed while in hospital
- Prior fall
- no osteoporosis diagnosis/ no osteoporosis medications
- family reported recent weight loss and height change from 5'5" (165 cm) to 5'2" (157 cm) on admission
- Height loss prompted a lateral thoracolumbar x-ray ordered  
– 2 vertebral fractures found



33

## Mrs. Andrews

- LTC Assessment:

- Appetite seems good and she is willing to eat food without difficulty
- No significant dysphagia noted by staff
- Wandering frequently around the home
- Able to walk in corridor independently
- BMI <18



34

**At what level of risk for fractures is Mrs Andrews?**

**How can you estimate fracture risk?**

35

## **Fracture Risk Scale For LTC (FRS)**



*Assessing fracture risk for LTC residents to put strategies into place to prevent fractures*

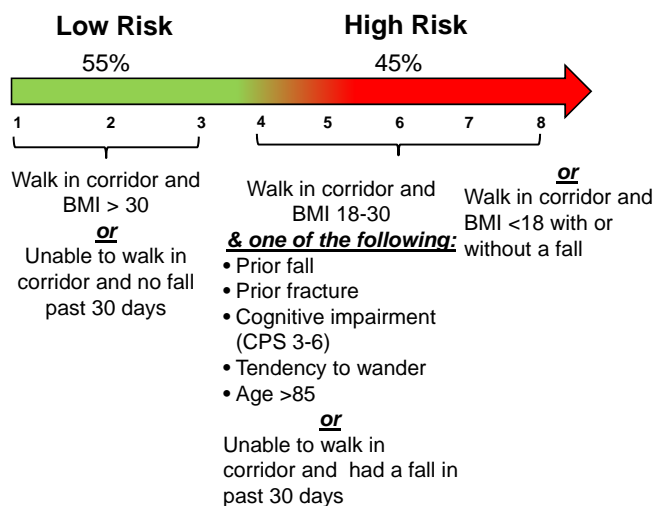
Ioannidis G, et al. *BMJ Open*, 2017;7.

**NOTE:** Developed and validated with MDS 2.0 in Canada, but items could be derived from MDS 3.0.

Fracture Risk Scale has been developed for Home Care as well



## Fracture Risk Scale Scores – Hip Fracture Risk

Ioannidis G, et al. *BMJ Open*, 2017;7.

32

## What is the fracture risk for residents who are immobile?

- **Fracture Risk Scale** - hip fracture risk
  - Inability to walk independently = low risk
  - Inability to walk independently + a fall in last 30 days = high risk
  - May underestimate vertebral fractures and potential for these with transfers or shifting in bed
- **Immobilization** is a risk factor for bone loss and increases risk for osteoporotic fractures<sup>1</sup>

Ioannidis G, et al. *BMJ Open*, 2017;7  
Chen et al *J Bone Min Res* 2006;21:324-31.

38

## There are many options:

- FRAX
- Clin-Fx
- FRAiL model

Journals of Gerontology: Medical Sciences  
Cite as: *J Gerontol A Biol Sci Med Sci*, 2018, Vol. 73, No. 6, 703-708  
doi:10.1093/geronl/gm147  
Advance Access publication August 31, 2017

OXFORD

Research Article

**Fracture Risk Assessment in Long-term Care (FRAiL): Development and Validation of a Prediction Model**

Sarah D. Berry, MD, MPH,<sup>1,2</sup> Andrew R. Zullo, Pharm D, PhD,<sup>3</sup> Yoojin Lee, MPH,<sup>3</sup> Vincent Mor, PhD,<sup>3</sup> Kevin W. McConeghy, PharmD,<sup>3</sup> Geetanjali Banerjee, MPH,<sup>3</sup> Ralph B. D'Agostino Sr, PhD,<sup>4</sup> Lori Daiello, PharmD,<sup>3</sup> David Dosa, MD,<sup>3</sup> and Douglas P. Kiel, MD, MPH<sup>1,2</sup>



... Back to Mrs. Andrews

### Mrs. Andrews FRS score

- is able to walk in the corridor (independently)
- has a BMI <18
- had a fall in last 180 days

She is at the highest level of risk



## Multifactorial interventions

- Any combination of interventions that are tailored to an individual's risk to reduce falls
- May include:
  - medication reviews, assessment of environmental hazards, use of assistive devices, exercise, management of urinary incontinence and educational interventions directed to staff

**For all residents, we suggest**  
multifactorial interventions that are  
individually tailored to reduce the risk  
of falls and fractures



## Summary of evidence

- Studies did not measure fractures, quality of life, mobility or pain. Risk of falls informed the recommendation. With multifactorial interventions there may be, per 1000 residents per year:
  - 660 fewer falls (1230 fewer to 120 more)
  - 55 fewer residents will fall (115 fewer to 10 more)
  - 10 fewer hip fractures (14 fewer to 1 more)

Cameron ID. *Cochrane Database Syst Rev.* 2012

51

## Number Need to Treat (NNT)

First Line Drug Therapies to prevent fractures in older persons at High Risk of fractures in long-term care<sup>1</sup>

	Bisphosphonates <sup>2</sup>					
	Alendronate	Risedronate	Zoledronate	Denosumab <sup>3</sup>	Teriparatide <sup>3</sup>	
<b>Hip Fractures</b>	Number of hip fractures prevented per 1000 treated	24 fewer	23 fewer	22 fewer	22 fewer	26 fewer
	Confidence interval	(14 - 32 fewer)	(15 - 31 fewer)	(12 - 29 fewer)	(6-32 fewer)	(40 fewer to 34 more)
	<b>NNT to prevent one hip fracture</b>	<b>42</b> (71 - 31)	<b>43</b> (67 - 32)	<b>45</b> (83 - 34)	<b>45</b> (167 - 31)	<b>n/a</b>
<b>Vertebral Fractures</b>	No. of vertebral fractures prevented per 1000 treated	89 fewer	97 fewer	120 fewer	124 fewer	130 fewer
	Confidence Interval	(35-124 fewer)	(55-128 fewer)	(62 - 152 fewer)	(60- 155 fewer)	(79 - 162 fewer)
	<b>NNT to prevent one vertebral fracture</b>	<b>11</b> (29 - 8)	<b>10</b> (18 - 8)	<b>8</b> (16 - 7)	<b>8</b> (17 - 6)	<b>8</b> (13 - 6)

<sup>1</sup>Quality of evidence was assessed as moderate. Estimated effects assumed baseline risk of hip fx at 6% and vertebral fx at 20%

<sup>2</sup>Primarily with at least 500 mg of calcium, and with/without vitamin D

<sup>3</sup>With calcium and vitamin D

Papaloannou A et al. *CMAJ*. 2015



44

## What medications are associated with falls and fractures?

Which medications should be considered for deprescribing?

### Antipsychotics

- Antipsychotic drug use associated with:
  - Somnolence
  - Extrapyrimal side effects
  - Gait abnormalities
  - Increase postural sway
  - Increased fragility fractures<sup>7</sup>
- Fracture risk is greatest in the first 30 days of use<sup>7</sup>
- Haloperidol has the strongest association to fractures<sup>7</sup>

↑ Falls<sup>1-6</sup>

<sup>1</sup>Bozat-Emre et al. Int J Geriatr Psychiatry 2015; 30:842-50. <sup>5</sup>Hughenoltz et al. Bone 2005; 37:864-70.

<sup>2</sup>Corbeil et al Psychopharmacology 2012; 222:59-69.

<sup>3</sup>Jalbert et al. JAMDA 2010 11:120-17.

<sup>4</sup>Jeste et al. Neuropsychopharmacology 2008; 33:957-70.

<sup>6</sup>Cox et al. JAMDA 2016; 17: 1089-1093

<sup>7</sup>Torstensson et al. Age Ageing 2017; 46:258-64



## Benzodiazepines

- Risk of falls is greatest within first 24 hours of initiation<sup>1</sup>
- Associated with:
  - gait and balance impairment<sup>2</sup>
  - 30% - 40% increase in hip fracture risks<sup>3-5</sup>
  - In people with Alzheimer's Disease, almost 60% more likely to still be in hospital/rehab beyond 4 months.

<sup>1</sup> Berry et al J Gerontol A Biol Sci Med Sci 2016, 17: 273-278.

<sup>2</sup> Dell'Osso & Lader, Eur Psychiatry 2013; 28: 7-20.

<sup>3</sup> Xing et al. Osteoporosis Int 2014;25:105-120

<sup>4</sup> Khong et al. Calcif Tissue Int 2012;91:24-31

<sup>5</sup> Takkouch et al. Drug Safety 2007;30:171-184

<sup>6</sup> Saarelainen et al JAMDA 2017;18:e15-87



47

## Trazodone

- 5.7% incidence of a fall-related injury requiring hospitalization within 90 days<sup>1</sup>
- New use of low dose trazodone no safer than new use of benzodiazepine<sup>1</sup>
- Compared to atypical antipsychotics, use has similar rates of falls and major osteoporotic fracture and a lower rate of mortality<sup>2</sup>

<sup>1</sup> Bronskill et al JAGS 2018; 66(10):1963-1971

<sup>2</sup> Watt et al, CMAJ, 2018;190(47):E1376-83.



48



## Anticholinergic Medications

(e.g., clozapine, onanzapine, quetiapine, chlorpromazine)

- Associated with functional decline, falls and delirium in nursing home residents<sup>1</sup>
- High-level use of anticholinergic medications associated with 14% greater fracture risk within 30 days than nonuse<sup>2</sup>
- Comorbid conditions and markers of frailty account for increased falls, fractures and BMD loss<sup>3</sup>

<sup>1</sup>Landi et al JAMDA 2014; 15:825-829

<sup>2</sup>Chatterjee et al JAGS, 2016; 64:1492-1497.

<sup>3</sup>Fraser et al Ann Pharmacol 2014 48:954-961



49

## Pearls

- **Fracture Prevention** – key to maintaining mobility
- Determine **risk of fracture** on admission
- **Exercise and multifactorial interventions** may reduce falls, but caution in those at high risk
- **Deprescribing** is important (e.g., anticholinergics)
- **Osteoporosis Medications** reduce fracture risk by 40-60%, provide alternatives to oral bisphosphonates in residents with swallowing difficulties or renal impairment
- Consider a **quality improvement** approach to fracture prevention in your home

<sup>1</sup>Kennedy C et al. *Implementation Science*. 2012  
Papaioannou A et al. *CMAJ*. 2015



50

**Making life better for older adults by bringing the best research to the frontlines of care as quickly as possible**