FALLS RISK ASSESSMENT AND INTERVENTIONS

BONE HEALTH & OSTEOPOROSIS FOUNDATION:
INTERDISCIPLINARY SYMPOSIUM ON OSTEOPOROSIS
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DISCLOSURES

Conflict of Interest (COI) and Financial Relationship Disclosures:

- Presenter: Karen Kemmis, PT, RN, DPT, MS, GCS, CDCES, FADCES – No COI/Financial Relationships to disclose

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OBJECTIVES

- Following this presentation, you will be able to:
  - Describe the impact of falls for an individual with osteoporosis
  - Identify individuals at risk for falls
  - Able to perform an examination to guide exercise interventions for the prevention of falls/fractures
  - Able to prescribe exercises to decrease the risk of falls/fractures
  - Access and utilize resources

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IMPACT OF FALLS FOR AN INDIVIDUAL WITH OSTEOPOROSIS

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FACTS ABOUT FALLS

- Falls are the leading cause of both fatal and nonfatal injuries in adults ≥ 65 years

Fact Sheet Older Adult Falls (cdc.gov)

Patient & Caregiver Resources | STEADI - Older Adult Fall Prevention | CDC Injury Center

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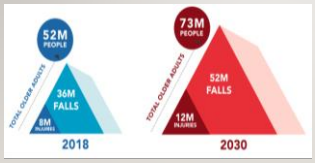
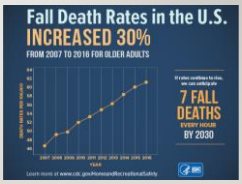
FACTS ABOUT FALLS



Fact Sheet Older Adult Falls (cdc.gov)



Facts About Falls (cdc.gov)

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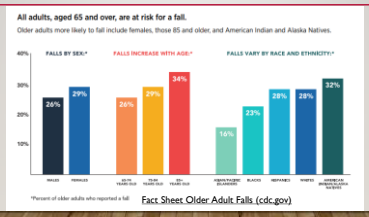
FACTS ABOUT FALLS



Fact Sheet Older Adult Falls (cdc.gov)

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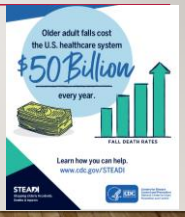
FACTS ABOUT FALLS

- Falling once doubles the chance of another fall
- Falling can increase fear of falling, even if not injured; can cause a decrease in activities, decreased strength, increased risk of another fall
- The 2015 medical costs for falls > $50 billion, Medicare and Medicaid covered 75% of the costs



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IMPACT OF FALLS FOR AN INDIVIDUAL WITH OSTEOPOROSIS

- Over 300,000 people ≥ 65 years are hospitalized for hip fractures annually
- More than 95% of hip fractures are caused by falling, usually by falling sideways
- Women experience 3/4 of all hip fractures
  - Fall more often than men
  - Have higher rates of osteoporosis
- Risk of hip fracture increases with age Hip Fractures Among Older Adults (cdc.gov)
- Estimated 1/3 of vertebral fractures are due to a fall

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IDENTIFICATION OF INDIVIDUALS AT RISK FOR FALLS

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RISK OF FALLS IS MULTI-FACTORIAL

- Most falls are caused by a combination of risk factors
- The more risk factors a person has, the greater their chances of falling
- Healthcare providers can decrease risk by reducing fall risk factors




https://www.cdc.gov/falls/facts.html

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RISK FACTORS FOR FALLS: MEDICAL RISK FACTORS

- Advanced age
- Arthritis
- Female gender
- Poor vision*
- Urinary urgency or incontinence*
- Previous fall
- Orthostatic hypotension*
- Impaired transfer and mobility*
- Medications that cause dizziness or sedation (narcotic analgesics, anticonvulsants, psychotropics)*
- Malnutrition/parenteral nutrition (vitamin D deficiency, insufficient protein)*

*Modifiable

NOF (2003) Health professional's guide to rehabilitation of the patient with osteoporosis.

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RISK FACTORS FOR FALLS: NEUROLOGICAL AND MUSCULOSKELETAL RISK FACTORS

- Poor balance*
- Weak muscles/sarcopenia*
- Gait disturbances*
- Kyphosis (abnormal spinal curvature)*
- Reduced proprioception*
- Diseases and/or therapies that cause sedation, dizziness, weakness, or lack of coordination*
- Alzheimer's/other dementia, delirium, Parkinson disease, and stroke

*Modifiable

NOF (2003) Health professional's guide to rehabilitation of the patient with osteoporosis.

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RISK FACTORS FOR FALLS: ENVIRONMENTAL AND PSYCHOLOGICAL RISK FACTORS

Environmental

- Low-level lighting*
- Obstacles in the walking path*
- Loose throw rugs*
- Stairs*
- Lack of assistive devices in bathrooms*
- Slippery outdoor conditions*

Psychological risk factors

- Anxiety and agitation
- Depression
- Diminished cognitive acuity
- Fear of falling*

*Modifiable

NOF (2003) Health professional's guide to rehabilitation of the patient with osteoporosis.

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CONDITIONS, DISEASES, AND MEDICATIONS THAT CAUSE OR CONTRIBUTE TO OSTEOPOROSIS AND/OR FRACTURES

Lifestyle factors

- Alcohol abuse
- Excessive thinness
- Excess vitamin A
- Frequent falling
- High salt intake
- Immobilization
- Inadequate physical activity
- Low calcium intake
- Smoking (active or passive)
- Vitamin D insufficiency/deficiency

Those in reds are related to falls

Office of the Surgeon General (US) (2004) cited in LeBoff, M., Greenspan, S., Insogna, K. et al. Osteoporos Int (2022).

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EXAMINATION TO GUIDE EXERCISE INTERVENTIONS FOR THE PREVENTION OF FALLS/FRACTURES

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TESTS & MEASURES: GAIT, LOCOMOTION, BALANCE, POSTURE AND STRENGTH

- Timed up and go (TUG)
- Gait speed
- Tandem walk
- Dynamic gait index (DGI)
- Functional gait assessment (FGA)
- Functional reach
- Four square step test
- Four stage balance test
- Romberg, Progressive Romberg, Sharpened Romberg
- One leg stance test
- Modified clinical test for sensory interaction of balance (mCTSIB)
- Berg balance scale (BBS)
- Fullerton advanced balance scale (FAB)
- *Activities-specific balance confidence scale (ABC)*
- *Falls efficacy scale (FES)*
- *Fear of falling avoidance-behavior questionnaire (FFABQ)*
- 30-second chair rise
- Posture tests for kyphosis

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TIMED UP AND GO

- Used to evaluate basic mobility skills in older adults
- Identifies fall risk
- Incorporates functional components of sit to stand, ambulation (and gait speed), turning, and stand-to-sit

Podsiadlo D, Richardson S. *J Amer Geriatr Soc*, 1991.

https://research.gaitup.com/publications/tugstroke/

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TIMED UP AND GO

+Good first test to assess general mobility

+Inexpensive; easy

+May use assistive device

-May not be challenging enough for some community-dwelling elders (ceiling effect)

~8 foot TUG has been developed that has norms based on age groups and gender Rikli RE, Jones CJ. *J Aging Phys Activ*, 1999.

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TIMED UP AND GO

- Start with back against chair, arms on arm rests
- On go, stand and walk 3 m (9.84 feet), turn and return to chair and sit
- May use assistive device (no physical assistance given) - in re-test, use same assistive device as pre-test
- Instructions given - "Walk at your normal pace to the line on the floor (3 meters), turn around and sit down with your back against the chair."
- Perform practice test

Podsiadlo D, Richardson S. *J Amer Geriatr Soc*, 1991.

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TIMED UP AND GO

- <10 sec = freely mobile
- ≤12 seconds - community dwelling older adults should be able to complete (Bischoff HA et al, *Age Aging*, 2003)
- >13.5 sec = increased risk of falls
- >20 sec = may need assistive device
- >30 sec = dependence

Podsiadlo D, Richardson S. *J Amer Geriatr Soc*, 1991.

https://research.gaitup.com/publications/tugstroke/

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TANDEM WALK

- To test dynamic balance
- Mark a 6 meter walkway
- Steps counted once person places one foot before the other
- Test is stopped if:
  - a foot touched the floor before proper placement
  - the heel didn't touch the toes
  - the foot wasn't on the line, or
  - 20 steps was reached
- Should be able to complete 20 steps
- Best performance of 3 trials is used

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TANDEM WALK

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FOUR STAGE BALANCE TEST

- Purpose: To assess static balance
- Equipment: A stopwatch
- Directions: There are four standing positions that get progressively harder to maintain. You should describe and demonstrate each position to the patient. Then, stand next to the patient, hold their arm, and help them assume the correct position. When the patient is steady, let go, and time how long they can maintain the position, but remain ready to assist the patient if they should lose their balance.

Assessment: The 4-stage Balance Test (cdc.gov)

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FOUR STAGE BALANCE TEST

- Instructions to the patient:
  - I'm going to show you four positions.
  - Try to stand in each position for 10 seconds.
  - You can hold your arms out, or move your body to help keep your balance, but don't move your feet.
  - For each position I will say, "Ready, begin." Then, I will start timing.
  - After 10 seconds, I will say, "Stop."

Assessment The 4-stage Balance Test (cdc.gov)

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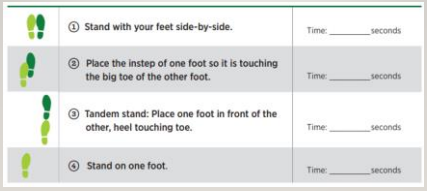
FOUR STAGE BALANCE TEST



Assessment The 4-stage Balance Test (cdc.gov)

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FOUR STAGE BALANCE TEST

- If the patient can hold a position for 10 seconds without moving their feet or needing support, go on to the next position
- If not, STOP the test
- Patients should not use an assistive device (cane or walker) and they should keep their eyes open

Assessment The 4-stage Balance Test (cdc.gov)

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FOUR STAGE BALANCE TEST

- Unable to hold tandem stand for ≥10 seconds is at increased risk of falling
- To reduce their risk of falling, consider referring them to physical therapy for gait and balance exercises, or refer them to an evidence-based fall prevention program, such as Tai Chi.

Assessment The 4-stage Balance Test (cdc.gov)

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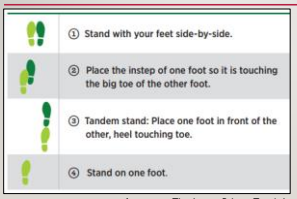
FOUR STAGE BALANCE TEST



Assessment The 4-stage Balance Test (cdc.gov)

Give it a try!

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ONE LEG STANCE TEST

- Purpose: To measure static postural control and fall risk

+Easy and quick to perform

+Can predict fall risk and has norms

- Many older people may have difficulty performing the task

- Requires significant balance

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ONE LEG STANCE TEST

- Stand on dominant foot with arms folded across chest, barefoot with eyes open
- Timing starts when subject raises one foot off the ground and stops when a variation of the following occurs:
  - Displacement of weight bearing foot
  - Suspended foot touches the ground
  - Use of suspended limb to support weight bearing limb
- May stop test at 30 seconds

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ONE LEG STANCE TEST

Correct Form

Incorrect Form

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ONE LEG STANCE TEST

Let's try it.

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ONE LEG STANCE TEST NORMS

AGE CATEGORY	SECONDS BALANCED (Mean)
60-99	15.7 (12.6-18.7)
60-69	27.0 (20.4-33.7)
70-79	17.2 (11.6-22.8)
80-99	7.5 (1.0-16.1)

Bohannon RW, *J Geriatr Phys Ther.2006.*

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30 SECOND CHAIR RISE

- Purpose: To test lower extremity strength
- Instructions:
  - Place chair against wall for safety
  - Assess ability to maintain balance in standing
  - Instruct person to cross arms over chest if possible
  - On instruction to "Go," rise to standing and sit again as many times as possible in 30 seconds.
  - Describe any adaptations (chair height, any assistance needed, task performance)

Rikli & Jones, Senior Fitness Test Manual, 2001.

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30 SECOND CHAIR RISE NORMS FOR MEN

Age % rank	60-64	65-69	70-74	75-79	80-84	85-89	90-94
95	23	23	21	21	19	19	16
75	19	18	17	17	15	14	12
55	17	16	15	15	13	12	10
35	15	13	13	12	11	9	8
15	12	11	10	10	8	6	6
5	9	8	8	7	6	4	3

Rikli & Jones, Senior Fitness Test Manual, 2001.

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30 SECOND CHAIR RISE NORMS FOR WOMEN

Age % rank	60-64	65-69	70-74	75-79	80-84	85-89	90-94
95	21	19	19	19	18	17	16
75	17	16	15	15	14	13	11
55	15	14	13	13	12	11	9
35	13	12	11	11	10	9	6
15	10	10	9	9	7	6	3
5	8	8	7	6	4	4	0

Rikli & Jones, Senior Fitness Test Manual, 2001.

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OPTIONS FOR TELEMEDICINE: FOCUS ON SAFETY! *SPOTTER AND SAFE SITUATION REQUIRED

- ~~Timed~~ up and go (~~TUG~~)
- Gait speed
- Tandem walk
- Dynamic gait index (DGI)
- Functional gait assessment (FGA)
- Functional reach
- Four square step test
- Four stage balance test
- Romberg, Progressive Romberg, Sharpened Romberg
- One leg stance test
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- Falls efficacy scale (FES)
- Fear of falling avoidance-behavior questionnaire (FFABQ)
- 30-second chair rise
- Posture tests for kyphosis

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PRESCRIBING EXERCISES TO DECREASE THE RISK OF FALLS/FRACTURES

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ENVIRONMENTAL DEMANDS ASSOCIATED WITH COMMUNITY MOBILITY IN OLDER ADULTS

Functional requirements for community-living

- Temporal factors: gait speed 1.2 m/sec
- Complete an errand: 1203 feet (366.7 meters)
- Physical load: carrying 6.7 pounds (3.04 kg) package
- Terrain: walking on stairs, obstacles (curbs), slopes, gravel, grass, uneven pavement
- Postural transitions: head turns, reaching, looking up, moving backwards, twisting

Shumway-Cook A, Patla AE, Stewart A, et al. Phys Ther. 2002;82:670–681.

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BALANCE TRAINING

- Balance is the ability to maintain the body in equilibrium with gravity
  - Statically (while stationary)
  - Dynamically (while moving)
- Is based on input from the body
  - Vision (eyes)
  - Vestibular (inner ear)
  - Somatosensory (sensation)
    - All systems are less sensitive with aging

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BALANCE TRAINING

- INTENSITY
  - Remember balance is a motor skill
  - Requires constant **challenge**
  - Primarily done in standing
  - Always maintain good form/posture
  - Must challenge limits of stability both statically and dynamically
  - Use variety of progressive activities targeting important postural muscle groups
  - Mix it up!
  - *The sky's the limit!*

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BALANCE TRAINING

- Static balance
  - Change base of support
    - Feet hip width apart to feet together to modified tandem to tandem to one leg to tree pose (yoga)
  - Change floor surface from tiled to carpeted (using base of support positions)
  - Change from shoes to barefoot (using base of support positions)

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BALANCE EXERCISES

- Start in the hardest, yet safe, foot position. It **should be challenging**, but not dangerous. It needs to feel wobbly.

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BALANCE TRAINING

- Static balance
  - Change arm assist (using base of support positions)
    - Arms 90 degrees of abduction
    - Arms at sides/crossed on chest
  - Change vision (using all base of support positions)
    - Eyes open
    - Eyes closed
  - Do on noncompliant and compliant surfaces (e.g., foam pads, rocker boards, BOSU, Harbinger)

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BALANCE TRAINING

- Dynamic Balance
  - Impose body movement (using base of support positions) average speed at first, then more slowly and more quickly
    - Head turns right and left, lateral flexion
    - Forward reach, other reaches
    - Trunk forward bend – midline, to right, to left
    - Trunk lateral flexion right and left, rotation right and left
    - Arms up out to sides, cross on chest, down to sides, overhead

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BALANCE TRAINING

- Dynamic Balance
  - Impose body movement (using base of support positions)
    - PNF upper extremity patterns – symmetrical and asymmetrical
    - Toe taps – front, side, back, tap in front of other leg, tap in back of other leg
    - The clock – with left planted on floor take large step with right to 12, 1, 2, 3, 4, 5, 6; then large step with left to 6, 7, 8, 9, 10, 11, 12; then reverse

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BALANCE TRAINING

- Dynamic Balance
  - Perform lower extremity moving balance
    - March in place high step
    - Large steps forward with hesitation in between each step; same backwards
    - Walk on toes, heels
    - Side stepping
    - Tandem walking

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BALANCE TRAINING

- Dynamic Balance
  - Perform lower extremity moving balance
    - Grapevine
    - Carioca
    - 360-degree turns clockwise and counterclockwise
    - 4 Square
    - Obstacle course with cones and shoe boxes

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BALANCE TRAINING

- DURATION
  - May be done either as
    - Specified balance exercise session (10-15 minutes)
    - Incorporated into daily activities (e.g., balance on toes while brushing teeth, walk the hallway one time on toes, one time on heels, one time tandem, crossovers, grapevines, head movements)
- FREQUENCY
  - 1-7 days/week
  - Older adults preferable daily

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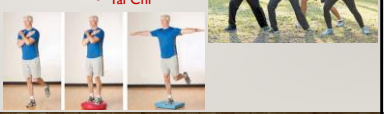
BALANCE TRAINING

MODES: All modes on static and dynamic balance lists

- Balance, wobble boards
- Foam surfaces
- Stability/Swiss balls
- Foam rollers
- Slide boards
- Trampolines
- BAPS
- BOSU
- Tai Chi



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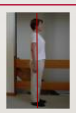
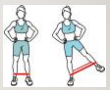
OTHER IMPORTANT COMPONENTS

- Posture exercises
- Lower extremity strengthening
- Environmental assessment
- Assistive devices if needed
- Medications assessment
- Vision evaluation
- Other specific interventions as needed (i.e., treatment for incontinence)
- Refer to PT/OT or community programs (balance, Tai chi)





Steadi-rx Older Adult Fall Prevention Guide for Community Pharmacists (cdc.gov)

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THE CLINICIAN'S GUIDE TO PREVENTION AND TREATMENT OF OSTEOPOROSIS 2022

Universal recommendations

- Identify and address modifiable risk factors (i.e., sedating medications, polypharmacy, hypotension, gait or vision disorders, and out-of-date prescription glasses)
- Counsel or refer patients for instruction on balance training, muscle-strengthening exercise, and safe movement strategies to prevent fracture(s) in activities of daily life
- In community-dwelling patients, refer for at-home fall hazard evaluation and remediation

LeBoff, M., Greenspan, S., Insogna, K. et al. Osteoporos Int (2022). https://doi.org/10.1007/s00198-021-05900-y

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ACCESS AND UTILIZE RESOURCES

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STEADI PATIENT AND CAREGIVER RESOURCES

Patient & Caregiver Resources | STEADI - Older Adult Fall Prevention | CDC Injury Center

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RESOURCES

- Centers for Disease Control and Prevention STEADI Older Adult Fall Prevention
  - STEADI - Older Adult Fall Prevention | CDC
- Centers for Disease Control and Prevention Older Adult Fall Prevention
  - Older Adult Falls (cdc.gov)
- Clinician's Guide to the Prevention and Treatment of Osteoporosis 2022
  - The clinician's guide to prevention and treatment of osteoporosis | SpringerLink
- Bone Health & Osteoporosis Foundation
  - https://www.bonehealthandosteoporosis.org/

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