

Upper Extremity Fractures and Secondary Fall Prevention: Opportunities to Improve Management and Outcomes Across Disciplines

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- Boston University, TREAT, NEPDC



Objectives

- Present current evidence related to UE Fx through the lens of secondary prevention
 - Selected studies from TDI MCRC Research Project 1
 - Study 1: Epidemiology of Second Fracture
 - Study 2: Prescription Drug Use Before and After Fx
 - Study 3: Evaluation and Treatment of Balance & Gait after UE Fx
 - Study 4: Opioid Use after Fx
 - Recommendations based on American Physical Therapy Association
 - Fall Risk Management Guideline
 - Systematic Review of Measures

Sample & Data Sources

- Fee-for-service Medicare beneficiaries age 66–99 years old who sustained a hip, shoulder, or wrist fragility fracture
- Enrolled in Medicare
- Without managed care enrollment for one year before and one year after the index fracture or until death
- Identified fracture types using claims

Study 1: Fracture Epidemiology

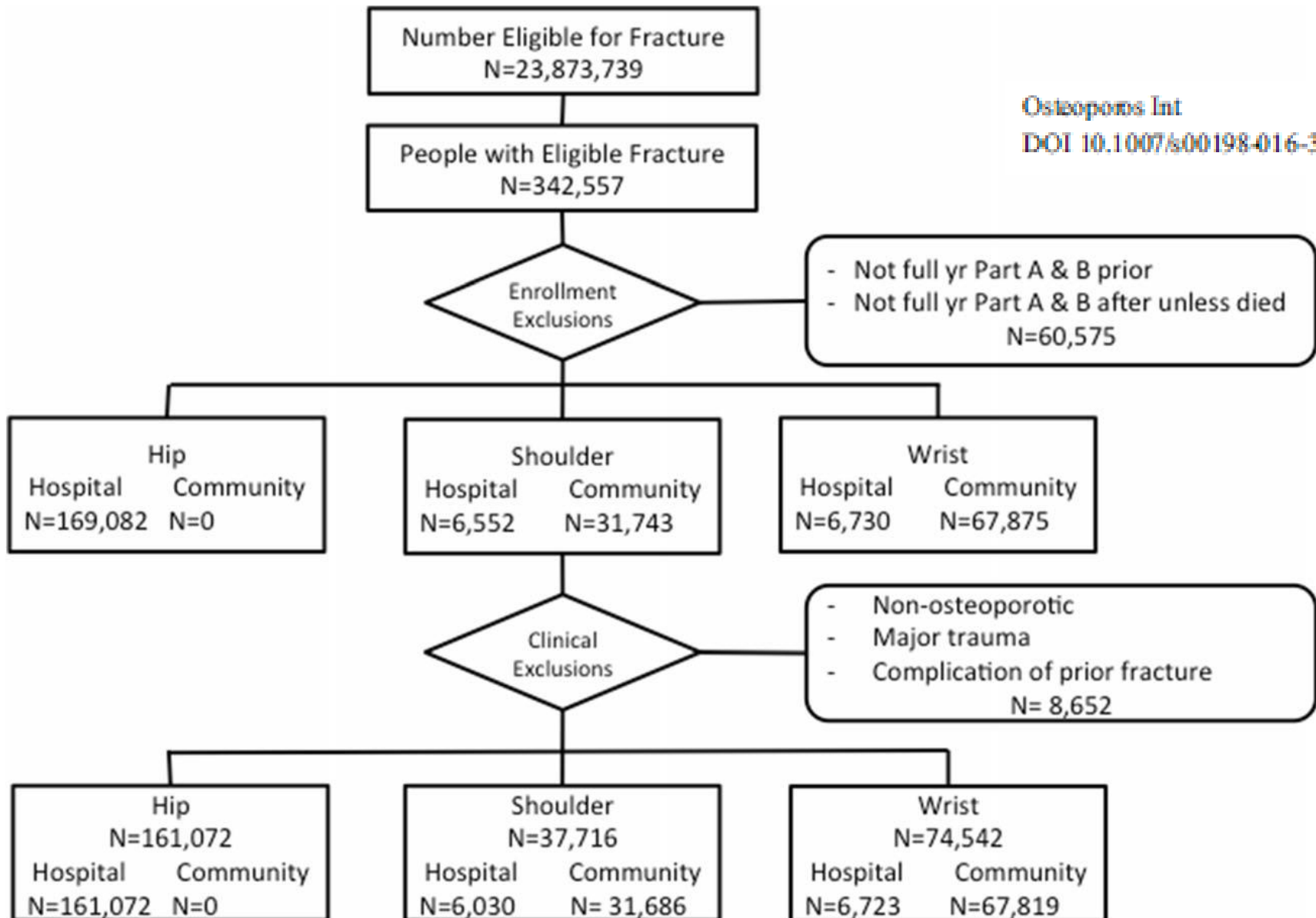
ORIGINAL ARTICLE

Second fractures among older adults in the year following hip, shoulder, or wrist fracture

**J. P. W. Bynum^{1,2} • J.-E. Bell³ • R. V. Cantu³ • Q. Wang¹ • C. M. McDonough^{1,4} •
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Cohort Description

Osteoporosis Int
DOI 10.1007/s00198-016-3542-6



Results

- Hip fracture patients: older, had higher comorbidity.
 - Older more likely to die by 1 yr after index Fx
 - Hip: 27%
 - Shoulder: 13%
 - Wrist: 7%
- Women more likely than men to sustain any Fx
 - Gender imbalance > for UE than hip Fx
 - Wrist: 14 % male
 - Shoulder: 19 % male
 - Hip: 26 % male

Second Fracture Results & Conclusions

- Overall 11,885 people (4.3%) had second within one year
- Age and comorbidity have strong effects on risk of second fracture
- Little difference in risk by index fracture type or gender

Results reveal that fracture prevention is as important after humerus and wrist fracture as for hip and for men as much as women

Study 2: Prescription Drug Use

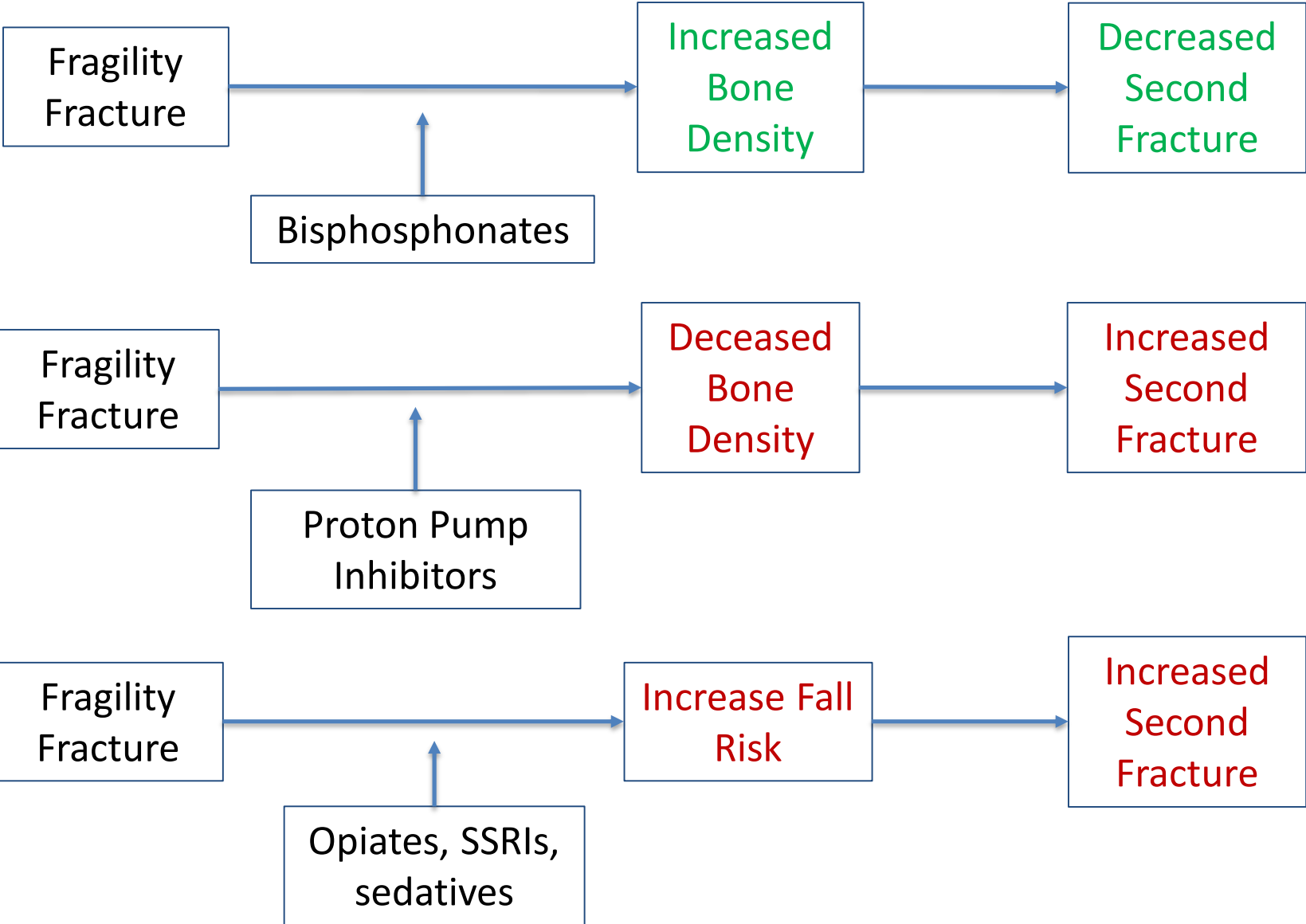
Research

JAMA Internal Medicine | [Original Investigation](#)

Patterns of Prescription Drug Use Before and After Fragility Fracture

Jeffrey C. Munson, MD, MSCE; Julie P. W. Bynum, MD, MPH; John-Erik Bell, MD, MS; Robert Cantu, MD, MS; Christine McDonough, PT, PhD; Qianfei Wang, MS; Tor D. Tosteson, ScD; Anna N. A. Tosteson, ScD

Rationale: Prescription Drug Use Is Modifiable Risk Factor



Study 2: Prescription Drug Use

- Background:
 - Prescription drugs are modifiable risk factor for second fracture
 - Bisphosphonate use after fracture low
 - Small study showing high rate of use of drugs associated with fall risk
- Aim: To characterize prescription drug use and associated fracture risk before and after fragility fracture

Study 2 Results & Conclusions

- There was very little reduction in exposure to prescription drugs associated with fracture risk after fragility fracture
 - some patients discontinued drugs associated with fracture
 - an equal number started new risk-related drugs

Post-fracture care is an opportunity to ↓ medication-related risk of second fracture risk

Study 3

Original Research

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Falling Down on the Job: Evaluation and Treatment of Fall Risk Among Older Adults With Upper Extremity Fragility Fractures

Christine M. McDonough, Carrie H. Colla, Donald Carmichael, Anna N. A. Tosteson, Tor D. Tosteson, John-Erik Bell, Robert V. Cantu, Jonathan D. Lurie, Julie P. W. Bynum

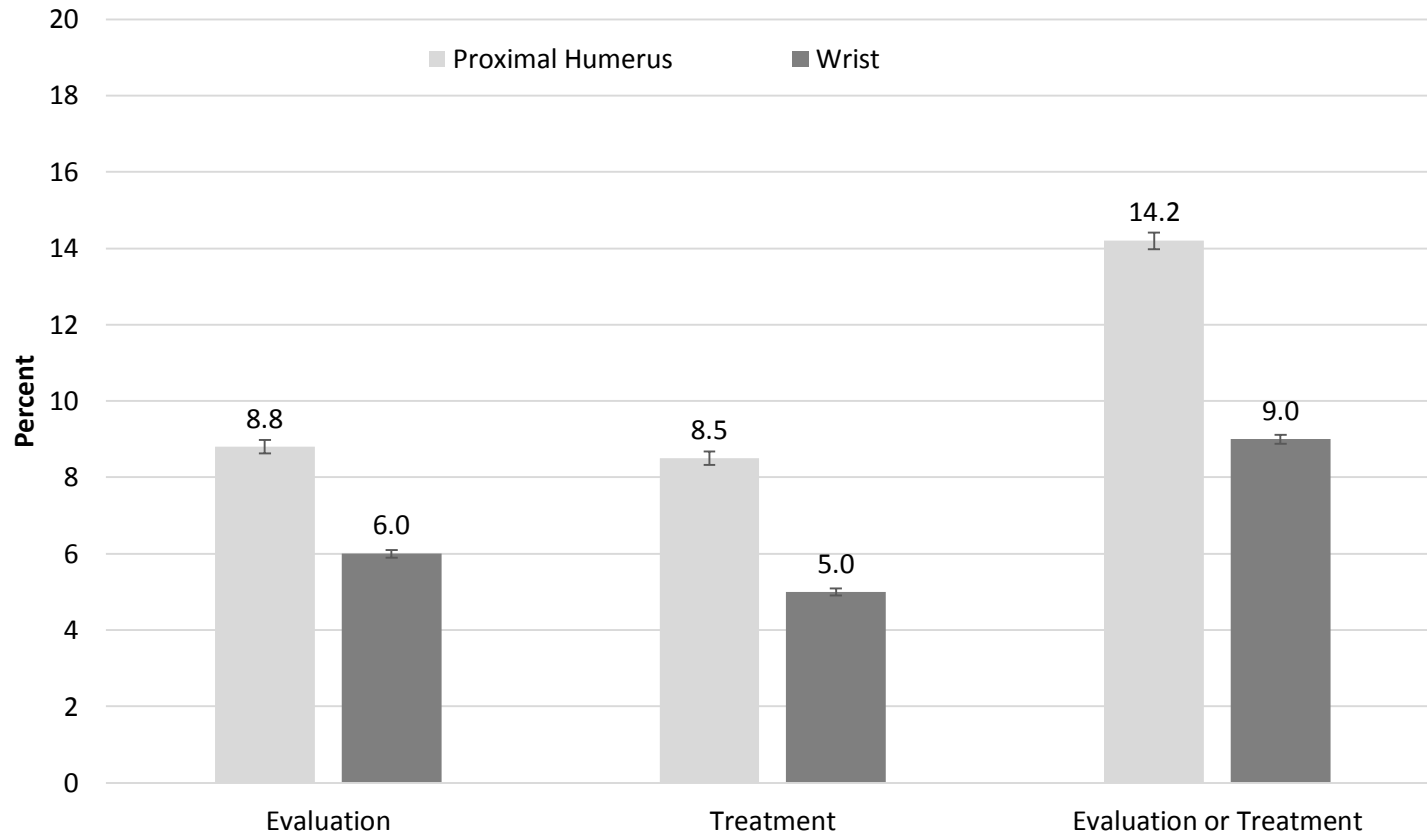
Study 3 Methods

Subjects: Fee-for-service beneficiaries age 66 to 99 treated as outpatients for proximal humerus or distal radius/ulna ("wrist") fragility fractures

Outcomes

- % evaluated or treated for fall risk up to 6 months after proximal humerus or wrist fracture from 2007-2009
- Predictors of receiving evaluation or treatment (logistic regression)

Percent Receiving Assessment or Treatment for Extremity Fracture Study Results



Percent of Medicare Beneficiaries who Received Evaluation or Treatment up to 6 Months after Index Proximal Humerus or Wrist Fracture (n=309,947).

Study 3 Results

- 10.7% received evaluation or treatment for fall risk or gait issues
- Using the broader definition the percentage increased to 18.5%
- Higher likelihood of services after fracture were: evaluation or treatment for falls or gait prior to fracture, more comorbidities, prior nursing home stay, older age, humerus fracture (versus wrist), female sex and white race

Study 3 Conclusions/Next Steps

This low rate of assessment and treatment after an upper extremity fracture is the most important finding of this study, marking a large missed opportunity to reduce future falls and associated functional loss



Next step

Rerun the analysis from 2010-2013 to address more recent incentives and policies (AGS/BGS CPG, APTA CGS, PQRS, Medicare annual wellness visit, etc.)

Opportunities to Improve Management and Outcomes Across Disciplines

Fragility fractures should be sentinel events triggering

- Assessment of medication-based risk & reduction
- Evaluation & treatment of balance and mobility deficits
- Consider humerus, wrist, and hip fracture as equally predictive of second fracture

Take appropriate action as soon as possible after fracture

Physical Therapy

Journal of the American Physical Therapy Association



Management of Falls in Community-Dwelling Older Adults: Clinical Guidance Statement From the Academy of Geriatric Physical Therapy of the American Physical Therapy Association

Keith G. Avin, Timothy A. Hanke, Neva Kirk-Sanchez, Christine M. McDonough, Tiffany E. Shubert, Jason Hardage and Greg Hartley

PHYS THER. 2015; 95:815-834.

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The online version of this article, along with updated information and services, can be found online at: <http://ptjournal.apta.org/content/95/6/815>

Methods: Identification of Clinical Practice Guidelines (CPGs)

- Systematically search (11 databases)
- Search terms: falls, geriatric, older adult
- Inclusion
 - Published between 2000 and 2013
 - English and
 - Adults over the age of 65 living in the community or in assisted-living settings
- Exclusion
 - Specific to a neurological condition (e.g., stroke, Parkinson disease, multiple sclerosis)
 - Fracture management
 - Clinical practice statements excluded

Methods

- 4028 CPGs identified
- 5 met inclusion criteria
- Critically appraised by ≥ 3 reviewers: AGREE II
 - AGS/BGS (American & British Geriatrics Societies)
 - NICE (National Institute for Health & Care Excellence)
 - FSGG (French Society of Geriatrics & Gerontology)
 - AGILE (UK Society for PTs working with older adults)
 - Moreland J et al. 2003

Assessment

- Consistent across all three CPGs, anyone with a positive fall history should receive a multi-factorial assessment
- AGS/BGS provides a nuanced comment to the above recommendation:
 - Multi-factorial assessment should not be performed if:
 - Only a single fall
AND
 - Demonstrates no unsteadiness or difficulty with gait or balance

Assessment: Health Conditions

Cardiac conditions

√√ Cardiac exam (NICE, AGS/BGS)

- HR, rhythm, postural pulse, BP, hypotension (AGS/BGS)

√ Anti-arrhythmia medication (NICE)

√ Cardiac drugs and postural hypotension (Moreland)

√√ Osteoporosis (NICE, AGS/BGS)

Risk assessment or diagnosis

Assessment: Health Condition

✓ Depression (Moreland)

- Assess for risk
- Geriatric Depression Scale

✓✓✓ Medication review

- Number of meds with dosage
- Cardiac
- Psychotropic (benzodiazepines, hypnotics, antidepressants, tranquilizers)

Assessment: Body Functions and Structures

√√√ Strength of the extremities

- Lower extremity strength (AGS/BGS)

√√√ Balance

- No specific procedures or methods for balance assessment are provided within the CPGs
- Frequently used tests: BBS, TUG, POMA

Assessment: Body Functions and Structures

√√√ Vision

- Visual acuity (AGS/BGS)

√√√ Urinary function/ incontinence

√√√ Cognitive assessment/ neurologic function

- Cognitive evaluation (AGS/BGS, NICE)
- Peripheral nerve function, proprioception, reflex testing, and cortical, extrapyramidal, cerebellar function (AGS/BGS)

Assessment: Activity and Participation

√√√ Gait (thorough and detailed)

- Gait deficits or abnormalities are a risk factor for falls
- No specific procedures or methods were recommended
- Individual professional should identify appropriate measures for the assessment of gait for each older adult (NICE)
- Use of walking aids (Moreland)

Assessment: Activity and Participation

√√ Activities of daily living and mobility

- ADL skill including use of adaptive equipment
- Mobility aids (AGS/BGS)
- Transfers (Moreland)

√ Physical activity

- Given that moderate activity levels may be protective to balance and falls, assess levels of physical activity (Moreland)

Assessment: Environmental and Personal Factors

√√√ Since home safety and hazards are risk factors, assess the home for hazards

- Example: Tripping hazards: attention to loose rugs and mats

√√ Fear and health perception

- Assess perceived functional ability and fear of falling

Assessment: Environmental and Personal Factors

√ Social support

- Identification of the older adult's social support network (Moreland)

√ Alcohol use

- Assessment of consumption and inappropriate alcohol use (Moreland)

√ Feet and footwear

- Assess feet and footwear (AGS/BGS)

Intervention

- Broadly, recommendations were similar for older adults at risk of falls
 - Individualized exercise program including:
 - Balance training
 - Strength training
 - Referral to physical therapy (Moreland)
- There were differences...

Intervention: Health Conditions

- √√√ Conduct medication review; modify/withdraw psychotropic meds if possible
- √√ Treat cardioinhibitory carotid sinus hypersensitivity (NICE, AGS/BGS)
- √√ Treat postural hypotension (AGS/BGS, Moreland)
- √ Treat vitamin D insufficiency (AGS/BGS)
- √ Treat impaired cognitive status (Moreland)
- √ Treat depression (Moreland)

Intervention: Body Functions and Structure

- √√√ Individualized balance training
- √√ Individualized strength exercises (NICE, AGS/BGS)
- √√ Monitored by appropriately trained health care professional (NICE, AGS/BGS)
- √ Coordination training (AGS/BGS)
- √ Flexibility and endurance should be offered; not as stand alone intervention (AGS/BGS)

Intervention: Body Functions and Structure

For persons who have fallen, but with no specific findings on assessment

- ✓ Tai chi or other balance control ex (e.g. on foam surfaces) (Moreland)
- ✓ For women over 80 yrs, individualized home physical therapy program for strengthening, balance, and flexibility (Moreland)

Intervention: Body Functions and Structure

Delivery

- ✓ Referral to physical therapy (Moreland)
- ✓ Tai chi or physical therapy (AGS/BGS)
- ✓ Group exercise or individual (AGS/BGS)

Intervention: Body Functions and Structure

- ✓ Expedite first cataract surgery when indicated (AGS/BGS)
- ✗ Advise against multifocal lenses for walking on level and stairs (AGS/BGS)
- ✓ Treat vision and hearing impairment (Moreland)
- Insufficient evidence to recommend vision correction as stand-alone falls intervention (NICE, AGS/BGS)

Intervention: Activity & Participation

- √ √ Individualized gait training combined with balance and strength training (AGS/BGS, Moreland was specific to older women)
- × Advise against brisk walking for post-menopausal women with fracture history (Moreland)
- Insufficient evidence for brisk walking (NICE)

Intervention: Activity & Participation

- √ √ ADL training for those with difficulty performing ADL activities. (AGS/BGS, Moreland)

Intervention

Education and information giving

- ✓ Verbal and written re: prevention, effective measures, motivation to exercise, benefits of engagement in risk reduction activities (NICE)
- ✓ Tailored education within multi-factorial intervention (AGS/BGS)
- ✓ Insufficient evidence for targeted or untargeted educational programs as stand-alone interventions (AGS/BGS)

Intervention

For those with inappropriate alcohol use

✓ Educate and refer for treatment (Moreland)

For those with risky activity level

✓ Educate and refer for treatment (Moreland)

Intervention: Environmental Factors

Home hazard modification

- ✓✓✓ Home hazard assessment combined with modifications. Home hazard assessment should not be conducted without follow-up and modifications

Intervention: Personal Factors

Footwear

- ✓ Treatment of foot and footwear problems identified in multi-factorial assessment (AGS/BGS)
- ✓ Advise low heels and high surface contact area (AGS/BGS)

Intervention: Personal Factors

Hip protectors

- √ Insufficient evidence to recommend hip protectors for fall prevention (NICE)
- ** Note that hip protectors may be effective in preventing fractures associated with falls

Which tests to Use to Determine Fall Risk



Systematic Reviews

OPEN

Determining Risk of Falls in Community Dwelling Older Adults: A Systematic Review and Meta-analysis Using Posttest Probability

Michelle M. Lusardi, PT, DPT, PhD¹; Stacy Fritz, PT, PhD²;
Addie Middleton, PT, DPT, PhD³; Leslie Allison, PT, PhD⁴;
Mariana Wingood, PT, DPT, GCS⁵; Emma Phillips, PT, DPT, GCS⁶;
Michelle Criss, PT, GCS⁷; Sangita Verma, PT, DPT, GCS⁸;
Jackie Osborne, PT, DPT, GCS⁹; Kevin K. Chui, PT, DPT, PhD, GCS, OCS¹⁰

Summary of Clinically Useful Indicators of Fall Risk

Category	Measure
Medical History Questions	Any previous falls
	Psychoactive medication
	Requiring any ADL assistance
	Ambulatory assistive device use
Self-report Measures	Geriatric Depression Scale-15
	Falls Efficacy Scale International
Performance-based Functional Measures	Timed Up & Go Test
	Single-limb stance eyes open
	Five Times Sit-to-Stand Test
	Self-selected walking speed

What We Do Know

Gillespie LD, Robertson MC, Gillespie WJ, et al. Interventions for preventing falls in older people living in the community. Cochrane Database of Systematic Reviews 2012, Issue 9.

Sherrington C, Whitney JC, Lord SR, et al. Effective exercise for the prevention of falls: A systematic review and meta-analysis. *J Amer Geriatr Soc.* 2008; 56(12): 2234-43.

Power V, Clifford AM. Characteristics of optimum falls prevention exercise programmes for community-dwelling older adults. *Eur Rev Aging Phys Act* 2013; 10:95-106.

Mode

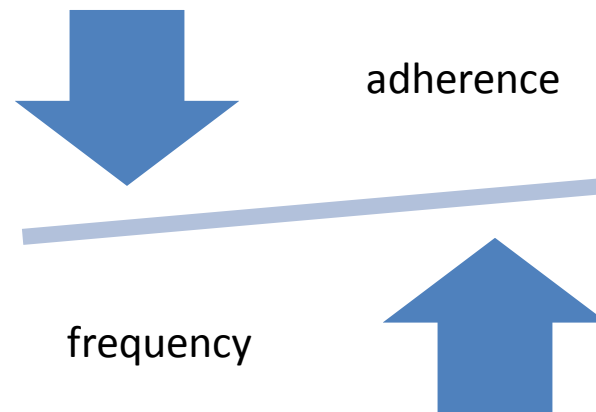
- Must include balance training
- Strength training only has small effect
- Multifactorial home or community-based interventions
- Walking programs alone have small effect

Intensity

- Intensity of training
 - Balance training
 - “demanding”
 - “challenging”
 - “appropriate and increasing levels of difficulty”
 - Highest possible level of difficulty without falling or near-falling
 - Mastery of each exercise before progressing

Frequency

- Minimum effective frequency twice per week
- Most consistently effective frequency three times per week
- Higher frequencies reduce fall risk, but adherence was poor



Time

- Total exercise volume?
 - At least 40 (Power et al) or 50(Sherrington et al) hours over the course of the intervention

Exercise components

- What works
 - Leaning beyond BOS
 - Shifting the COM
 - Minimizing UE support
 - Narrowing base of support
 - Dual-task movement
 - Altering sensory feedback
 - Functional activities
 - Tai-chi
- What doesn't work
 - Lack of balance training component
 - Lack of functional relevance
 - Lack of exercise progression

Questions?

Thank You!