Falls In the Older Adult:
Tools For your Practice

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Disclosures

- I have no financial relationships with any commercial interest related to the content of this activity.

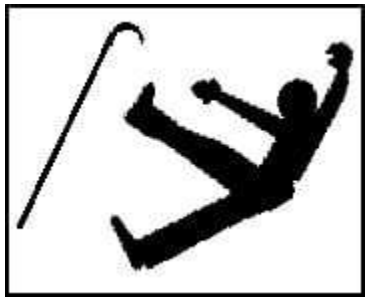
Objectives

- By the end of this session you will be able to:
  - 1. Recognize the impact of falls on the lives of older adults.
  - 2. Identify risk factors for falls.
  - 3. Perform at least 3 tests to assess a patient's balance and mobility.
  - 4. Describe interventions to reduce an older person's risk of falling.

Mr. Chase

- 83 yo male presents with 4 falls in the past month.
- He lives alone and cannot remember the exact events surrounding falls.
- + anxious about falling.
- Seen in ED 2X in the past year for falls.
- + walker but forgets to use it; doesn't want to look "old."
- Sometimes feels dizzy.
- Wonders if it's an "equilibrium" problem.

What is a fall?



"Anyone inadvertently coming to rest on the ground or a lower level but not due to trauma or other overwhelming medical event (stroke, syncope)" *-M.Tinetti, MD*

- **Falls are not random events**
  - **Patient characteristics**
  - **Activity at time of the fall**
  - **Environment**

The Impact of falls

- 30-40% over age 65 and 50% in long-term care and age >80 years fall annually
- Complications from falls are a **leading cause** of injury-death in those >65 years
- Fall injury hospitalizations cost more than all other traumas combined
- **OREGON**: ~**700 deaths** and **8,000 hospitalizations** are due to falls

Oregon Dept. of Health, Fall & Injury Prevention 2018
Centers for Disease Control & Prevention 2010

Sequelae of Falls

- **Associated with**:
  - Decline in functional status
  - Nursing home placement
  - Increased use of medical services
- **Serious injuries**: fractures, head trauma, lacerations
- "**Long lie**": Half of those who fall unable to get up without help
  - Rhabdo, dehydration/AKI, pressure ulcers
  - Predicts lasting decline in functional status
- **Post-fall Anxiety Syndrome**
  - ¼ of all fallers limit their activities due to **fear of falling**
  - Increased risk of institutionalization and mortality

Tinetti, JAMA 1993
Visschedijk, JAGS 2010

Falls in Older Adults

- Common and Expensive
- High Morbidity and Mortality
- Many Causes and Risk Factors
- Potentially Preventable

An Ounce of Prevention

- Education and activity programs have been shown to reduce fear of falling and improve measures of stability and strength in community dwelling seniors

- Risk factor interventions have reduced the risk of falling by more than 30%

Brouwer, JAGS 2003
Tinetti, NEJM 1994

Issues with Addressing Falls in Clinical Practice

- Lack of awareness of the morbidity and mortality related to falls
- Lack of **time** during the office visit to adequately address a multifactorial problem
- Lack of awareness of evidenced-based interventions available for fall prevention
- Logistical barriers to patient access to interventions

Chou, J Gen Intern Med 2006

Cause of Falls

- **Multiple** causes usually involved
- Frequently not observed
- Often poor recall of event
- Different ways to categorize cause

RISK FACTORS FOR FALLS:
SIXTEEN MULTIVARIATE STUDIES

FACTOR	Mean RR
Muscle weakness	4.4
Prior fall	3.0
Balance deficit	2.9
Gait deficit	2.9
Assistive device	2.6
Vision deficit	2.5
Arthritis	2.4
ADL deficit	2.3
Depression	2.2
Cognitive deficit	1.8
Age > 80	1.7

Rubenstein & Josephson, Med Clin N Amer 2006

When and How to Screen for Falls

- **USPSTF: screening at age 65;** identify older adults at increased risk for falls - *history of falls, mobility problems, and poor performance on TUG
- **AGS, BGS, AAOS** recommends yearly screening for patients **≥65**
  - **NNS** to prevent 1 fall over 1 year is **20** (*Tinetti, NEJM 1994*)
- **Screening questions:**
  - **Have you fallen in the past year?**
    - If so how many times and under what circumstances?
  - **Do you feel unsteady when standing or walking?**
  - **Do you worry about falling?**
- If answer is "**Yes**" to any of these questions then proceed with a fall risk assessment

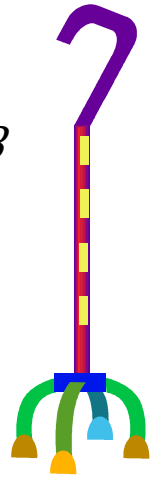
Fall Risk Assessment

- **Determine multifactorial fall risk**
  - History of falls
  - Gait, balance, mobility
  - Neurologic impairment
  - Muscle weakness
  - Cognitive impairment
  - Visual Acuity
  - Cardiovascular risks (arrhythmias)
  - Orthostatic hypotension
  - Foot care and footwear
  - Medications
  - Environmental Hazards (home safety)

AGS

Gait, Balance, Mobility

- Tinetti – POMA (Performance Oriented Mobility Assessment)
- Timed Up and Go test (TUG)
- Four-Stage Static Balance Test
  - **"Two of the most sensitive tests are the Static Balance and TUG"** *McMichael, J Geri Nursing 2008*
- 30-Sec Sit-to-Stand
- Gait Speed



TINETTI BALANCE AND GAIT EVALUATION (AKA POMA)

BALANCE:

- Sitting balance
- Arising
- Attempts to arise
- Immediate standing balance (first 5 secs)
- Standing Balance
- Nudging
- Turn 360*
- Sitting Down

Less than 19 = high fall risk

19-24 = medium fall risk

25-28 = low fall risk

GAIT:

- Initiation of gait (Immediately after being told to go)
- Step length and height
- Right Swing
- Left Swing
- Step Symmetry
- Step Continuity
- Path
- Trunk Alignment
- Walking Stance

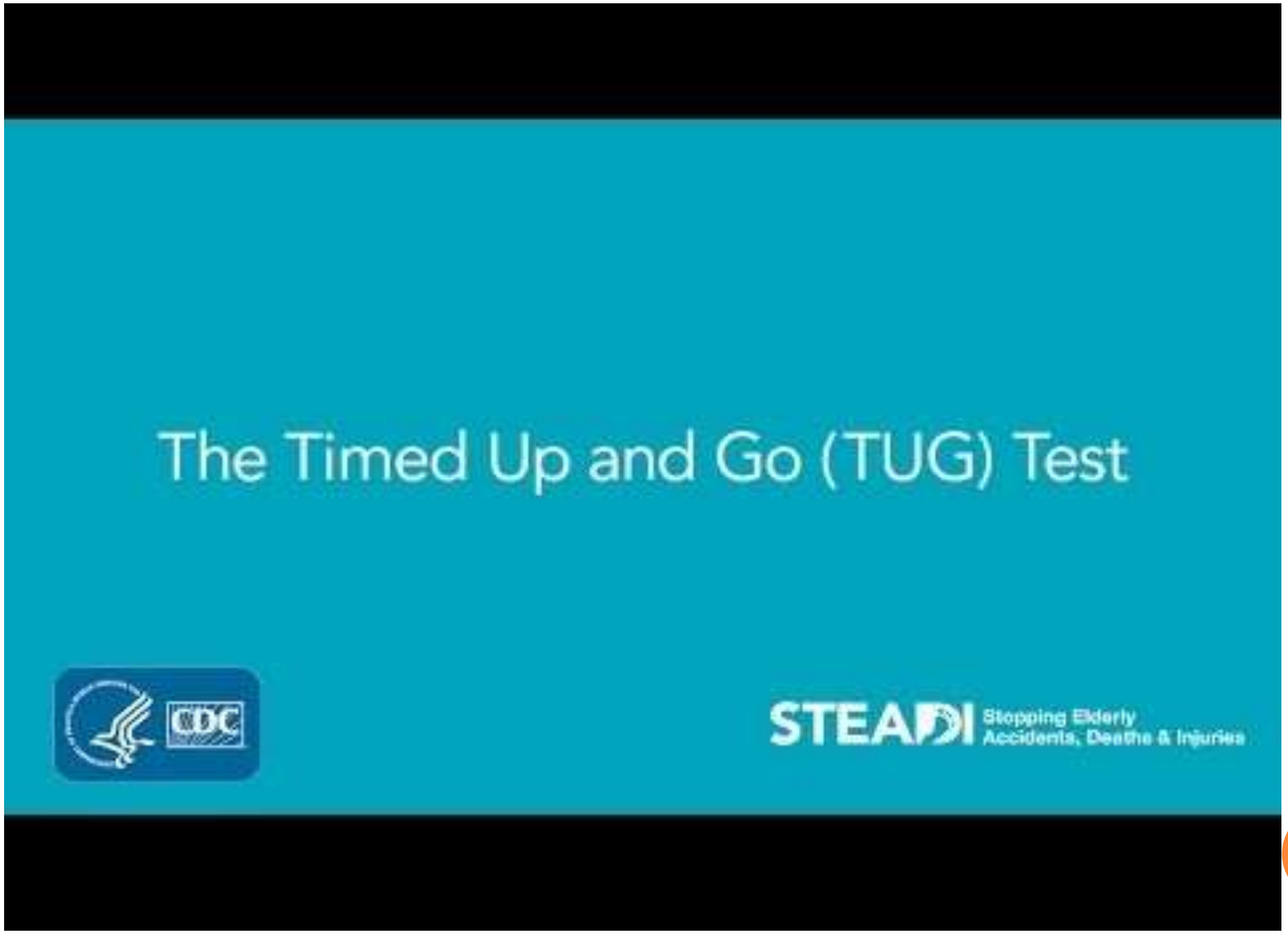
Amer J Med 1986

Timed Up and Go (TUG)

- Technically it's Timed Up, Go and Return
- Record the time it takes a person to:
  1. Rise from a hard-backed chair
  2. Walk 10 feet (3 meters)
  3. Turn
  4. Return to the chair
  5. Sit down

Podsiadlo, JAGS 1991

Timed Up and Go



TUG (Timed Up and Go)

- Most adults can complete in 10 seconds
- Most frail older adults can complete in <20 seconds
- **≥12 sec = ↑ falls risk** *Lusardi, J Geriatr Phys Ther 2017*
- **>20 sec → comprehensive evaluation**
- Association between the TUG score and mortality observed in both men and women
- Addition of Cognitive or Physical Tasks can dramatically increase the difficulty and can identify fallers that are better compensated

Bohannon, J Geri PT 2006
Hofheinz & Schusterschitz, Clin Rehab 2010
Tang, Geri & Gerontol Int'l 2014
Cardon-Verbecq, Ann Phys Rehab 2017

Four-Stage Balance test

Instructions to the patient:

1. Stand with your feet side by side. **Time: _____ seconds**

2. Place the instep of one foot so it is touching the big toe of the other foot. **Time: _____ seconds**

3. Place one foot in front of the other, heel touching toe. **Time: _____ seconds**

4. Stand on one foot. **Time: _____ seconds**

If the patient can hold a position for 10 seconds without moving his/her feet or needing support, go on to the next position.
If not, stop the test.

STEADI

30-Second sit-to-Stand

Instructions to the 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.

Count and record the number of times the patient can complete the chair stand in 30 seconds.

30-Second sit-to-Stand

30-sec Sit-to-Stand Published Averages by age

Age	Men	Women
60-64	14 - 16	12 - 14
65-69	13 - 15	11 - 13
70-74	13 - 15	10 - 12
75-79	12 - 14	9 - 11
80-84	11 - 13	8 - 10
85-89	10 - 12	7 - 9
90-94	9 - 11	6 - 8

Rikli & Jones, Res Quart Exer & Sport 2001

Gait speed

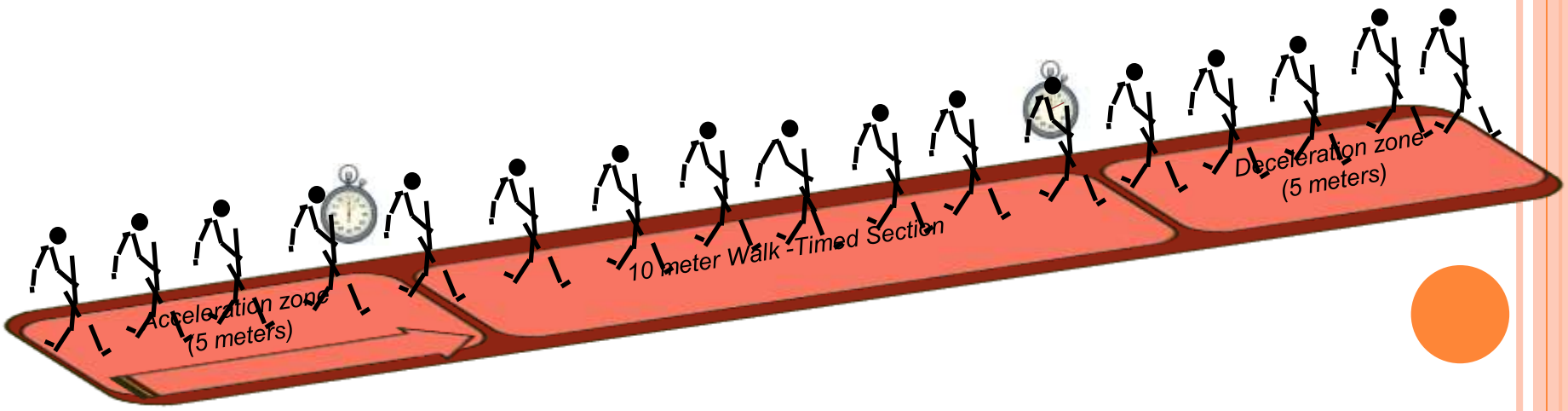
- Almost the perfect measure — *Wade, Meas In Neuro Rehab 1992*
- Reliable — *Richards, Gait and Posture 1996*
- Valid — *Steffen, Phys Therapy 2002*
- Sensitive — *van Iersel, J Clin Epidem 2008*
- Specific — *Harada, Phys Therapy 1995*

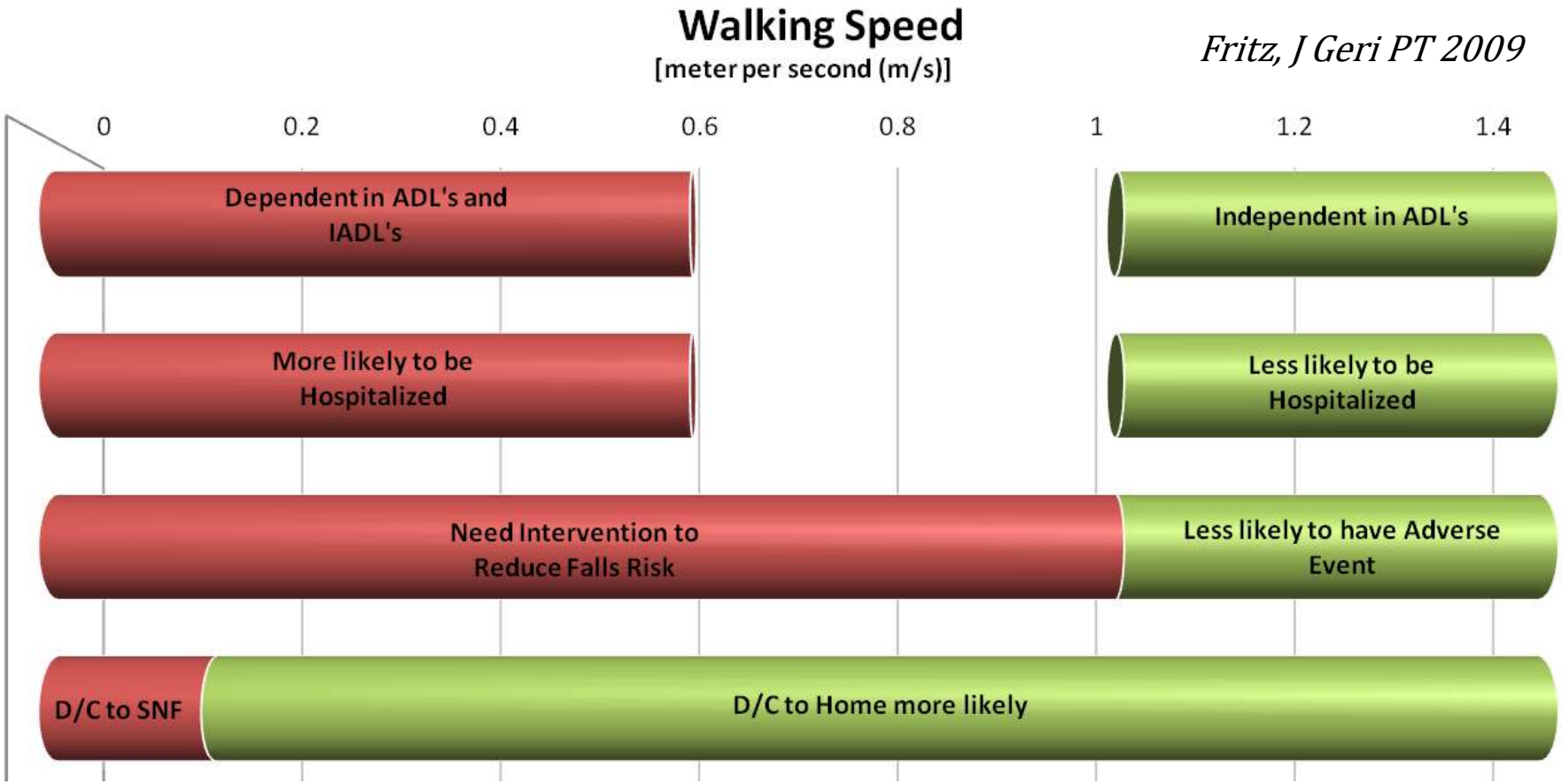
Correlates with …

- Functional Ability — *Perry, Stroke 1995*
- Balance and Confidence — *Mangione, Physio Can J 2007*
- Future Health Status — *Studenski, JAGS 2003; Purser, J Rehab Res & Dev 2005*
- Functional Decline — *Brach, Phys Therapy 2002*
- Rehabilitation Potential — *Goldie, Arch Phys Med & Rehab 1996*

GAIT SPEED: 10 METER WALK TEST

- Reliable, inexpensive method *Perera, JAGS 2006*
- **20 meter path**
  - Central 10 meters being the timing area
- **Start your patient at the beginning of the 20 meter line**
  - Ask pt to walk "at a comfortable pace" to the end line
  - Time during the central 10 meters



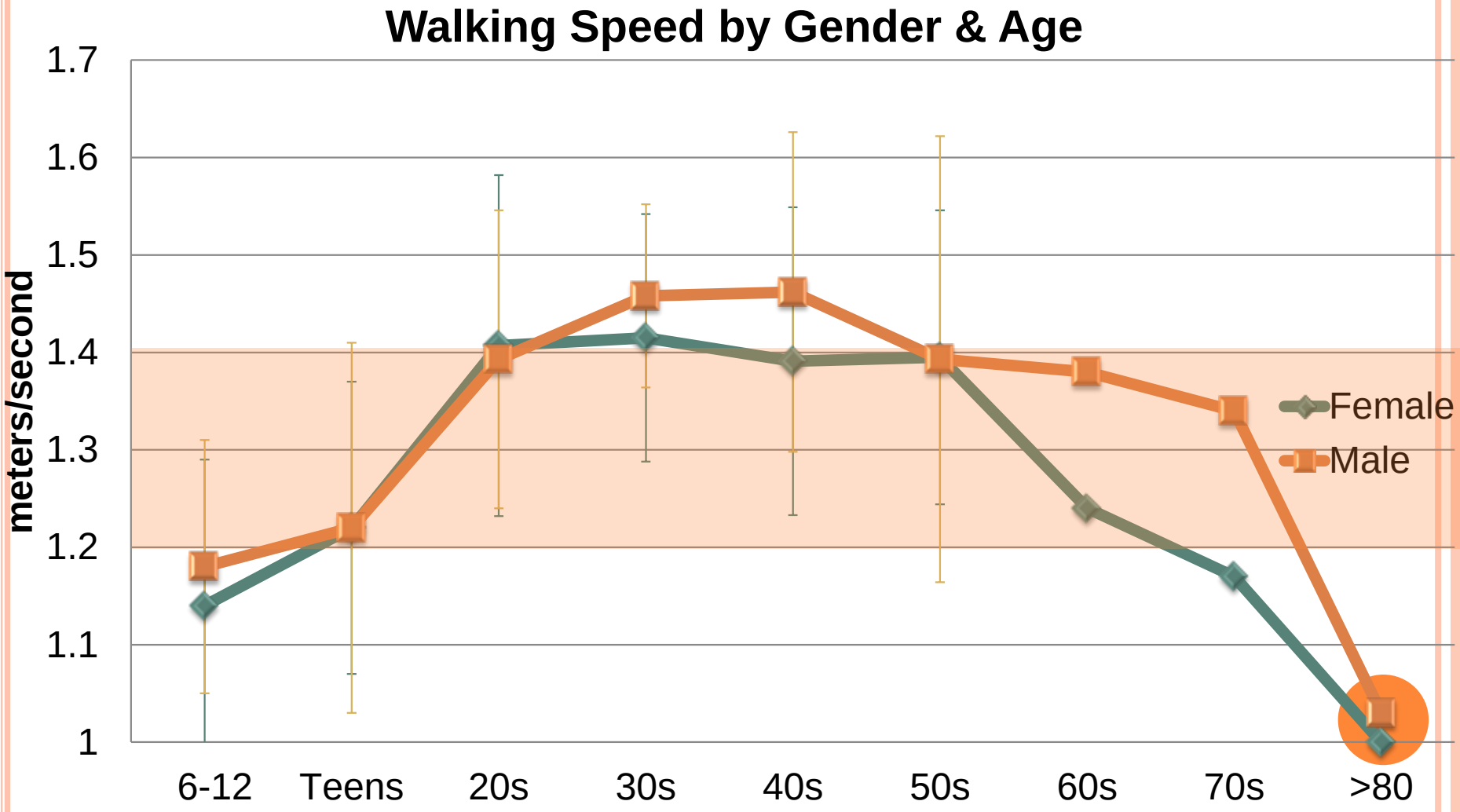


Fritz, J Geri PT 2009

Gait Speed Correlates with:

- Functional ability (*Perry, Stroke 1995*)
- Balance confidence (*Mangione, Physio Can 2007*)
- Hospitalization *(Studenski, JAGS 2003)*
- Mortality *(Hardy, JAGS 2007)*
- Falls *(Guimaraes, Int'l Rehab Med 1980)*
- Fear of Falling *(Maki, JAGS 1997)*

Walking Speed varies by age, gender, & anthropometrics



Self selected walking speed categorized by gender & age : 6-12 & teens (Waters, Lunsford et al. 1988); 20s-50s (Bohannon 1997); & 60's-80's (Bohannon 2008)

Fall Risk Assessment

- Clinical assessment

  -Targeted H&P

  - *History of previous falls
  - *Lower extremity weakness
  - Neuro exam including cognitive testing
  - Cardiac exam including orthostatics
  - Examine feet and footwear
  - Vision and hearing

  -**Chronic medical issues***:* OA, Stroke, Parkinson's, Chronic Pain, Cognitive Impairment, Diabetes, Neuropathy, Cardiopulmonary conditions

  -**Substance use***: Alcohol intake*

HIGH-RISK MEDICATIONS FOR FALLS

- **Psychoactive medications (OR 1.47-1.68)**
  - **Antipsychotics** (e.g., haloperidol, risperidone)
  - **Antianxiety drugs** (e.g., benzodiazepines)
  - **Hypnotics** (e.g., zolpidem)
  - **Antidepressants** (e.g., SSRI's, TCA's)

- **Cardiovascular** (OR 1.24)
  - Antihypertensives
  - Diuretics

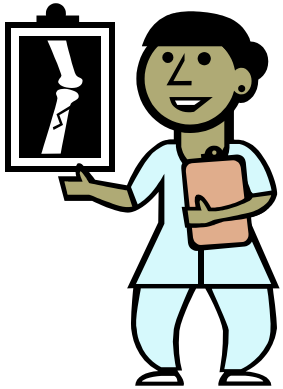
Woolcott, Arch Int Med 2009

Assessing for orthostasis

- Checking orthostatics: 0,1, and 3 minutes
- Drop in systolic BP $\geq$20 mmHg or diastolic BP $\geq$10 or + symptoms
- Consider standing BP only if unable to perform full orthostatics
- Treatment can reduce falls
  - **Medication reduction**
  - **Fluid optimization (1.5-3 L)**
  - **Elastic stockings (Waist high)**
  - **Ankle Pumps / Isometrics**
  - **Consider adding Salt (1g/BID)**
  - **MEDS: Fludrocortisone, Midodrine, Droxidopa**

Amer Geri Soc Clin Prac Guideline 2010

DIAGNOSTICS



- TSH
- Vitamin B12
- Vitamin D (***levels <10 ng/mL***)
- Folate
- CBC
- Comprehensive panel (for renal/hepatic disease)
- RPR
- Brain imaging: CT or MRI
- X-ray of injuries
- Cardiac eval: EKG, Holter, ECHO -- *If syncope, arrhythmia, or cardiac contributors are suspected*
- Bone density

Vitamin D

- Those >65 years with 25(OH)D levels <10 ng/mL at greater risk for loss of muscle mass, strength, & increased risk for hip fracture

- Low risk of harm in appropriate doses

- Dosing recommendations:
  - ***American Geriatrics Society and AHRQ***: 800-1000 IU daily

  Include calcium if needed! 1000 mg daily

Visser, J Clin Endo Metab 2003
Cauley, Ann Int Med 2008

Other Modifiable Factors

- **Footwear & Podiatry Care**
  - **Highest fall risk**: socks or barefoot
  - **Best**: athletic shoes or thin, hard soles
  - Anti-slip shoe devices in icy conditions
  - Multifaceted podiatry intervention led to 36% decrease in falls

Kelsey, Footwear Sci 2010; Koepsell, JAGs 2004; Spink, BMJ 2011

- **Vision**
  - Impairment has been associated with falls and hip fracture

Lord, JAGS 2002

  - Increased falls with multifocal lenses
  - Expedited surgery for first cataract reduced rate of falls

Gillespie, Cochrane Database 2009

Strength and Endurance for Fall Prevention

- Exercise as a single intervention can prevent falls

  Sherrington, NSW Pub Hlth Bulletin 2011

- Exercise programs for lower-limb muscle endurance significantly improved static and dynamic balance

  Avelar, Physiotherapy Rev Brazil 2010

- Low-intensity strength training resulted in improved gait stability and steadiness in disabled elderly

  Krebs & Jette, Amer Congress of Rehab 1998

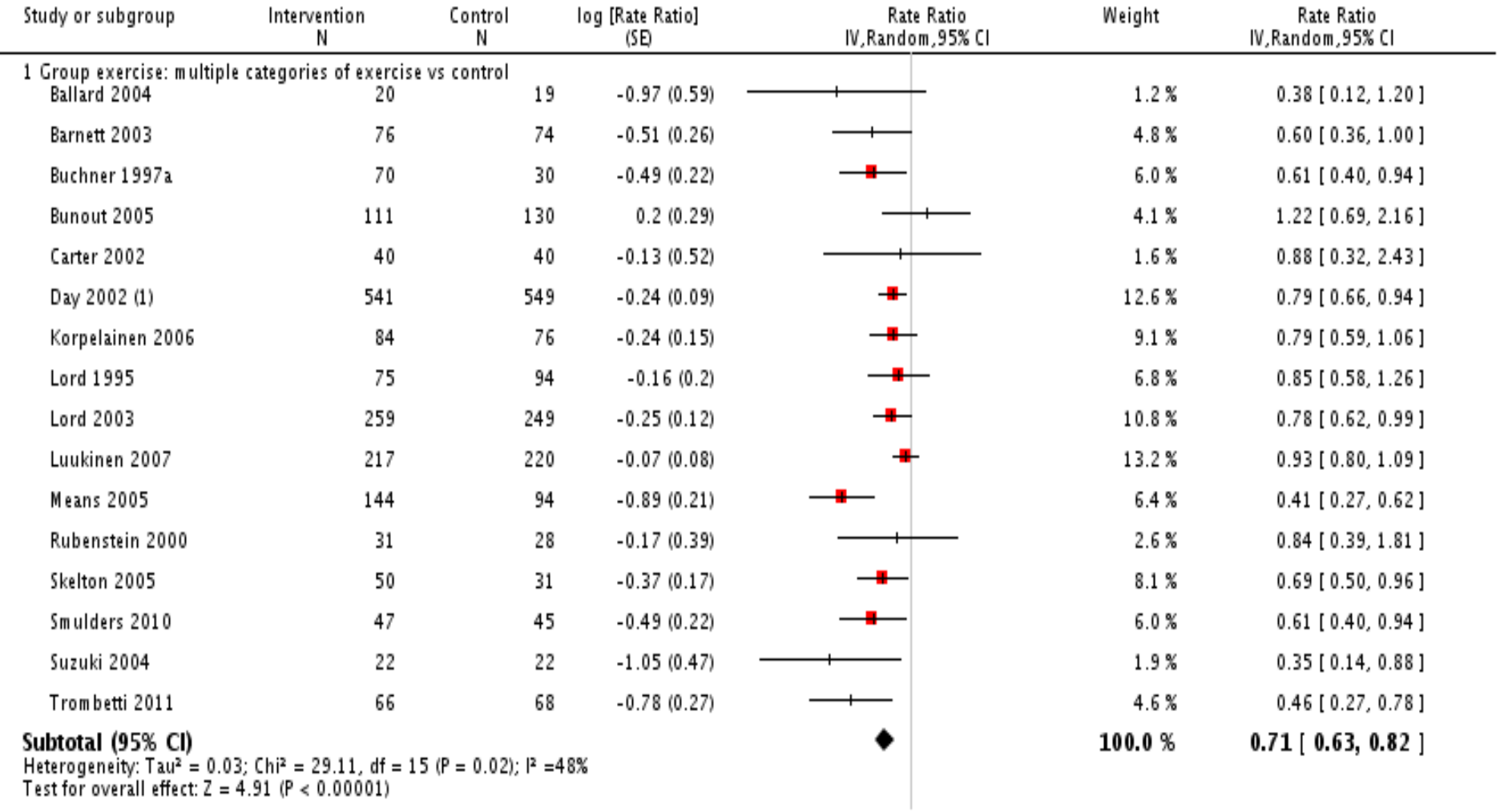
- Incidence of hip fracture in the older population can be cut nearly in half with physical activity throughout one's life

  Beck & Snow, Exer & Sports Sci Rev 2003

- Exercise can improve postural and neuromuscular control as well as reaction time, thereby reducing falls

  Lord, Stroke Mag 1995

Review: Interventions for preventing falls in older people living in the community
Comparison: 1 Exercise vs control
Outcome: 1 Rate of falls



Tai Chi for Fall Prevention

- Tai Chi exercise improves stride length and QoL scores in older adults

  Chyu, Clin Rehab 2010

- Tai Chi improves muscle quality and posture

  Hsu, J Formosan Med Assoc 2014

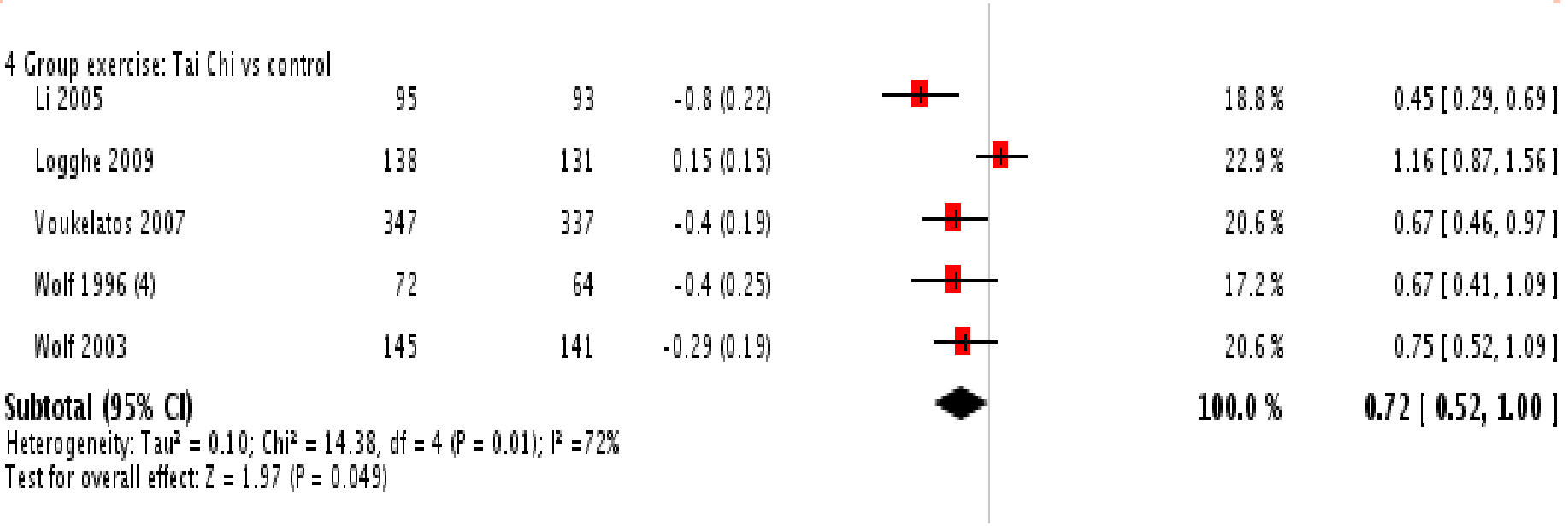
- Tai Chi subjects demonstrated decreased TUG times, increased stride length and improved time on one limb during gait

  Quigley, Amer J Phys Med & Rehab 2014

- Comparing falls incidents in Taiwan with CDC data for the same period seems to show that falls in Taiwanese elders occur about half as often as in their U.S. counterparts

  Lai, Gait & Posture 2013

Tai Chi


4 Group exercise: Tai Chi vs control
Li 2005 95 93 -0.8 (0.22) 18.8 % 0.45 [0.29, 0.69]
Logghe 2009 138 131 0.15 (0.15) 22.9 % 1.16 [0.87, 1.56]
Voukelatos 2007 347 337 -0.4 (0.19) 20.6 % 0.67 [0.46, 0.97]
Wolf 1996 (4) 72 64 -0.4 (0.25) 17.2 % 0.67 [0.41, 1.09]
Wolf 2003 145 141 -0.29 (0.19) 20.6 % 0.75 [0.52, 1.09]
Subtotal (95% CI) 100.0 % 0.72 [0.52, 1.00]
Heterogeneity: Tau² = 0.10; Chi² = 14.38, df = 4 (P = 0.01); I² =72%
Test for overall effect: Z = 1.97 (P = 0.049)

Home Safety

- Edges of stairs, uneven surfaces marked
- No throw rugs, mats, long electrical cords
- Less clutter
- Chairs, toilet at appropriate height
- Furniture arranged so provides assistance, not obstacles
- Night lights
- Nonslip pads in shower, tub
- Grab bars in shower, next to toilet (raised, handbars)
- Handrails along staircases
- Even, non-glare lighting

CDC Home Safety Checklist

Use this checklist to find and fix hazards in your home.

STAIRS & STEPS (INDOORS & OUTDOORS)

Are there papers, shoes, books, or other objects on the stairs?

- ☐ Always keep objects off the stairs.

Are some steps broken or uneven?

- ☐ Fix loose or uneven steps.

Is there a light and light switch at the top and bottom of the stairs?

- ☐ Have an electrician put in an overhead light and light switch at the top and bottom of the stairs. You can get light switches that glow.

Has a stairway light bulb burned out?

- ☐ Have a friend or family member change the light bulb.

Is the carpet on the steps loose or torn?

- ☐ Make sure the carpet is firmly attached to every step, or remove the carpet and attach non-slip rubber treads to the stairs.

Are the handrails loose or broken? Is there a handrail on only one side of the stairs?

- ☐ Fix loose handrails, or put in new ones. Make sure handrails are on both sides of the stairs, and are as long as the stairs.

FLOORS

When you walk through a room, do you have to walk around furniture?

- ☐ Ask someone to move the furniture so your path is clear.

Do you have throw rugs on the floor?

- ☐ Remove the rugs, or use double-sided tape or a non-slip backing so the rugs won't slip.

Are there papers, shoes, books, or other objects on the floor?

- ☐ Pick up things that are on the floor. Always keep objects off the floor.

Do you have to walk over or around wires or cords (like lamp, telephone, or extension cords)?

- ☐ Coil or tape cords and wires next to the wall so you can't trip over them. If needed, have an electrician put in another outlet.

KITCHEN

Are the things you use often on high shelves?

- ☐ Keep things you use often on the lower shelves (about waist high).

Is your step stool sturdy?

- ☐ If you must use a step stool, get one with a bar to hold on to. Never use a chair as a step stool.

BEDROOMS

Is the light near the bed hard to reach?

- ☐ Place a lamp close to the bed where it's easy to reach.

Is the path from your bed to the bathroom dark?

- ☐ Put in a nightlight so you can see where you're walking. Some nightlights go on by themselves after dark.

BATHROOMS

Is the tub or shower floor slippery?

- ☐ Put a non-slip rubber mat or self-stick strips on the floor of the tub or shower.

Do you need some support when you get in and out of the tub, or up from the toilet?

- ☐ Have grab bars put in next to and inside the tub, and next to the toilet.

STEADI, 2018

STEADI (Stopping Elderly Accidents, Deaths & Injuries)

- Researchers at CDCs Injury Center have created this **tool kit for providers** who treat older adults who are at risk of falling or have fallen in the past

- Resources and tools that help make fall prevention an integral part of clinical practice

  - **Falls screening algorithm (adapted from the American and British Geriatric Societies' Clinical Practice Guidelines)**
  - **Risk factor check lists**
  - **Gait and balance tests, instructions and videos**
  - **List of medications linked to falls**
  - **Educational handouts for providers and patients**

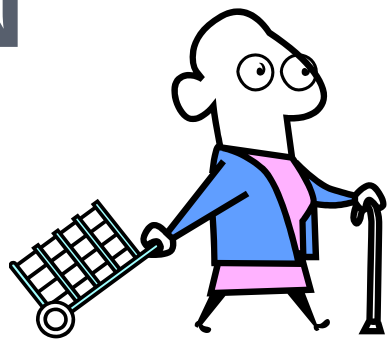
http://www.cdc.gov/homeandrecreationalsafety/Falls/steadi/index.html

Reduction of falls

- **Tai Chi:** up to 49% reduced risk for falls
- **Muscle strengthening / balance retrainin:** 17% reduced risk
- **Vitamin D supplementation :** 26% reduced risk
- **Withdrawal of psychotropic meds**: 66% reduced risk
- **Home safety assessment for person with history of falls:** 34% reduced risk

Frick, JAGS 2010

FALL EVALUATION



- Orthostatic BP check
- Vision check
- Cognitive screen with ***Mini-Cog***
- Medication, substances, lab review
- Assess fear of falling with ***FES-I***
  - **FES-I: Fall Efficacy Scale International**
- PE, Gait and balance assessment
  - **Timed Up and Go (TUG)**
  - Sit-to-Stand
  - Four-Stage Balance test
  - Gait Speed
- Home safety checklist

Mr. Chase

- 83 yo male presents with 4 falls in the past month.
- He lives alone and cannot remember the exact events surrounding falls.
- + anxious about falling.
- Seen in ED 2X in the past year for falls.
- + walker but forgets to use it; doesn't want to look "old."
- Sometimes feels dizzy.
- Wonders if it's an "equilibrium" problem.

Case Study

- 83 year old male with 4 falls in the past month.
- PMH: HTN, OA of the knees, DM2
- MEDS: **Lisinopril 20 mg BID, furosemide 20 mg QD**
  Quetiapine 50 mg qhs
- EXAM:
  - Arthritic deformity of both knees
  - + abnormal monofilament
  - + orthostatics with 25 point SBP drop
  - Difficulty arising from chair without using arms
  - **30STS**- 5; **TUG** 23 sec; **Gait speed** 0.74 m/s
  - **Balance**: unable to close eyes w/feet together
  - **Mini-cog** abnormal (2/5); **FES-I**: 20/28 (high)

Case Study

- **MANAGEMENT**
  - **Medication modification**
    - Address orthostatic hypotension – decrease ACEI; discuss fluid intake
    - Eliminate quetiapine & furosemide
    - Scheduled acetaminophen for pain
  - **Vision screen**
  - **Further cognitive evaluation**
  - **Home safety handout**
  - **Action plan for home exercises/PT/OT referral**
  - **Check labs**

Case Study #2

- 61 yo male with a 2 year hx of intermittent dizziness, near syncope, and difficulty with urination. Admits to a change in sweating. He is falling almost daily.

- **Meds**: MVI, diphenhydramine

- **PE**: 185/100, P 75 supine; 95/54, P 80 standing
- General exam relatively normal although unsteady gait and some slowness of movement.

Implications for clinical Practice

- **ASSESSMENT**
  - Inquire about falls annually in those **≥65**
  - Assess persons failing screen or with >1 fall
- Review risk factors for falls: chronic medical conditions, exam, labs
- Consider a fall risk assessment note template and screening/assessment tools

Implications for clinical Practice

- **MANAGEMENT OF FALLERS**
  - **Multicomponent interventions**
    - Exercise, Tai Chi, PT/OT
    - Medication review and adjustment
    - Treatment of underlying conditions: vision, cardiac, orthostasis, cognitive impairment, low vitamin D, podiatry issues
    - Environmental assessment and modification

Thank You!

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