

Community-based Fall Prevention: It's a Team Sport



Ericka E. Tung, MD, MPH

Mayo Clinic

Division of Primary Care Internal Medicine

Objectives

Community-based Fall Prevention

- Dispel common myths associated with falls
 1. Epidemiology
 2. Risk factor assessment
 3. Evidence-based interventions
 4. Roles and responsibilities of each team member

Mrs. Johnson

- 74 year old woman
- Past medical history
 - Hypertension
 - Atrial Fibrillation
 - Hyperlipidemia
 - Depression
- Presents to her primary care provider's office for her annual check-up

Mrs. Johnson

- In addition to her chronic disease maintenance issues, her PCP asks about falls in the past year
- "I guess that I stumble once in a while.... but isn't that normal for older ladies like me?"
- "It really isn't a big deal."

Epidemiology of Falls

Epidemiology of Falls *Community-dwelling Older Adults*

- 30-60% of community-dwelling older adults fall each year
 - 50% will experience multiple falls
- Fall incidence rate
 - Mean: 0.7 falls per person, per year
 - 5% will experience a serious complication

Rubenstein LZ, Clin Geriatr Med 2002; 141-158

Epidemiology of Falls *Institutionalized Older Adults*

- **Nursing Home Residents**
 - 16-75%
 - Mean annual incidence 1.6 falls per bed, per year (0.2-3.6)
 - 10-25% experience a serious complication
- **Hospitalized Patients**
 - 1.4 falls per bed, per year (0.5-2.7)

Rubenstein LZ, Clin Geriatr Med 2002; 141-158

Consequences of Falling *Local Impact*

- **Among Minnesotans aged 65+:**
 - #1 cause of injury-related hospitalization
 - #1 cause of ED-treated trauma
 - 3rd highest fall-related death rate in the country
 - The incidence of falls in MN is on the rise



Falls: The Aftermath

Consequences and Implications

Discuss with your partner

- **Why should we care whether our patients are falling?**
 - Identify 3 implications of falling

Consequences of Falling *Mortality and Morbidity*

- **Accidents are the 5th leading cause of death among older adults**
 - Falls make up 2/3 of these injury deaths
- **5-10% sustain serious injury**
- **Hospitalization, premature NH placement**



Consequences of Falling *Morbidity*

- **Digging a little deeper...**
 - Functional decline
 - Fear of falling
 - Post-fall anxiety syndrome
 - Depression
 - Social isolation

Consequences of Falling Costs

- 1.8 million ED visits in 2000
- >10,000 deaths annually
- Direct costs from fall related injury
 - > \$20 billion in 2000
 - \$32.4 billion in 2020



Fall Prevention Practice Implications

- NH Litigation
 - Growing concern
 - >30% of claims

Stevenson, DG. Health Affairs; 2003:219-229



Fall Prevention Practice Implications

- Performance Measurement
 - Physician Quality Reporting Initiative (CMS)
 - Currently voluntary
 - Clinical performance measures
 - Fall risk assessment is #4 (of 74)
 - % of older patients who were screened for "future fall risk"
 - "At risk" vs. "Not at risk"



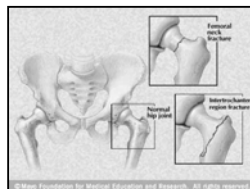
Fast forward to our patient Mrs. Johnson: Emergency Department

- Presented to the ED this morning after she was found in her kitchen, unable to rise.
 - Severe pain and confusion.
 - Sustained a fall while transferring from her chair to the sink.
 - Unable to bear weight on her left leg, complaining of pain in the lateral left hip.



Falls and Hip Fractures

- 250,000 hip fractures occur annually in the US
 - 25% will die within the first year after the fracture
 - Of those that survive 6 months
 - 40% will not recover pre-fracture walking ability
 - 50% will not recover pre-fracture functional status



A Clinical Paradox

- Serious morbidity and mortality
- National guidelines for quality
- Litigation
- Screening rates are poor
- Assessment rates are poor
- <40% of "fallers" receive evaluation/treatment by their primary care providers



The Solution

- Community-based service providers are in a unique position to identify individuals at risk for falls and to prevent future falls
- Incorporation of risk factor assessment and evidence-based interventions into routine community based care is essential

Why is my patient falling?

Risk factors for the syndrome

Etiology of Falls

- Rarely due to a single cause
- May be due to the accumulated effect of multiple impairments
- Complex interaction of:
 - Extrinsic factors
 - Behaviors
 - Intrinsic factors

Discuss with your neighbor

- Name 3 Intrinsic Risk Factors
- Identify 3 Extrinsic Risk Factors
- Identify 3 Risk-taking behaviors

Intrinsic Factors

Age related changes

Medical conditions

Sensory impairment

Weakness & imbalance

Extrinsic Factors

Medications

Improper use of assistive devices

Environmental hazards

FALLS

Risk taking behavior

Causes of Falls and Disordered Gait *Normal Aging*

- Changes of Normal Aging
 - Stiffening of connective tissue
 - Loss of muscle mass
 - Slowing of nerve conduction
 - Decreased visual acuity
 - Impaired proprioception
- Direct Results
 - Decreased ROM
 - Prolonged reaction time
 - Impaired depth perception
 - Increase postural sway
 - Slower gait
 - Shortened stride length

Causes of Falls and Disordered Gait *Specific Conditions*

- **Pain**
 - Arthritis, injury
- **Weakness**
 - Deconditioning, Myopathy, CV disease, Lung disease, Orthostatic Hypotension
- **Sensory Impairment**
 - Stroke, Neuropathy, Vision impairment
- **Musculoskeletal Dz.**
 - OA, Contractures, Leg shortening
- **Impaired Central Processing**
 - Dementia, Stroke, Parkinson's disease
- **Spasticity**
 - Stroke, Spinal cord lesion



Fall-related Risk Factors *Intrinsic Risk Factors*

Risk Factor	Mean RR-OR	Range
(LE) Weakness	4.4	1.5-10.3
History of falls	3.0	1.7-7.0
Balance deficit	2.9	1.6-5.4
Gait impairment	2.9	1.3-5.6
Vision Impairment	2.5	1.6-3.5
Mobility impairment	2.6	1.2-4.6
Functional Impairment	2.3	1.5-3.1
Depression	2.2	1.7-2.5
Cognitive Impairment	1.8	1.0-2.3
Age >80	1.7	1.1-2.5

Consensus Guideline for Prevention of Falls in Older People.
JAGS 49:664-672, 2001



Fall-related Risk Factors *Medications*

- **Psychotropic Medications**
 - 1.7 (1.52-1.97)
- **Anti-arrhythmics**
 - 1.6 (1.02-2.48)
- **Digoxin**
 - 1.2 (1.05-1.42)
- **Diuretics**
 - 1.1 (1.02-1.16)



Falls: Guide to Assessment



Screening Questions

- How many times have you fallen in the past year?
- Have you ever injured yourself?
- Are you afraid of falling?
 - Does this prevent you from activity?



Fall-Related Assessment *History*

- **Circumstances of the fall**
 - Activity, location, preceding symptoms
 - Ability to get up after fall
 - Witnesses?
 - Fear of falling?
- **Associated Injuries**



Fall-Related Assessment *History*

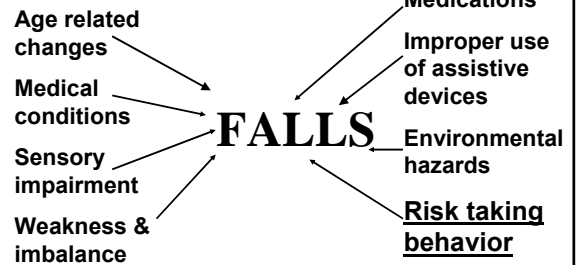
Functional Status Assessment

- **Activities of Daily Living**
 - transfers, toileting/continence, grooming, bathing, dressing, feeding oneself
- **Instrumental Activities of Daily Living**
 - Housework, laundry, shopping, cooking, transportation, telephone, medication set-up, finances
- **Current home health support system**



Intrinsic Factors

Extrinsic Factors



Fall-Related Assessment *Medication Review*

- “High risk” medications
- >4 medications
- Compliance and pill set-up
- Potential strategies to combat polypharmacy



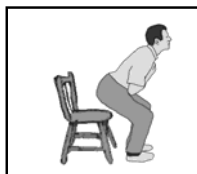
Fall-Related Assessment *Physical Examination*

- Measure orthostatic blood pressure
- Systems of focus
 - Cardiovascular
 - Neurologic
 - Musculoskeletal
 - Feet
 - Vision/hearing
- Gait and balance assessment



Performance Testing for Falls *Timed Up and Go*

- **Timed Up and Go**
 - 1 item, 1-2 minutes to administer
 - Sensitivity 87%, Specificity 87%
 - Instruct the older adult to stand up, walk 3 meters, and return
- **Scoring is based on time**
 - Normal <20 seconds
 - ≥ 30 seconds = significant functional dependence and gait abnormality



Podsiadlo D, et al. JAGS 1991
Shumway-Cook et al. Physical Therapy 2000



Performance Testing for Falls *Timed Up and Go*

Observations

- Seated balance
- Ability to stand with arms folded
- Stance
- Hesitancy with initiation of gait
- Step symmetry
- Proficiency with walking aid

Podsiadlo D, et al. JAGS 1991
Shumway-Cook et al. Physical Therapy 2000



Extrinsic Risk Factors *Home Sweet Home*



Extrinsic Factors

- > 50% of falls occur in and around fallers' homes
- 40% involve environmental hazards
 - Stairs
 - Ground objects
 - Chair legs



Extrinsic Factors

• Most frequent locations

- Bedroom
- Lounge room
- Front/back doors
- Kitchen
- Bathroom



AMDA Clinical Practice Guideline on Falls and Fall Risk 1998

Home-based Assessment

- Allows you to accurately assess the environment for activities of daily living
- Identify Home Hazards
 - Flooring (throw rugs, slippery surfaces, clutter)
 - Bathroom
 - Lighting
 - Stairs



Prevalence of Home Hazards

Hazards	%	Average number/home
Throw rugs/mats	100 of all homes	14.23
Slippery floor	34.5 of all rooms	6.19
Deficient lighting	11.6 of all rooms	2.07
Stepovers	38.6 of all rooms	6.92
Inappropriate bed height	11.6 of all subjects	0.15
Inappropriate toilet height	7 of all subjects	0.09

Stevens et al. JAGS, 2001

Home-based Assessment

- Can be performed by:
 - Home health nurse
 - Physician, Advanced care practitioner
 - Physical therapist, Occupational therapist
 - Volunteer organizations
 - Family member/patient

But what about our patient?
Mrs. Johnson: fall assessment

- History:
 - Falling nearly weekly
 - Multiple ED visits, 1 hospitalization
 - Soft tissue injuries
 - Circumstances reviewed
 - Fall related risk factors:
 - Vision impairment
 - Medications
 - Risk taking behavior
 - Multiple, multiple home hazards



Myth or Fact?

- **Most falls are not preventable**

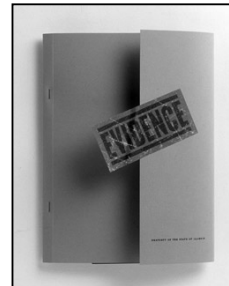


Discuss with your partner

- Is there any evidence for fall prevention interventions?
- Is there anything that we can do to prevent Mrs. Johnson from falling again?



Fall Prevention Interventions
What works, what's new?



Fall Prevention Interventions
What works?

- **DHHS/RAND Health Meta-analysis**
 - Intervention types:
 - Multifactorial falls risk assessment & management
 - Exercise program
 - Environmental modification
 - Education
 - Outcomes:
 - Falling during specified follow-up period
 - Monthly rate of falling



Chang, JT, et al. BMJ 2004

Fall Prevention Interventions
DHHS-RAND Meta-analysis

Treatment component	Participants who fell at least once*		Number needed	Monthly rate of falling†		Fewer falls in treatment group
	No of studies (comparator pairs)	Adjusted risk ratio (95% CI)		No of studies (comparator pairs)	Adjusted incidence rate ratio (95% CI)	
Multifactorial falls risk assessment and management programs	10 (10)	0.82 (0.72 to 0.94)	11	7 (7)	0.63 (0.49 to 0.83)	1.3
Exercise	13 (15)	0.86 (0.75 to 0.99)	16	19 (21)	0.86 (0.73 to 1.01)	2.7
Environmental modifications	5 (4)	0.90 (0.77 to 1.05)	NA	5 (6)	0.85 (0.65 to 1.11)	NA
Education	2 (3)	1.28 (0.95 to 1.72)	NA	1 (1)	0.33 (0.09 to 1.30)	NA

A multifactorial risk factor reduction strategy reduced the monthly rate of falls by 37%!



Chang, JT, et al. BMJ 2004

Fall Prevention Interventions *Multifactorial Strategy*

- Most commonly assessed factors
 - Medications
 - Orthostatic blood pressure
 - Vision
 - Environmental hazards
 - Strength & balance



Fall Prevention Interventions *Cognitive Impairment*

- Shaw, F.E. et al.
 - RCT, 274 cognitively impaired (MMSE <24) older adults seen in ED after a fall
 - Multifactorial assessment & intervention (n=130)
 - Usual care (n= 144)
 - No significant difference between groups (proportion of patients who fell in the year following intervention)

Shaw, FE BMJ 2003

What about Tai Chi Chuan?

- "Supreme ultimate boxing"
- "Boundless fist"
- Internal Chinese "soft" martial art
- Benefits:
 - Relaxation, stress management
 - Fitness
 - ? Fall prevention



Fall Prevention Interventions *Tai Chi*

- RCT of community dwelling older adults
 - N= 702 randomized
 - Tai chi vs. wait list
- 16 weeks (1hr/week)
- At 16 weeks
 - HR 0.72 (0.51-1.01)
- At 24 weeks
 - HR 0.67 (0.49-0.93)

Voukelatos A, et al JAGS 2007: 1185-91

Fall Prevention Interventions *Tai Chi*

- RCT
- 6 month trial of Tai Chi (3x/week) vs. stretching
- Resulted in:
 - Fewer falls
 - Lower proportion of fallers
 - Fewer injurious falls
 - Improvement in balance, physical performance, and reduced fear of falling at 6 months



Li F et al. J Gerontol A Biol Sci Med Sci. 2005; 187-94

Vitamin D *Falls and Fractures*

- Vitamin D deficiency is common among older Minnesotans!
 - Homebound
 - Inpatients
 - Long term care residents
 - Obese
 - Women admitted with hip fractures



Vitamin D *Falls and Fractures*

- Vitamin D concentration could be associated with falls and fractures in several way
 - Muscle strength and balance
 - Kidney function
 - Interaction with estrogen receptors
 - Higher bone turnover, osteoporosis

Cauley JA, Annals of Internal Medicine. 2008 242:250

Vitamin D



- Meta-analysis
 - 1237 participants (5 RCTs)
 - 22% risk reduction (compared to calcium or placebo)
 - Number needed to treat to prevent one person from falling = 15
 - Optimal dose/preparation?

Bischoff-Ferrari, HA. JAMA 2004

Vitamin D *Long Term Care Residents*

- Double-blinded, placebo controlled RCT
 - 129 nursing home residents (Mean age 89)
- Randomized to :
 - Placebo vs.
 - Vitamin D2- 200 IU, 400 IU, 600 IU, or 800 IU
- Participants receiving 800 IU had a 72% lower falls incident rate ratio compared to placebo
 - RR 0.28 (0.10-0.75)
 - No dose response trend observed

Broe KE. JAGS, 2007

Vitamin D *Recommendations*

- Many of our older patients are at risk for vitamin D deficiency
- Screening vs. Empiric treatment
 - 25-OH is the recommended concentration to monitor if you do check
- Variable dosing strategies:
 - Vitamin D2: 50,000 IU q2 weeks
 - Vitamin D2: 1000 IU daily
 - Vitamin D3: 50,000 IU q 4 weeks
 - Vitamin D3: 1000 IU daily

Hip Protectors

- Specifically designed padding worn around the hip
- Initial studies (cluster randomized by facility) suggested effectiveness
- Kannus P NEJM, 2000
 - ↓60% hip fractures
 - NNT 41 (1 year)



Hip Protectors *Long Term Care*

- HIP PRO RCT 2007
 - 1042 NH residents (Multicenter)
 - All wore unilateral hip protector
 - Mean duration 7.8 months
 - Incidence of hip fracture in protected vs. unprotected did not differ
 - 4.4% vs. 2.5% (p=0.70)
 - Overall adherence 73.8%
 - Impact of unilateral pad on gait mechanics?
 - Gold standard for hip protectors?

Kiel, DP, JAMA 2007; 413-422

FACT

- Many falls are preventable with the use of evidence based strategies
 - Multifactorial risk reduction
 - Balance-based exercises
 - Vitamin D supplementation

Fall Prevention *A Team Sport*

Interdisciplinary Team Approach

- Role of the social service professional
 - Screening
 - Risk factor identification
 - Disability
 - Malnutrition
 - Substance abuse
 - Dementia
 - Preparing older adult for upcoming appointments
 - Inspection of living environment
 - Food Services
 - Home Services

Interdisciplinary Team Approach

- Role of the public health or home care nurse
 - Screening
 - Risk factor identification
 - Lower extremity weakness
 - Orthostatic hypotension
 - Vision impairment
 - Inappropriate footwear or gait aid
 - Medications (type, adherence, assistance)
 - Substance abuse
 - Nutritional assessment
 - Inspection of living environment
 - Home Services

Interdisciplinary Team Approach

- Role of the primary care provider
 - History and physical examination
 - Treat underlying health problem
 - Discontinue, change, or reduce dose of medication
 - Osteoporosis treatment
 - Appropriate referrals

Interdisciplinary Team Approach

- Role of the Physical Therapist
 - Strengthening exercises
 - Balance exercises
 - Gait aid training
 - Vestibular rehabilitation
 - Group exercise programs

Interdisciplinary Team Approach

- **Role of the Occupational therapist**
 - Home aids and modifications
 - Footwear counseling
 - Personal alarm/safety devices
 - Cognitive assessment and safety planning
 - Compensatory strategies

Interdisciplinary Team Approach

- **Role of the assisted living facility professional**
 - Staff training
 - Identification of modifiable risk factors
 - Target interventions
 - Bed alarms
 - Hip protectors
 - Environmental modifications

Fostering Communication

- **Communication of fall risk**
 - Timely
 - Key circumstances
 - Risk factors
 - Possible community-based options

Back to the office: *Mrs. Johnson's Recommendations*

1. **Specific home safety modifications:**
 - Community resources for installation
2. **Medication regimen simplification**
 - Weaned SSRI, diuretic
 - Home health nursing to set up pills
3. **In-home physical therapy for gait training**
4. **Meals-on-Wheels**
5. **Vitamin D supplementation**

Fall Prevention: Take Home Messages

- **1. Falls are a common, preventable cause of functional decline and premature institutionalization**

Fall Risk Assessment Take Home Messages

- **2. Screening & assessment are a MUST**
 - All adults 75+ (70+ if RF)
 - Improves awareness
 - Older adults reluctant to tell
 - Document and COMMUNICATE

Fall Prevention: Take Home Messages

- **3. Intervene with strategies that work!**
 - **Multifactorial risk factor reduction**
 - M-O-V-E-S
 - **Exercise for ALL**
 - Tai Chi
 - **Vitamin D (≥ 800 IU)**
 - **LTC: staff education, universal precautions**



Fall Prevention Web Resources

- www.mnfallsprevention.org
- www.fallprevention.org
- www.stopfalls.org

