Community-Based Exercise Programs for Balance and Falls Prevention featuring Tai Chi Fundamentals® Adapted Program and Ballroom Basics for Balance™

Kristi Hallisy, PT, DSc and Susan Frikken DPT, LMT
2018 WPTA Spring Conference – Waukesha WI

Strengthen Your Expertise

COURSE DESCRIPTION
Prevention of falls among older adults is a pressing public health challenge in America. Every year, one in four older adults falls, and one in five falls leads to serious injury. Wisconsin currently ranks #1 in the nation in falls. The biopsychosocial and financial cost of falls is staggering. Now more than ever, health care providers are needed to screen and determine level of falls risk, remediate mobility impairments and utilize evidence-based community programs to reduce the falls rate in this country. Using the Stopping Elderly Accidents, Deaths and Injuries (STEADI) screening tools and American Geriatrics Society Guidelines, this workshop will arm physiotherapists with fun, innovative and evidence-based ways to assess and train balance, and reduce falls in older adults. Perform validated pre- and post- testing to measure balance, cognitive function and quality of life. Discuss two community-based falls risk reduction programs. Tai chi Fundamentals® is a mind-body martial art that fosters effective and efficient movement patterns addressing the strength, endurance, mobility and balance impairments frequently seen in the aging population. Ballroom Basics for Balance™ (BB4B) is a group balance class that uses basic dance moves to enhance balance and prevent falls.

OBJECTIVES
1. Comprehend the relevance of falls and implement a falls assessment algorithm (Stopping Elderly Accidents Deaths and Injuries [STEADI] program).
2. Demonstration and hands-on participation in tests and measures for identifying levels of falls risk.
3. Delineate best practice recommendations for risk reduction and falls prevention, emphasizing exercise as a tool to improve balance and prevent falls. Two programs (Tai Chi Fundamentals® and Ballroom Basics for Balance®) will be utilized as sample community-based programs.
4. Provide a step-wise protocol for finding evidence-based community resources for falls risk remediation in your locale.

I. BACKGROUND: State of Aging and Health in America

Snapshot of our nation’s progress in promoting prevention, improving the health and well-being of older adults, and reducing behaviors that contribute to premature death and disability.

A. Burden of an Aging America
1. Influx of baby boomers (born 1945-1964) will markedly impact America’s social/economic scene
   a. In 2016, persons 65+ years of age numbered 49.2 million (15.2% of USA population)
   b. By 2030, baby boomers will number (ages 66-84) will be 61 million and the “oldest old” (person > 85 years) will number 9 million.
2. Issue of Dependency Ratios (20-64/65+) – in 1960 there were there will be 5.66 persons ages 20-64 for every person over 75 years of age, By 2030, the dependency ratio will be 2.67.
3. US has more time to prepare for the influx of aging as compared to other industrialized countries, but we have to work now to improve the health status of the elderly (and ourselves)
FROM: Knickman, Health Serv Res 2002 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1464018/
4. Living Arrangements of Older Americans
   a. Community dwelling adults comprise the vast majority of adults over 65 years of age
   b. 4% of women and 3% of men over 65 years of age live in nursing home or other group quarters, but still the estimated costs for persons living with assistance of Long-term Care Providers is (depending on sources) $210.9 to $317.1 billion annually.

http://www.pewsocialtrends.org/2016/02/18/2-living-arrangements-of-older-americans-by-gender/ (3/18/18)

B. Burden of Chronic Illness in Older Adults Impacts all Older Adults
1. Leading causes of death for all age groups, including older adults, has shifted from acute illness & infectious diseases to chronic/degenerative illnesses
   a. 80% have 1 chronic illness
   b. 2 out of 3 have multiple illnesses
   c. 66-75% of the country’s health care budget
2. The State of Aging & Health in America highlights that mobility is fundamental to healthy aging
3. PTs and PTAs in great position to aid the aging adult and the American health care system

OPPORTUNITY & RESPONSIBILITY OF HEALTH CARE

C. Burden of Falls among Older Adults
1. A fall is defined as any event that leads to an unplanned, unexpected contact with a supporting surface. {Shumway-Cook, Phys ther 1997;77:812-819}
2. Types of Falls and the Under-Reporting of Falls
   1) Loss of balance
   2) Fall without injury
   3) Fall with OP visit
   4) Fall with hospitalization
   5) Fall with death (> 27,000 in 2014)
3. STEADI Facts www.cdc.gov/steadi
   1. An older adult falls every second of the day
   2. One in four older adults reported a fall in 2014
      *This used to be 1 in 3, but don’t let the numbers fool you!
   3. Falls are the #1 cause of hip fractures = the spiral of death
      1) Over 300,000 hip fractures per year
      2) 95% caused by falling
      3) ¾ of all hip fractures are women
4. Cost of Falls
   “In 2015, the estimated medical costs attributable to fatal and nonfatal falls was approximately $50.0 billion. For nonfatal falls, Medicare paid approximately $28.9 billion, Medicaid $8.7 billion, and private and other payers $12.0 billion. Overall medical spending for fatal falls was estimated to be $754 million.” FROM: Florence et al. J Am Geriatr Soc (7 March 2018)
II. FALL PREVENTION (AGS/BGS Clinical Practice Guidelines & STEADI)

Falls need not be an inevitable part of aging. Health care providers can reduce the risks of falling with the following: 1) screen patients to determine level of falls risk (low, medium, high), 2) identify modifiable risk factors, 3) review and manage medications linked to falls and 4) recommend interventions. The STEADI Toolkit is based on a simple algorithm (adapted from the American and British Geriatric Societies’ Clinical Practice Guideline). It includes basic information about falls, case studies, conversation starters, and standardized gait and balance assessment tests (with instructional videos). In addition, there are educational handouts about fall prevention specifically designed for patients and their friends and family.
A. Stay Independent Brochure = patient entry-point to the STEADI Algorithm

1. For older adults: 4 things you can do to prevent falls:
   a. Speak up. Talk openly with your healthcare provider about falls risks and prevention. Ask your doctor or pharmacists to review medications (and reduce as able).
   b. Exercise program to improve leg strength and balance
   c. Get an annual eye exam.
   d. Make your home safer.

2. Take the quiz. Talk to your doctor to talk about falls risk and prevention.

Check Your Risk for Falling

<table>
<thead>
<tr>
<th>Circle &quot;Yes&quot; or &quot;No&quot; for each statement below</th>
<th>Why it matters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes (2) I have fallen in the past year.</td>
<td>People who have fallen once are likely to fall again.</td>
</tr>
<tr>
<td>Yes (2) I use or have been advised to use a cane or walker to get around safely.</td>
<td>People who have been advised to use a cane or walker may already be more likely to fall.</td>
</tr>
<tr>
<td>Yes (1) Sometimes I feel unsteady when I am walking.</td>
<td>Unsteadiness or needing support while walking are signs of poor balance.</td>
</tr>
<tr>
<td>Yes (1) I steady myself by holding onto furniture when walking at home.</td>
<td>This is also a sign of poor balance.</td>
</tr>
<tr>
<td>Yes (1) I am worried about falling.</td>
<td>People who are worried about falling are more likely to fall.</td>
</tr>
<tr>
<td>Yes (1) I need to put with my hands to stand up from a chair.</td>
<td>This is a sign of weak leg muscles, a major reason for falling.</td>
</tr>
<tr>
<td>Yes (1) I have some trouble stepping up onto a curb.</td>
<td>This is also a sign of weak leg muscles.</td>
</tr>
<tr>
<td>Yes (1) I often have to rush to the toilet.</td>
<td>Rushing to the bathroom, especially at night, increases your chance of falling.</td>
</tr>
<tr>
<td>Yes (1) I have lost some feeling in my feet.</td>
<td>Numbness in your feet can cause stumbles and lead to falls.</td>
</tr>
<tr>
<td>Yes (1) I take medicine that sometimes makes me feel light-headed or more tired than usual.</td>
<td>Side effects from medicines can sometimes increase your chance of falling.</td>
</tr>
<tr>
<td>Yes (1) I take medicine to help me sleep or improve my mood.</td>
<td>These medicines can sometimes increase your chance of falling.</td>
</tr>
<tr>
<td>Yes (1) I often feel sad or depressed.</td>
<td>Symptoms of depression, such as not feeling well or feeling slowed down, are linked to falls.</td>
</tr>
</tbody>
</table>

Total | Add up the number of points for each "yes" answer. If you scored 4 points or more, you may be at risk for falling. Discuss this checklist with your doctor. |

This checklist was developed by the Greater Los Angeles VA Geriatric Research Education Clinical Center and affiliates and is a validated fall risk assessment tool (Rahman et al., J Safety Res, 2018;42(5):497-503). Adapted with permission of the authors.

B. Fall Prevention in Primary Care (and Physical Therapy) Practice

1. When you see patients 65+ years, make these 3 questions a routine part of your exam:
   1) Have you fallen in the past year?
   2) Do you feel unsteady when standing or walking?
   3) Do you worry about falling?

2. Identify modifiable risk factors

3. Evaluate gait (TUG), lower body leg strength (30-second Chair test) and balance (4-stage balance test)

4. Determine Level of Risk (low, moderate or high)

5. Remediate as outlined in the STEADI protocol
C. Risk Factors for Falls

“Falls are multifactorial; no single measure is an accurate diagnostic tool.”


This comprehensive falls risk factor article, published in January 2017, has literally 25 pages of statistical data on falls including 112 tests and measures used to evaluate falls. Fifty-six (56) of these items include calculated sensitivity (Sn) and specificity (Sp) measures. To be included in this review, articles had to have a sample size of at least 30 ambulatory community living adults (≥ 65 years) and track falls for a minimum of 6 months. 2,294 abstracts were identified from Jan 1990 to Sept 2013, with N= 95 articles meeting inclusion criteria, and 59 having sufficient data to calculate posttest probability (PoTP) of falls.

There are 15 items related to medical history (Table 2) with Sn, Sp, LR and CI reported for each item.

- Activities of Daily Living, where issues of dependency increasing risk of fall
- Age, where increasing age + history of previous fall increasing risk
- Assistive device
- Alcohol consumption
- Depression
- Difficulty walking or missteps
- Fear of Falling
- Health status (self-reported fair or poor)
- History of falling
- History of imbalance
- Limited physical activity or exercise
- Nocturia
- Pain
- Polypharmacy (≥ 4 meds)
- Psychoactive medications

Table 3 summarizes 15 self-reported measures of falls (grouped by construct)

- Measures of balance confidence and fear of falling (e.g. Activities of Balance Confidence Scale (ABCs), Falls Efficacy Scale, etc.).
- Measures of ADLs
- Measures of Cognition (e.g. MMSE)
- Measures of Depression (e.g. Geriatric Depression Scale)
- Measures of Physical Activity (SF-36 Physical scale)
- Measures of Caregiver Concern about Falls Risk
- Measures of Overall Health Status (e.g. Sickness Impact Profile, Self-rated health)

Table 4 contains 26 performance-based functional measures with data about number of fallers and nonfallers having scores above and below cut scores, and Sn and Sp, such that calculation of posttest probability (PoTP) of falls was possible. Sample items in this table include Berg Balance Scale (BBS), Dynamic gait index (DGI), Chair tests, TUG, and functional reach.

This article is the BOMB – ask a fall risks question and you can likely look it up!
Risk Factors for Falls from the STEADI

**INTRINSIC RISK FACTORS**
- Advanced age (> 80 years)
- Previous fall(s)
- Muscle weakness (quads)
- Gait & balance problems
- Poor vision
- Postural hypotension
- Chronic conditions including arthritis, stroke, incontinence, diabetes, Parkinson’s, dementia
- Fear of falling

**EXTRINSIC RISK FACTORS**
- Lack of stair handrails
- Poor stair design
- Lack of bathroom grab bars
- Dim lighting or glare
- Obstacles and tripping hazards
- Slippery or uneven surfaces
- Improper use of assistive device

Risk Factors for Falls and Odds Ratio

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Mean Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muscle Weakness</td>
<td>4.0</td>
</tr>
<tr>
<td>Prior Fall</td>
<td>3.0</td>
</tr>
<tr>
<td>Gait Deficit</td>
<td>2.9</td>
</tr>
<tr>
<td>Balance Deficit</td>
<td>2.9</td>
</tr>
<tr>
<td>Assistive Device Use</td>
<td>2.6</td>
</tr>
<tr>
<td>Visual Impairment</td>
<td>2.5</td>
</tr>
<tr>
<td>Arthritis</td>
<td>2.4</td>
</tr>
<tr>
<td>ADL disability</td>
<td>2.3</td>
</tr>
<tr>
<td>Depression</td>
<td>2.2</td>
</tr>
<tr>
<td>Orthostatic Hypotension</td>
<td>1.9</td>
</tr>
<tr>
<td>Cognitive Impairment</td>
<td>1.8</td>
</tr>
<tr>
<td>Age &gt;80 years</td>
<td>1.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Relative Risk Or Odds Ration Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>2.1-3.9</td>
</tr>
<tr>
<td>Diabetes</td>
<td>2.8-3.8</td>
</tr>
<tr>
<td>Medications</td>
<td>1.1-2.4</td>
</tr>
<tr>
<td>Low BMI</td>
<td>1.5-1.8</td>
</tr>
<tr>
<td>Incontinence</td>
<td>1.3-1.8</td>
</tr>
<tr>
<td>Pain</td>
<td>1.7</td>
</tr>
</tbody>
</table>

Risk Factors are Additive for % of Falling

Tinetti, NEJM, 1988

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>No Fall, 76.1%</th>
<th>Fall, 23.9%</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of falls, %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>52.1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>21.3</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>10.5</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>4.2</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>3.7</td>
<td></td>
</tr>
<tr>
<td>≥6</td>
<td></td>
<td>5.7</td>
<td></td>
</tr>
<tr>
<td>Female, %</td>
<td>55.8</td>
<td>63.0</td>
<td>.01</td>
</tr>
<tr>
<td>Caucasian, %</td>
<td>86.0</td>
<td>91.7</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Age, average</td>
<td>76.5</td>
<td>78.4</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Income, average, $</td>
<td>40,318</td>
<td>37,688</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Education, %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;High school</td>
<td>23.4</td>
<td>25.5</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>High school graduate</td>
<td>24.2</td>
<td>23.2</td>
<td></td>
</tr>
<tr>
<td>Some college</td>
<td>23.5</td>
<td>25.0</td>
<td></td>
</tr>
<tr>
<td>College graduate</td>
<td>24.5</td>
<td>21.5</td>
<td>.41</td>
</tr>
<tr>
<td>Region, %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>15.7</td>
<td>12.3</td>
<td></td>
</tr>
<tr>
<td>Midwest</td>
<td>23.0</td>
<td>26.1</td>
<td></td>
</tr>
<tr>
<td>South</td>
<td>42.5</td>
<td>42.1</td>
<td></td>
</tr>
<tr>
<td>West</td>
<td>16.6</td>
<td>17.6</td>
<td>.07</td>
</tr>
<tr>
<td>Self-rated general health, %&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excellent</td>
<td>17.7</td>
<td>11.3</td>
<td></td>
</tr>
<tr>
<td>Very good</td>
<td>34.1</td>
<td>24.7</td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>30.7</td>
<td>31.1</td>
<td></td>
</tr>
<tr>
<td>Fair</td>
<td>13.8</td>
<td>23.3</td>
<td></td>
</tr>
<tr>
<td>Poor</td>
<td>3.2</td>
<td>9.3</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Depression, %</td>
<td>18.8</td>
<td>33.3</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Hypertension, %</td>
<td>71.2</td>
<td>76.1</td>
<td>.01</td>
</tr>
<tr>
<td>Diabetes mellitus, %</td>
<td>24.0</td>
<td>32.8</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Osteoporosis, %</td>
<td>22.3</td>
<td>30</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Emphysema, asthma, chronic obstructive pulmonary disease, %</td>
<td>17.7</td>
<td>24.0</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Other heart condition, %</td>
<td>11.7</td>
<td>14.4</td>
<td>.05</td>
</tr>
<tr>
<td>Stroke, brain hemorrhage, %</td>
<td>9.8</td>
<td>15.0</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>High blood pressure within last 12 months, %</td>
<td>50.9</td>
<td>56.1</td>
<td>.01</td>
</tr>
<tr>
<td>Myocardial infarction within last 12 months, %</td>
<td>1.9</td>
<td>1.8</td>
<td>.82</td>
</tr>
<tr>
<td>Stroke/brain hemorrhage within last 12 months, %</td>
<td>1.7</td>
<td>3.2</td>
<td>.01</td>
</tr>
<tr>
<td>Legally blind, %</td>
<td>0.6</td>
<td>0.9</td>
<td>.30</td>
</tr>
</tbody>
</table>
D. Functional Assessments: demonstration and practice

1. Timed-Up and Go (TUG) Test
   a. Purpose: To assess mobility
   b. Equipment: stopwatch and standard 17-inch chair
   c. When I say “GO,” I want you to:
      1) Stand up from the chair
      2) Walk to the line (3 meter = 10 feet) on the floor at your normal pace
      3) Turn
      4) Walk back to the chair at your normal pace
      5) Sit down again
   d. OBSERVATIONS: Check all that apply:
      - Slow tentative pace
      - Loss of balance
      - Short strides
      - Little or no arm swing
      - Steadying self on walls
      - Shuffling
      - En bloc turning
      - Not using assistive device properly

   CUT-Score: An older adult who takes ≥ 12 seconds to complete the TUG is at risk for falling.

<table>
<thead>
<tr>
<th>Age</th>
<th>Gender</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>60-69</td>
<td>Male</td>
<td>15</td>
<td>8</td>
<td>2</td>
<td>7-9</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>22</td>
<td>8</td>
<td>2</td>
<td>7-9</td>
</tr>
<tr>
<td>70-79</td>
<td>Male</td>
<td>14</td>
<td>9</td>
<td>3</td>
<td>7-11</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>22</td>
<td>9</td>
<td>2</td>
<td>8-10</td>
</tr>
<tr>
<td>80-89</td>
<td>Male</td>
<td>8</td>
<td>10</td>
<td>1</td>
<td>9-11</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>15</td>
<td>11</td>
<td>3</td>
<td>9-12</td>
</tr>
</tbody>
</table>


2. TUG variation not specific to the STEADI
   a. TUG Cognitive-complete the task while counting backwards from a randomly selected number
      between 20 and 100 (Shumway-Cook 2000) OR alternatively may recite alternating letters of
      the alphabet (A=C=E…) aloud, Maranhao-Filho et al (2011)
   b. TUG manual-complete the task while carrying a full cup of water

3. NORMS: TUG Community dwelling elderly: Hofheinz et al, 2010, n = 120 healthy older adults
   between the ages 60-87)
   a. Mean time to perform TUG is 8.39 (±1.36) seconds
   b. Mean time to perform TUG (Cognitive) is 9.82 (±2.39) seconds
   c. Mean time to perform TUG (Manual) is 11.56 (±2.11) seconds
   d. The performance times for the TUG and the TUG with dual task (cognitive and manual)
      do not differ significantly between men and women (P > 0.05). However, the mean values for
      different age groups (60-69, 70-79, 80-87 years old) differ significantly from each other. With
      increasing age, the time required to perform the different tests is longer.
6. TUG: excellent test/retest reliability \( (r = 0.98) \), excellent interrater reliability \( \text{ICC} = 0.99 \) and excellent interrater reliability \( \text{ICC}=0.94 \), excellent correlation with Berg Balance \( (r = -0.66) \)

7. Predictive validity TUG for community dwelling elderly: High specificity (93.3\%) for predicting non-fallers. High sensitivity (80\%) in positive prediction of falls. (Shumway-Cook, 2000)

8. The time taken to complete the task is strongly correlated to level of functional mobility, (i.e. the more time taken, the more dependent in activities of daily living).

9. The cutoff levels for TUG is 13.5 seconds or longer with an overall correct prediction rate of 90\% for TUG manual is 14.5 seconds or longer with a 90\% correct prediction rate; and TUG cognitive is 15 seconds or longer with an overall correct prediction rate of 87\%.


2. **30-second Chair Stand Test**
   a. Purpose: Assess leg strength
   b. Equipment: stopwatch and standard 17-inch chair (no arms)
   c. Instructions to the patient:
      1) Sit in the middle of the chair
      2) Keep your hands on the opposite shoulder crossed at your wrists (cross arms on chest)
      3) Keep your feet flat on the floor
      4) Keep your back straight and arms against your chest
      5) When I say “GO,” rise to a full standing position and sit back down again
      6) Repeat this for 30 seconds.
   4. Begin timing on “GO.” If they use UEs = zero (0). Count reps to a full standing position, If person is ½ way up on at 30-seconds, count this as a stand.

<table>
<thead>
<tr>
<th>AGE</th>
<th>MEN</th>
<th>WOMEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>60-64</td>
<td>&lt;14</td>
<td>&lt;12</td>
</tr>
<tr>
<td>65-69</td>
<td>&lt;12</td>
<td>&lt;11</td>
</tr>
<tr>
<td>70-74</td>
<td>&lt;10</td>
<td>&lt;10</td>
</tr>
<tr>
<td>75-79</td>
<td>&lt;10</td>
<td>&lt;10</td>
</tr>
<tr>
<td>80-84</td>
<td>&lt;10</td>
<td>&lt;9</td>
</tr>
<tr>
<td>85-89</td>
<td>&lt;8</td>
<td>&lt;8</td>
</tr>
<tr>
<td>90-94</td>
<td>&lt;7</td>
<td>&lt;7</td>
</tr>
</tbody>
</table>

Walking Speed: The 6th Vital Sign

- Walking speed predicts future health status and functional decline including hospitalization, discharge location and mortality
- Walking speed determines rehabilitation potential, aids in prediction of falls and fear of falling
- Leg strength (quads) very relevant to gait, mobility and balance
4. 4-Stage Balance Test  
a. Purpose: static balance  
b. Equipment: stopwatch to time 10-seconds

Instructions to the patient: I’m going to show you 4 positions. Try to stand in each position for 10 seconds. You can hold your arms out or move your body to keep your balance but don’t move your feet. Hold this position until I tell you to stop.  
For each stage say, “Ready, begin” and begin timing.  
After 10 seconds say “Stop.”

Positions:

1) Stand with feet side by side.  
2) Place the middle of 1 foot so it is touching the big toe of the other foot.  
3) Place one foot in front of the other, heel touching toe (tandem stance).  
4) Stand on 1 foot.

An older adult who cannot hold the tandem stance position for at least 10 seconds is at increased risk of falling.  
https://www.cdc.gov/steadi/pdf/STEADI-Assessment-4Stage-508.pdf

5. Decision Time #2 – is client at Moderate or High Risk for Falls?

Stay Independent Brochure Or Self-Report  
- Fell in past year  
- Feels unsteady when standing or walking  
- Worries about falling

Yes Or Score ≥ 4  
Low Risk

Positive Risk Based On TUG or Chair Stand or Balance Sequence  
Negative On All Tests

2+ falls or injury  
1 fall last year  
0 falls last year

Injury  
No Injury

Moderate Risk

Multifactorial Risk Assessment  
Postural dizziness/hypotension  
Medication Review  
Cognitive Screen  
Feet & Footwear  
Mobility Aids  
Visual Acuity Check

High Risk

MODERATE RISK  
Individualized Fall Intervention Plan  
1. Educate patient  
2. Review/modify medications  
3. Vitamin D ± calcium  
4. Refer to PT to improve gait, strength and balance  
OR  
Refer to a community fall program

HIGH RISK = Conduct a Multi-factorial Risk Assessment
III. MANAGEMENT OF THE HIGH RISK FALLS PATIENT (STEADI)

A. Conduct a Multi-Factorial Risk Assessment
1. If the patient has not completed the Stay Independent Brochure Checklist, do so now.
2. Take a detailed falls history noting “causes of falls, number of falls and any injuries
3. Perform a more detailed physical examination (outlined below)
4. Identify and remediate risk factors

B. Measure Orthostatic Blood Pressure
1. Assess impact of position change on blood pressure
2. PROCEDURE
   a. Have the patient lie down for 5 minutes.
   b. Measure blood pressure and pulse rate.
   c. Have the patient stand.
   d. Repeat blood pressure and pulse rate measurements after standing 1 and 3 minutes.
3. A drop in BP of ≥ 20 mm Hg, or in diastolic BP of ≥ 10 mm Hg, or experiencing lightheadedness or dizziness is considered abnormal.
4. SYMPTOMS
   a. Dizziness or lightheadedness
   b. Feeling about to faint, passing out, or falling
   c. Headaches, blurry or tunnel vision
   d. Feeling vague or muddled
   e. Feeling pressure across the back of your shoulders or neck
   f. Feeling nauseous, or hot and clammy
   g. Weakness or fatigue
5. Symptoms may happen when standing or sitting up suddenly, in the morning when blood pressure is naturally lower, after a large meal or alcohol, during exercise, when straining on the toile, when you are ill or if you become anxious or panicky.
6. Linked to HTN, diabetes, heart disease, diuretics, medications, neurological diseases, dehydration, Vitamin B12 deficiency, alcoholism and prolonged bed rest.
7. Also, assess heart rate and/or arrhythmia as they may also predispose to BP changes
8. Use of diuretics for HTN can predispose to nocturia and/or dehydration which are linked to falls

C. Physician and/or Pharmacists: Medication Review and Modification (if possible)

<table>
<thead>
<tr>
<th>Medication Review</th>
<th>Psychoactive Medications</th>
</tr>
</thead>
<tbody>
<tr>
<td>S Screen for meds that increase fall risk</td>
<td>• Anticonvulsants</td>
</tr>
<tr>
<td>A Assess the patient to best manage health conditions</td>
<td>• Antidepressants</td>
</tr>
<tr>
<td>F Formulae the patient’s medication action plan.</td>
<td>• Antipsychotics</td>
</tr>
<tr>
<td>E Educate the patient and caregiver about medication changes and fall prevention strategies</td>
<td>• Benzodiazepines</td>
</tr>
<tr>
<td></td>
<td>• Opioids</td>
</tr>
<tr>
<td></td>
<td>• Sedatives-hypnotics</td>
</tr>
<tr>
<td></td>
<td>Drugs that cause dizziness, sedation confusion, blurred vision or orthostatic hypotension</td>
</tr>
<tr>
<td></td>
<td>• Anticholinergics</td>
</tr>
<tr>
<td></td>
<td>• Antihistamines</td>
</tr>
<tr>
<td></td>
<td>• Blood pressure meds</td>
</tr>
<tr>
<td></td>
<td>• Muscle relaxants</td>
</tr>
</tbody>
</table>

RESOURCES


D. Cognitive Screening – many options available

1. **Mini–Mental State Examination (MMSE)** or Folstein test is a 30-point questionnaire that is used extensively in clinical and research settings to measure cognitive impairment. It is commonly used in medicine and allied health to screen for dementia. The maximum **MMSE score** is 30 points. A score of 20 to 24 suggests mild dementia, 13 to 20 suggests moderate dementia, and less than 12 indicates severe dementia. On average, the MMSE score of a person with Alzheimer's declines about two to four points each year. A PDF of the MMSE is available at this link: [https://www.uml.edu/docs/Mini%20Mental%20State%20Exam_tcm18-169319.pdf](https://www.uml.edu/docs/Mini%20Mental%20State%20Exam_tcm18-169319.pdf)

2. The **Trail Making Test** is a neuropsychological test of visual attention and task switching. It consists of two parts in which the subject is instructed to connect a set of 25 dots as quickly as possible while still maintaining accuracy.

<table>
<thead>
<tr>
<th>Scoring</th>
<th>Average</th>
<th>Deficient</th>
<th>Rule of Thumb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trail A</td>
<td>29 seconds</td>
<td>&gt; 78 seconds</td>
<td>Most done in 90 seconds</td>
</tr>
<tr>
<td>Trail B</td>
<td>75 seconds</td>
<td>&gt;273 seconds</td>
<td>Most done in 3 minutes</td>
</tr>
</tbody>
</table>


   a. The Stroop effect has been widely used in psychology. Among the most important uses is the creation of validated psychological tests based on the Stroop effect permit to measure a person's selective attention capacity and skills, as well as their processing speed ability.
   b. In psychology, the emotional Stroop task is used as an information-processing approach to assessing emotions. Related to the standard Stroop effect, the emotional Stroop test works by examining the response time of the participant to name colors of negative emotional words.


E. Feet and Footwear (2010 AGS/BGS Guidelines include Foot Health & Footwear Assessment)


1. Age related changes in the feet
   a. Skin = reduction in plantar sensitivity (loss of sensation)
   b. Soft tissue = thicker, more compressible, dissipate more energy, stiffer, thinker plantar fascia
   c. Nails = brittle, onychomycosis
   d. Loss of LE strength: hallux (27%), toes (27%) and lower leg muscles (24-37%)
   e. Pronated (planus) foot with less propulsion; decreased foot clearance
   f. Foot pain

2. Age-related changes in gait include decreased speed, single limb support, stride length and balance
3. Numerous systematic reviews note the relevance of multi-factorial podiatry intervention with feet/nail care, foot-ankle exercise and footwear (anti-slip shoes, low heels, firm sole, solid heel counter)

4. It is advisable for older individuals to wear shoes in their home whenever possible to minimize the risk of falling. N=765 community-dwelling adults (> 70 years) followed for a median of 27.5 months for falls. RESULTS: At the time of in-home falls, 51.9% of people were barefoot, wearing socks without shoes, or wearing slippers; 10.1% of people reported that their usual footwear was one of these types. Among those who fell in their own home, the adjusted odds ratio for a serious injury among those who were shoeless or wearing slippers compared to those who were wearing other shoes at the time of the fall was 2.27 (95% confidence interval 1.21–4.24).


### F. Use of Mobility Aides


**Background:** Many older adults who might benefit from using mobility aids do not or will not use them. Studies show that attitudes and beliefs strongly affect the decision to use mobility aids. Despite the growing diversity of the population, no prior studies have compared attitudes towards and beliefs about mobility aids by race and ethnicity.

**Objective:** This study aimed to explore whether and how attitudes towards and beliefs about mobility aid use vary by race and ethnicity.

**Method:** We conducted 12 focus groups with 61 community dwelling persons age 65+ years from three groups: White, non-Hispanic Black, and Hispanic. Data were coded and compared across groups.

**Results:** For all groups, perceived benefits of mobility devices in maintaining independence and control produced positive attitudes. However, the association of mobility aid use with aging and physical decline contributed to stigmatizing attitudes. Black and Hispanic participants expressed apprehension about using unsafe or inappropriate secondhand equipment, heightened concerns about mobility aid users becoming subjects of negative biases, and a preference for fashionable aids. Hispanic participants expressed a preference for human assistance. Participants of all groups perceived physicians as influencing their decisions to use aids.

**Conclusions:** Social pressures and perceived stigma deter mobility aid use, particularly in minority populations. Greater physician involvement, positive peer models and affordable, safe, visually appealing devices would promote greater acceptance of mobility aids.

**Keywords:** mobility, assistive technology, Hispanic, African American, seniors

### G. Visual Acuity Check Guidelines


1. USPSTF 2016: “Impairment of visual acuity is a serious public health problem in older adults. In 2011, about 12% of US adults aged 65 to 74 years and 15% of those 75 years or older reported having problems seeing, even with glasses or contact lenses.”

2. Vision problems impart a 2.5 odds ratio for all (AGS/BGS Guidelines).

3. Presently, in older adults (65+ years) who do not present with vision problems, there is insufficient evidence to recommend visual acuity testing.

4. However, older age is an important risk factor for most types of visual impairment (e.g. cataracts due to smoking, alcohol use, UV exposure, diabetes, corticosteroid use, and black race. Risk factors for age-related macular degeneration (AMD) include smoking, family history and white race.

5. Screening questions alone are insufficient. Visual acuity test should be down with a Snelling eye chart.
H. Evaluate Readiness to Change

STEADI FACT SHEET: Talking about Fall Prevention with Your Patients

1. Many fall prevention strategies call for patients to change their behaviors by:
   a. Changing their medications
   b. Doing prescribed exercises
   c. Attending a fall prevention program
   d. Changing their home environment

2. Assess readiness to change and use motivational interviewing to help patient/clients

<table>
<thead>
<tr>
<th>STAGE OF CHANGE</th>
<th>PATIENT COGNITION AND BEHAVIOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precontemplation</td>
<td>Does not think about change, is resigned or fatalistic</td>
</tr>
<tr>
<td></td>
<td>Does not believe in, or downplays personal susceptibility</td>
</tr>
<tr>
<td>Contemplation</td>
<td>Weighs benefits vs. costs of proposed behavior change</td>
</tr>
<tr>
<td>Preparation</td>
<td>Experiments with small changes</td>
</tr>
<tr>
<td>Action</td>
<td>Takes definitive action to change</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Maintains new behavior over time</td>
</tr>
</tbody>
</table>

I. Home Assessment

A. Fall Prevention is an interaction of Individual and Environment


![Diagram of Individual, Falls, and Environment]

- Age-related changes
- Cognitive deficits
- Gait, strength, or balance deficits
- Sensory deficits
- Chronic conditions
- Acute illnesses
- Behaviors/choices
- Medications
- Footwear
- Assistive devices
- Home/neighborhood features
- Alcohol/drugs
- Supports from caregivers

B. Check for Safety Brochure


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

**STAIRS & STEPS (INDOORS & OUTDOORS)**

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are there papers, shoes, books, or other objects on the stairs?</td>
<td></td>
</tr>
<tr>
<td>- Always keep objects off the stairs.</td>
<td></td>
</tr>
<tr>
<td>Are some steps broken or uneven?</td>
<td></td>
</tr>
<tr>
<td>- Fix loose or uneven steps.</td>
<td></td>
</tr>
<tr>
<td>Is there a light and light switch at the top and bottom of the stairs?</td>
<td></td>
</tr>
<tr>
<td>- Have an electrician put in an overhead light and light switch at the top and bottom of the stairs. You can light switches that glow.</td>
<td></td>
</tr>
<tr>
<td>Has a stairway light bulb burned out?</td>
<td></td>
</tr>
<tr>
<td>- Have a friend or family member change the light bulb.</td>
<td></td>
</tr>
<tr>
<td>Is the carpet on the steps loose or torn?</td>
<td></td>
</tr>
<tr>
<td>- Make sure the carpet is firmly attached to every step, or remove the carpet and attach non-slip rubber treads to the stairs.</td>
<td></td>
</tr>
<tr>
<td>Are the handrails loose or broken? Is there a handrail on only one side of the stairs?</td>
<td></td>
</tr>
<tr>
<td>- 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.</td>
<td></td>
</tr>
</tbody>
</table>

**FloORS**

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>When you walk through a room, do you have to walk around furniture?</td>
<td></td>
</tr>
<tr>
<td>- Ask someone to move the furniture so your path is clear.</td>
<td></td>
</tr>
<tr>
<td>Do you have throw rugs on the floor?</td>
<td></td>
</tr>
<tr>
<td>- Remove the rugs, or use double-sided tape or a non-slip backing so the rugs won't slip.</td>
<td></td>
</tr>
<tr>
<td>Are there papers, shoes, books, or other objects on the floor?</td>
<td></td>
</tr>
<tr>
<td>- Pick up things that are on the floor. Always keep objects off the floor.</td>
<td></td>
</tr>
<tr>
<td>Do you have to walk over or around wires or cords (like lamp, telephone, or extension cords)?</td>
<td></td>
</tr>
<tr>
<td>- 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.</td>
<td></td>
</tr>
</tbody>
</table>

**BEDROOMS**

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the light near the bed hard to reach?</td>
<td></td>
</tr>
<tr>
<td>- Place a lamp close to the bed where it's easy to reach.</td>
<td></td>
</tr>
<tr>
<td>Is the path from your bed to the bathroom dark?</td>
<td></td>
</tr>
<tr>
<td>- Put in a nightlight so you can see where you're walking. Some nightlights go on by themselves after dark.</td>
<td></td>
</tr>
</tbody>
</table>

**BATHROOMS**

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the tub or shower floor slippery?</td>
<td></td>
</tr>
<tr>
<td>- Put a non-slip rubber mat or self-stick strips on the floor of the tub or shower.</td>
<td></td>
</tr>
<tr>
<td>Do you need some support when you get in and out of the tub, or up from the toilet?</td>
<td></td>
</tr>
<tr>
<td>- Have grab bars put in next to and inside the tub, and next to the toilet.</td>
<td></td>
</tr>
</tbody>
</table>

**KITCHEN**

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are the things you use often on high shelves?</td>
<td></td>
</tr>
<tr>
<td>- Keep things you use often on the lower shelves (about waist high).</td>
<td></td>
</tr>
<tr>
<td>Is your step stool sturdy?</td>
<td></td>
</tr>
<tr>
<td>- If you must use a step stool, get one with a bar to hold on to. Never use a chair as a step stool.</td>
<td></td>
</tr>
</tbody>
</table>
IV. LESSONS LEARNED IN THE FIRST FEW YEARS OF THE STEADI

A. Primary Care Implementation REQUIRES Teamwork and Follow-up (High Risk = 30 days)

Implementing falls prevention in a clinical setting requires support and effort across multiple stakeholders. Strategies include: creating a sense of urgency, building a guiding coalition, forming a strategic vision and initiative, enlisting volunteers, enabling success by removing barriers, generating short-term wins, sustaining change, and instituting change.

*Gerontologist. 2016;57(4):787-796*

Please refer to the Reference for Lessons Learned from STEADI Implementation. There is a need for a Collaborative Model of Practice to reduce falls in the older adult.
B. Integrating Fall Prevention into Practice

Working as a multidisciplinary team, healthcare providers can help identify and manage patients at risk of falling. You can help reduce falls by screening all older persons once a year for previous falls and/or balance problems. For those who screen positive, perform a fall risk assessment, and help patients understand and act upon the findings using proven prevention strategies.

<table>
<thead>
<tr>
<th>Assessments and/or interventions</th>
<th>Identify who in your practice can do this</th>
<th>What it involves</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screen all older patients for falls</td>
<td>• Have patient complete the Stay Independent brochure, or ask the patient these 3 questions: 1. Have you fallen in the past year? 2. Do you feel unsteady when standing or walking? 3. Do you worry about falling?</td>
<td></td>
</tr>
<tr>
<td>Identify modifiable fall risk factors</td>
<td>• Review the Stay Independent brochure, and take a falls history.</td>
<td></td>
</tr>
<tr>
<td>Evaluate gait, lower body strength, and balance</td>
<td>• Administer one or more gait, strength, and balance tests: - Timed Up and Go Test (Recommended): Observe and record patient’s postural stability, gait, stride length and away. - 30-Second Chair Stand Test (Optional) - 4-Stage Balance Test (Optional)</td>
<td></td>
</tr>
<tr>
<td>Address identified deficits</td>
<td>• As needed, refer to a physical therapist (PT), or recommend a community exercise, or fall prevention program.</td>
<td></td>
</tr>
<tr>
<td>Conduct focused physical exam</td>
<td>• In addition to a customary medical exam: - Assess muscle tone, look for incoordinated, and hypertension (cognitive). - Screen for cognitive impairment and depression. - Examine feet and evaluate footwear. Look for structural abnormalities, deficits in sensation, and proprioception. - If needed, refer to podiatrists or orthotics.</td>
<td></td>
</tr>
<tr>
<td>Address modifiable and/or treatable risk factors</td>
<td>• Check supine and standing blood pressure using 1-page protocol, Measuring Orthostatic Blood Pressure. • Recommend medication changes to reduce hypotension. • Monitor patient as he/she makes recommended changes. • Counsel patient, and give the brochure, Postural Hypotension: What It Is and How to Manage it.</td>
<td></td>
</tr>
<tr>
<td>Assess for and manage postural hypotension</td>
<td>• Stop, switch, or reduce the dose of psychoactive medications when possible. • Monitor patient as he/she makes recommended changes.</td>
<td></td>
</tr>
<tr>
<td>Review and manage medications</td>
<td>• Increase vitamin D</td>
<td></td>
</tr>
<tr>
<td>Increase vitamin D</td>
<td>• Recommend a daily vitamin D supplement.</td>
<td></td>
</tr>
<tr>
<td>Assess visual acuity, and optimize vision</td>
<td>• Administer brief vision test. • Refer to ophthalmologists or optometrists.</td>
<td></td>
</tr>
<tr>
<td>Address home safety, and how to reduce fall hazards</td>
<td>• Counsel patient about reducing fall hazards. Give the CDC brochure, Check for Safety. • Refer to OT to assess safety and the patient’s ability to function in the home.</td>
<td></td>
</tr>
<tr>
<td>Educate about what causes falls, and how to prevent them</td>
<td>• Educate patient about fall prevention strategies. • Give the CDC brochure, What YOU Can Do to Prevent Falls. • Recommend exercise or community fall prevention program.</td>
<td></td>
</tr>
</tbody>
</table>
| Identity community exercise and fall prevention programs | • Have staff contact providers of senior services. • Identify community exercise and fall prevention programs for seniors. • Compile a resource list of available programs.
V. Tools for Fall Prevention


A. Types of Evidenced-Based Interventions for Falls Prevention

1. Single Intervention
   a. Exercise* (15 programs)  *Exercise is the only single intervention shown to reduce rate of falls
      1) Stay Safe, Stay Active (Barnett, 2003)
      2) Otago Exercise Program (Campbell, 1997)
      3) LiFE (Lifestyle Approach to Reducing Falls Through Exercise) (Clemson, 2012)
      4) Erlangen Fitness Intervention (Frieberger et al, 2007)
      5) Senior Fitness and Prevention (SEFIP) (Kemmner et al, 2010)
      6) Adapted Physical Activity Program (Kovacs et al, 2013)
      7) Australian Group Exercise Program (Lord et al, 2003)
      8) Yaktrax® Walker (McKiernan, 2005)
      9) Veterans Affairs Group Exercise Program (Rubenstein et al, 2000)
     10) Falls Management Exercise (FaME) Intervention (Skelton et al, 2005)
     11) Music-Based Multitask Exercise Program (Trombetti et al, 2011)
     12) Multi-target Stepping Program (Yamada et al, 2013)
     13) TAI CHI PROGRAMS (3)
         - Tai Chi: Moving for Better Balance (Li et al, 2005)
         - Central Sydney Tai Chi (Voukelatos et al, 2007)
         - Simplified Tai Chi (Wolf et al, 1996)
         - Tai Chi Prime (TCF-Adapted Program) (Chewning, Hallisy, Yu et al, 2018)
   b. Home modification (4 programs)
      1) The VIP Trial (Campbell et al, 2005)
      2) Home Visits by an Occupational Therapist (Cumming et al, 1999)
      3) Falls-HIT (Home Intervention Team) Program (Nikolaus et al, 2003)
      4) Home Assessment and Modification (Pighills et al, 2011)
   c. Clinical Interventions by other health care providers (10 programs)
      1) Vitamin D + Calcium
      2) ↓ psychotropic medications
      3) Active Vitamin D
      4) VISIBLE (Visual Intervention Strategy Incorporating Bifocal and Long-distance Eyewear) Study
      5) Vitamin D to Prevent Falls after Hip Fracture
      6) Cataract surgery
      7) Pacemaker surgery
      8) Study of 1000 IU Vitamin D Daily for One Year
      9) Quality Use of Medicines Program
     10) Podiatry & Exercise Intervention

2. Multi-faceted (12) – reduce disability and/or falls by improving physical fitness, vision, hearing and home safety; modifying alcohol use and reducing psychoactive medication use; etc.
   a. Stepping On (Clemson, 2004) – has been disseminated in the USA
   b. PROFET (Prevention of Falls in the Elderly Trial) (Close et al, 1999)
c. Accidents & Emergency Fallers (Davison et al, 2005)
d. The NoFalls Intervention (Day et al, 2002)
e. The SAFE Health Behavior and Exercise Intervention (Horbrook et al, 1994)
f. Falls Team Prevention Program (Logan et al, 2010)
g. KAAOS (Falls and Osteoporosis Clinic) (Palvanen et al, 2014)
h. Multifactorial Fall Prevention Program (Salminen et al, 2009)
i. Nijmegen Falls Prevention Program (NFPP) for adults with Osteoporosis (Smulders et al, 2010)
j. The Winchester Falls Project (Spice et al, 2009)
k. Yale FICSIT (Frailty and Injuries: Cooperative Studies of Intervention Techniques) (Tinetti et al, 1994)
l. A Multifactorial Program (Wagner et al, 1994)

B. National Council on Aging Falls Prevention Link – Links to map of programs and partners across USA. Available at: https://www.ncoa.org/healthy-aging/falls-prevention/

C. Dane County Falls Prevention – SAFE Communities. Available at: https://safercommunity.net/falls-prevention/

D. Sherrington’s Best Practice Guidelines for Falls Prevention in Older Adults
1. Provide moderate- to high-level challenge to balance by satisfying three criteria:
   a. Reducing the base of support with progression from double limb to single limb stance
   b. Moving the center of mass over the base of support
   c. Decreasing the need for upper limb support in standing
2. At least 3 hours of exercise per week
3. Ongoing exercise participation is necessary
4. Falls prevention exercise should be targeted at the general community as well as community-dwellers with an increased risk of falls
5. Fall prevention exercise may be undertaken in a group or home-based setting
6. Walking training may be added to balance training but high-risk individuals should not be prescribed brisk walking programs [Walking alone is insufficient for falls prevention]
7. Strength training may be included in addition to balance training
8. Exercise providers should make referrals for other risk factors to be addressed
9. Exercise as a single intervention may prevent falls in people with Parkinson's disease or cognitive impairment. There is currently no evidence that exercise as a single intervention prevents falls in stroke survivors or people recently discharged from hospital. Exercise should be delivered to these groups by providers with particular expertise.

1. The 2008 Physical Activity Guidelines for Americans provides science-based guidance to help Americans aged 6 and older improve their health through appropriate physical activity. Developed with health professionals and policymakers in mind, the Guidelines can help you learn about PA, understand how to reduce risk of activity-related injury and how to ASSIST others in participating in PA.
2. **Children and adolescents (< 18 years) should perform 1 hour or more of PA daily**
   a. Aerobic = 60+ min/day moderate-or vigorous-intensity PA; vigorous-intensity 3x per week
   b. Strength strengthening = 3x per week (BW resistance exercises; calisthenics; tug-of-war)
   c. Bone strengthening = 3x per week (jumping sports, jump rope, gymnastics)

3. **Adults – 18+ years of age**
   a. Aerobic = At least 150-min of moderate-intensity/week OR 75-min of vigorous-intensity/week performed at least 10-minute bouts at a time
   b. Strength training = all major (8-10) major groups 2x/week, 70% Rep-max, 8-12 x 2 sets
   c. **OLDER ADULTS (65+)** = add neuro-muscular exercises for balance (falls prevention) 2x/week

4. **Conceptual Model on Benefits of Physical Activity for Older Adults**


---

### Examples of LiFE Program exercises

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Exercise</th>
<th>Setting</th>
<th>Upgraded exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Balance Training</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduce base of support</td>
<td>Tandem stand, tandem walking</td>
<td>Brushing teeth, ironing, walking down the hallway</td>
<td>Standing on one log</td>
</tr>
<tr>
<td>Move to the limits of sway</td>
<td>Lean to one side as far as possible</td>
<td>Talking on the telephone, holding longer</td>
<td>Reduce base of support</td>
</tr>
</tbody>
</table>

| **Strength Training**                |                                               |                                              |                   |
| Bend your knees | Squatting instead of bending your back         | Putting laundry away in drawers, putting a plate away in the kitchen cupboard | Emptying the dishwasher, putting the dishwashing liquid on a lower shelf |

---

**LiFE (Clemson, 2012)**

*Lifestyle Approach to Reducing Falls through Exercise*
F. Finding the Most Appropriate Exercise Program (EBP Falls Continuum of Care)
VI. Exercise Adherence in Older Adults

A. Healthy People 2020 (2016 data on Exercise Adherence)

<table>
<thead>
<tr>
<th>Population</th>
<th>Percent</th>
<th>Standard Error</th>
<th>Lower CI</th>
<th>Upper CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>All 65+ years</td>
<td>12.7</td>
<td>0.509</td>
<td>11.7</td>
<td>13.7</td>
</tr>
<tr>
<td>65-74 years</td>
<td>15.7</td>
<td>0.712</td>
<td>14.3</td>
<td>17.1</td>
</tr>
<tr>
<td>75-84 years</td>
<td>10.0</td>
<td>0.786</td>
<td>8.6</td>
<td>11.7</td>
</tr>
<tr>
<td>85+ years</td>
<td>3.9</td>
<td>0.610</td>
<td>2.7</td>
<td>5.1</td>
</tr>
</tbody>
</table>


1. In 2016, adults aged 18 years and over living in metropolitan areas had a 55.6% higher rate of meeting the physical activity guidelines than those living in non-metropolitan areas (23.8% versus 15.3%, age adjusted).

2. Adults aged 18 years and over born in the U.S. had a 38.5% higher rate of meeting the physical activity guidelines than adults born outside the U.S. (23.9% versus 17.2%, age adjusted) in 2016.

3. Among adults aged 18 years and over, married persons had the highest rate of meeting the physical activity guidelines (22.2%, age adjusted) among groups by marital status in 2016. Rates for widowed, never married, cohabitating, and divorced persons were 7.5%, 21.0%, 21.4%, and 21.4% (age adjusted), respectively.

4. Adults aged 18–64 years with private health insurance had the highest rate of meeting the physical activity guidelines (28.9%, age adjusted) among insurance groups in 2016.

5. Education Enhances Exercise Adherence
B. Factors Influencing Adherence in Community-Based Exercise Programs (CBEP)


1. Social connectedness – threads of belongingness, demographic homogeneity, socializing/support
2. Perceived health benefits of the exercise activity (strength, balance, weight loss, sleep, etc.)
3. Instructor behaviors – being enthusiastic, motivating, an ability to make exercise fun, enjoying working with older people and treating people with respect, knowledgeable, and skillful (all build confidence of the participants in the instructor)
4. Program design – geographic location, affordability, structure/content (including stakeholder engagement in the original design of the program!)
5. Empowerment & energizing effects – “go for the gusto” attitude, social atmosphere, fun and banter between participants and incentive for leaving the house
6. Individual behavior – those with a past experience with physical activity/exercise, being competitive, having a positive attitude and desire to try something new and continue learning


1. Adherence rates were generally higher in supervised programs.
2. The person-level factors associated with better adherence included: demographic factors (higher socioeconomic status, living alone); health status (fewer health conditions, better self-rated health, taking fewer medications); physical factors (better physical abilities); and psychological factors (better cognitive ability, fewer depressive symptoms).
3. Older people's adherence to exercise programs is most commonly measured with dropout and attendance rates and is associated with a range of program and personal factors


1. The pooled estimate of adherence across the studies was 0.74 (95% CI 0.67 to 0.80).
2. Lower levels of adherence were associated with group exercise interventions that had a duration of 20 weeks or more, two or fewer sessions per week, or a flexibility component.
   a. Longer interventions may bore or overwhelm participants
   b. More frequent contacts per week may enhance socializing
   c. Simplicity of exercise is relevant to exercise adherence
3. The interaction between an increase in duration and frequency of exercise and the reduction of adherence, poses some potential difficulties in the clinical setting.
4. No significant relationship was found between adherence and falls prevention efficacy.


1. Peer leaders can be selected by a variety of ways: similarity to group members, being respected in their communities, previous experience facilitating a group, ability to motivate, good listening and problem-solving skills, and having experience personal in the task at hand.
2. Peer-led classes hold promise for a model of delivery that has the potential for positive health outcomes and long-term sustainability (reduce costs of healthcare resources).
3. What will you do when your retire – a good role for the PT public servant!

**METHODS:** This was a randomized controlled trial with 2-year follow-up. Sedentary women (n = 137) aged ≥70 randomized to the exercise intervention were evaluated in their homes. The exercise prescription included walking 30 minutes per day 5 days per week and completing 11 balance exercises twice per week. The main outcome measure was exercise adherence of the intervention group only.

**RESULTS:** The average number of minutes walked per week was 95.2 (SD 68.8); 17% walked the recommended 150 minutes or greater. The average number of times the balance exercises were done was 1.5 (SD 1.6) per week.

1. Significant predictors of walking adherence included absence of depression, fewer chronic conditions, and use of behavioral processes of change.
2. Significant predictors of balance exercise adherence included intact cognitive function as measured by the MMSE, self-efficacy for exercise, and poor or fair health status.
3. Self-efficacy has been the most consistent construct in predicting exercise adherence or stage progression in the Transtheoretical Model (TTM).
4. Self-efficacy at baseline was significant in predicting balance adherence but not walking adherence.
5. Poorer self-rated health was found to predict adherence to the balance exercises (i.e. fear of falling is a motivator for many people).
6. Participants who were at risk for depression were less likely to adhere to their walking prescription, but no difference was seen with respect to balance exercises. Although depression is a well-known predictor of medication nonadherence, few studies have assessed depression as a predictor of exercise adherence in older adults.
7. Predictors of adherence varied with different forms of exercise. Preference of exercise type may be important to enhance adherence. Preference may be based on enjoyment of a specific form of exercise, as discussed elsewhere, but also on cognitive factors and health status. Individually tailored exercise interventions may be most amenable to sedentary populations of older women.


Abstract: This study examined factors affecting adherence in a *16-week tai chi program* among multi-ethnic middle-aged and older adults living in a low socioeconomic environment in Toronto. Analysis was based on data collected from three tai chi program cohorts that took place from August 2009 to March 2012. The main outcome variable, adherence, was measured by the total number of sessions attended by each of the participants. Total sample size was 210 participants with a mean age of 68.1 ± 8.6. Based on the regression model, greater adherence was significantly associated with older age, greater perceived stress, higher education, and higher mental and physical scores of Short Form-36 components. Conversely, lower adherence was significantly associated with higher baseline weekly physical activity. Our findings suggest that we target less-educated individuals with poor mental and physical health to optimize adherence for future community-based tai chi programs.
VII. **Tai Chi Fundamentals® Adapted for Falls Prevention (Tai Chi Prime)**

A. **What is Tai Chi?**
Tai Chi is a slow, graceful Chinese exercise that enhances relaxation skills, mental focus and physical alignment while building leg strength, endurance and stability. Ideal for increasing stamina, flexibility and coordination, Tai Chi promotes efficiency of movement and economy of effort. Its principles apply to all activity. Tai Chi is a form of Qigong, a Chinese term for energy cultivation. Tai Chi practice incorporates principles for health of body, mind and spirit and harmony in human interactions. [http://www.taichicenterofmadison.com/](http://www.taichicenterofmadison.com/)

B. **Summary of Evidence for Tai Chi**

![Image of Table 2: Tai Chi research: Summary of evidence from 120 systematic reviews and recent clinical trials; there is very little evidence for italicized conditions.](Image)

C. **Components of Tai Chi Fundamentals® Adapted Program**

1. **Tai Chi Mind-Body Principles**
   a. **Active Relaxation – Mindfulness**
      - Centering...Relaxed Alertness...Stillness within movement
   b. **Effective Action – Tai chi is rooted in the feet, powered by the legs, guided by the torso and expressed in the hands**
      - Body Mechanics...Spontaneous Action...Moving Around Obstacles
   c. **Tai Chi Energetics – integrated movement for the core**
      - Heavy and Lights...Flexible and Rooted...String of Pearls
2. **TCF 20 Basic Moves = exercise, or basic movement patterns of TC taught in neurodevelopmental Progression; offer the participant incremental success**
3. TCF Form = the Yang-style choreographed dance of tai chi
4. Guidelines for Tai Chi Practice (7)
   ✓ Mindfulness – strive to focus on the present moment (centering)
   ✓ Postural alignment – maintain the body in an upright posture
   ✓ Breath Awareness – central to all meditate movement therapies (e.g. qigong, tai chi, yoga)
   ✓ Active Relaxation – a state of relaxed stillness while in motion
   ✓ Slow movement – builds strength and endurance
   ✓ Weight Separation – enhances dynamic control of the COM (postural control and balance)
   ✓ Integrated Movement (form the core) – proximal stability for distal mobility

D. Tai Chi Prime – Evidence-Based Model of TCF Adapted Program (papers in progress)

Figure 1 – Hypothesized Model to Reduce Risk of Falls

<table>
<thead>
<tr>
<th>6-Week TCF Course + Home Practice Plan</th>
<th>Reduced Falls Risk Through Improved:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Leg Strength</td>
</tr>
<tr>
<td></td>
<td>Balance</td>
</tr>
<tr>
<td></td>
<td>Mobility/Gait</td>
</tr>
<tr>
<td></td>
<td>Balance Confidence</td>
</tr>
<tr>
<td></td>
<td>Executive Function</td>
</tr>
</tbody>
</table>

TAI CHI DOSE: 6 weeks, 2x/week x 90 minutes = 18 hours of contact time

METHODOLOGY: Each 90-minute class session included 45 minutes of TC training, 15 minutes of “tea time” and discussion of home practice, goal-setting and adherence training, followed by 30 more minutes of TC training.

CURRICULUM: Designed to enhance a home practice habit (adherence), included Book, DVD and exercise practice logs.

PARTICIPANTS: Studied recruited N = 453 and selected n = 206 older community-dwelling (65+ year old) adults with a fear of falling. Area Offices on Aging (AOAs) and Aging and Disability Resource Centers (ADRCs) in Madison, La Crosse, and Milwaukee, Wisconsin served as community partners. A randomized, wait list pre-post test design was used for the study.

RESULTS: A total of 223 participants completed the pretest and 199 completed the post-test. The average number of classes attended was 10.4 out of 12.

Paired t-test analyses found significant increases in participants’ self-efficacy to prevent falls (p ≤.000). Physical measures of leg strength and balance showed significant improvement at p ≤.000 (Timed-Up-and-Go; 30-sec Chair Stand; 4-stage Balance Tandem p ≤.000). The 4-stage Balance Staggered Tandem improved significantly (p ≤.014) as did executive cognitive function measured by the Trail-making B (p ≤.028).
REFERENCES: Background on Falls and STEADI References


REFERENCES: Lessons Learned from STEADI Implementation: The Need for a Collaborative Model of Practice


© Hallisy for WPTA 2018
REFERENCES: Community-Based Exercise Programs and Fall Prevention

REFERENCES: Tai Chi and Fall Prevention
CONCLUSION: In at-risk adults and older adults, tai chi practice may reduce the rate of falls and injury-related falls over the short term (<12 months) by approximately 43% and 50%, respectively. Tai chi practice may not influence time to first fall in these populations. Due to the low quality of evidence, more studies investigating the effects of tai chi on injurious falls and time to first fall are required.
CONCLUSION: Tai Ji Quan: Moving for Better Balance (TJQMBB) is an effective public health program that can be broadly implemented in community senior centers for primary prevention of falls among community-dwelling older adults.
5. Gleeson M, Sherrington C, Keay L. Exercise and physical training improve physical function in older adults with visual impairments but their effect on falls is unclear: a systematic review. J Physiother. 2014 Sep;60(3):130-5
DISCUSSION: This study will determine whether the evidence- Tai Ji Quan: Moving for Better Balance (TJQMBB) fall prevention program can be disseminated through a broad spectrum of community-based senior centers that often cater to low-income, underserved community-dwelling older adults at risk of falling. If shown to be both practically implementable and sustainable, the TJQMBB program will provide an effective, potentially low-cost, easy-to-
implement intervention that could be used by public health practitioners and community-based organizations to address the problem of falls among older adults.


CONCLUSION: Tai chi is recommended as an alternative treatment for improving balance so as to reduce falls.


13. Day L, Finch CF, Harrison JE, Hoareau E, Segal L, Ullah S. *Modelling the population-level impact of tai-chi on falls and fall-related injury among community-dwelling older people*. Inj Prev. 2010 Oct;16(5):321-6. CONCLUSION: Substantial investment in, and high population uptake of, tai-chi would be required to have a large effect on falls and fall-related hospitalisation rates. Although not accounted for in this study, investment in tai-chi is likely to be associated with additional significant health benefits beyond falls prevention. This approach could be applied to other interventions to assist selection of the most cost-effective falls-prevention portfolio for Australia and other countries.


15. Rogers CE, Larkey LK, Keller C. *A review of clinical trials of tai chi and qigong in older adults*, West J Nurs Res. 2009 Mar;31(2):245-79. ABSTRACT: Initiation and maintenance of physical activity (PA) in older adults is of increasing concern as the benefits of PA have been shown to improve physical functioning, mood, weight, and cardiovascular risk factors. Meditative movement forms of PA, such as tai chi and qigong (TC & QG), are holistic in nature and have increased in popularity over the past few decades. Several randomized controlled trials have evaluated TC & QG interventions from multiple perspectives, specifically targeting older adults. The purpose of this report is to synthesize intervention studies targeting TC & QG and identify the physical and psychological health outcomes shown to be associated with TC & QG in community-dwelling adults older than 55. Based on specific inclusion criteria, 36 research reports with a total of 3,799 participants were included in this review. Five categories of study outcomes were identified, including falls and balance, physical function, cardiovascular disease, and psychological and additional disease-specific responses. Significant improvement in clusters of similar outcomes indicated interventions utilizing TC & QG may help older adults improve physical function and reduce blood pressure, fall risk, and depression and anxiety. Missing from the reviewed reports is a discussion of how spiritual exploration with meditative forms of PA, an important component of these movement activities, may contribute to successful aging.

REFERENCES: General Health Benefits of Tai Chi and Tai Chi Fundamentals – Adapted Program


6. Tai Chi Heath with Tricia Yu. www.taichihealth.com

© Hallisy for WPTA 2018
SUMMARY

Ballroom Basics for Balance™ (BB4B) is a fun way to improve balance and prevent falls through the basics of dance. It encourages:

- Health and safe mobility.
- Participation in varied social activities.
- Promoting and empowering discussion among participants, caregivers, their social network, and health care network about balance concerns and falls prevention strategies.

The BB4B class includes **pre- and post-testing** of:

- Static balance (4-Stage Balance, modified).
- Dynamic balance (TUG standard, manual and cognitive).
- Cognitive health (Trail Making Test).
- Quality of Life.
  - WHOQOL – BREF (Initially)
  - SF – 36 (Currently)

Statistical analysis currently shows improvements in all measurements.

- 9 sessions 2014-2017 (average session length 9 weeks)
- Average age of participants 73 yrs (36-91 yrs) n=101 participants
- 68% females
  - Static Balance
    - SLS: 26 of 51 (51%) improved, ave change 1.79 sec.
  - Dynamic Balance
    - TUG standard: 40 of 56 (71%) improved, ave change -1 sec
    - TUG cognitive: 25 of 34 (74%) improved, ave change -1 sec.
    - TUG manual: 24 of 33 (64%) improved, ave change -0.9 sec.
  - Trail Making Test
    - A: 38 of 46 (83%) improved, ave change -13.95 sec.
    - B: 30 of 47 (64%) improved, ave change -1.87 sec.
  - Quality of Life Average Post Test Scores
    - Overall QOL 4.15 out of 5, declined 0.46 (n=35)
    - Satisfaction with health 3.75 out of 5, declined 0.16 (n=35)
    - Physical Domain 27.57 out of 35, improved 0.75 (n=23)
    - Psychological Domain 22.87 out of 30, improved 0.36 (n=24)
    - Social Domain 10.9 out of 15, improved 0.44 (n=20)
    - Environmental Domain 33.7 out of 40, improved 1.51 (n=23)
Community-Based Exercise Programs for Balance and Falls Prevention, WPTA, Spring 2018

Lead Instructors are encouraged to target, tailor and adapt curriculum to their population.

Accessibility is core to the mission of this effort, including:
- Race and ethnicity.
- Socioeconomic status.
- Gender.

Collaboration is important to the spirit of this course.
- Inter-professional
- Inter-generational
- Inter-disciplinary

The foundation of curriculum is based in multi-factorial, evidence-based approaches, using “Key Elements” to enhance balance and prevent falls.

Three realms of change which can be addressed in reducing falls risk:
- Behavior
- Environment
- Physical

In the Physical realm, the four systems crucial to balance:
- Vision
- Vestibular
- Proprioception
- CNS

Instruction is movement-based with emphasis on:
- Moving differently.
- Incorporating balance practice into daily activity.
- PRACTICE and REPETITION: Average of two hours of challenging balance practice per week (for six months and ongoing) to show effects upon falls prevention/balance enhancement. (>50 hrs/6 mo. = 115 minutes per week).
- Having fun rather than dancing “right”.
- Awareness and confidence.

Dance naturally incorporates and integrates the Key Elements.

Fear of falling is a greater predictor of subsequent falls than physical balance impairments.
Age-related changes in cognition
- Although everyone is different, studies have shown trends in cognitive decline as we age.
- Short-term memory changes more than long term memory.
- Working memory changes more than primary memory
  - Working memory is figuring things out.
  - Primary memory is recall of well-learned things/tasks/procedures.

The Hippocampus shrinks as we age.
- Memory
- Attention
- Working memory
- Spatial learning
- Navigating spaces

Changes in the hippocampus
- Serotonin and dopamine are released during exercise, helping new cells grow in the hippocampus. This may help decrease cognitive decline.
- Walking 40 min., 3x/wk increases the size of the hippocampus and improves memory.
- Stair climbing can reduce brain age. Two flights a day = the brain health of someone one year younger.

Can exercise protect your brain?
Research shows that participation in regular exercise can be beneficial to brain health.

Types of exercise
- Strengthening
- Balance
- Flexibility
- Endurance

Benefits of exercise
- Cardiovascular improvements
- Musculoskeletal improvements
- Falls prevention
- Cognitive improvements

How much exercise?
- Currently NOT defined for brain health but there are suggested guidelines.
- 150 minutes per week of moderate intensity activity for overall health
  - 75 min per week of vigorous intensity activity (CDC, NIH)
- 300 min/wk provides additional cardiovascular prevention – and possibly additional cognitive benefits?
Community-Based Exercise Programs for Balance and Falls Prevention, WPTA, Spring 2018

See also:
- Key Elements and Concepts to Highlight
- Statistics on Seniors and Falls
- Criteria For Fall Prevention Exercise Classes
- How Do You Know If An Exercise Class Is Good At Preventing Falls?
- Test Results Take Home Sheet

RESOURCES

- Ballroom Basics for Balance™ - www.ballroombasicsforbalance.org
  - Susan Frikken, DPT, LMT – susan@yaharatherapy.com
  - Darcie Olson, PhD, OTR – dlolson@madisoncollege.edu

- Mark Morris Dance – Dance for PD® - https://danceforparkinsons.org/about-the-program

- Dystonia TED Talk - https://www.youtube.com/watch?v=DwkHK3rfKO0

- https://stayingsharp.aarp.org/
REFERENCES


Chen HY, Tang PF. Factors contributing to single- and dual-task timed “up & go” test performance in middle-aged and older adults who are active and dwell in the community. Phys Ther. 2016 Mar; 96(3): 284–292.


Community-Based Exercise Programs for Balance and Falls Prevention, WPTA, Spring 2018


WHAT CAN ONE CHANGE to ENHANCE BALANCE and PREVENT FALLS?

(P) Physical being (see below)
(B) Behaviors
(E) Environment

(P) BROADLY:
- Proprioception
- Vestibular
- Vision
- Central Nervous System (brain – cognitive and processing, spinal cord reflexes)

INCORPORATE and CONSIDER and PROGRAM and PLAN – Broadly

- Learning styles
- Challenge Progression
- Strength
- Balance specific movements
- Neuromuscular re-education
- Coordination and Patterning
- Cognition
- Memory
- Repetition
- Variety
Key Elements and Concepts to Highlight - (What Do These Have to Do With Balance?)

**INCORPORATE and CONSIDER and PROGRAM and PLAN — *Specifically***

(P) Memory

(P) Learning

(P) Cognition

(P) Attention

(B) (P) Dual/multiple tasks (cognitive; manual: learning, enhancing attention)

(P) Vestibular system (in part, sensory perception)

(B) (P) Rhythm and pattern (memory)

(B) (P) Vocalizing/music (memory, multi-task)

(B) (P) Change in speed (muscle fiber type, attention)

(B) (P) Single leg balance/stance

(B) (P) Perturbations (internal, external: arm movements, partner, other dancers)

(B) (P) Narrow vs wide base of support (BOS; static and dynamic)

(P) Center of Mass/Gravity (COM/COG)

(B) (P) Challenging limits of stability

(B) (P) “Grounded-ness” (stability — solid base, enhancing ability to sense & react, contact with ground)

(B) (P) Arm position - varied to help stabilize or challenge balance; progression:
- wide to narrow to moving,
- from symmetrical to asymmetrical
- slow to sudden/quick
Ballroom Basics for Balance™

[See also: “Balance and Posture Elaborated”]

Key Elements and Concepts to Highlight - (What Do These Have to Do With Balance?)

(B) (P) Heel-toe and toe-heel (roll) gait (controlled)
   - Foot clearance to avoid trip/fall
   - If cannot “glide” with control, lift foot

(B) (P) Walking in various directions (forward, backward, lateral, diagonals)

(B) (P) Lead (Left) and Follow (Right)

(B) (P) Turns

(B) Slow vs. quick: Which is more difficult? Which is important to balance practice? [Trick question – both, but slow is very important to practice!]

(P) Ankle/hip/step strategies (reaction)

(P) Reactive and Anticipatory Reactions (postural control element)

(P) Trendelenburg gait

(P) Proprioception (“body sense”; sensory perception)

(P) Flexibility vs. stiffness (neck/spine in turning, ankle/knee/hip role in reaction strategies)

(P) Strength (muscle fiber type, fatigue)

(E) **Environment** (floor condition, practice choices)

(B) (E) Assistance (input from hands, leg support on self, device, partner)

(B) (E) Footwear (degree of friction, flexibility, comfort, security)

(E) (P) Sensory interference/integration:
   - Lighting, sound, background, motion sensitivity
   - Neuropathy, neuromuscular/coordination/movement disorders or conditions

(E) (P) External versus internal variables (Health, Mood, environment, strength, etc., etc., etc.)

(B) (P) (E) Role of Vision (sensory perception; lighting)

(B) (P) Spotting (Turns)
Key Elements and Concepts to Highlight - (What Do These Have to Do With Balance?)

(P) Posture (endurance muscles)
  (B) (P) Face forward to assist with scanning
  (B) (P) Spine lengthening to assist with practicing stability
    ▪ Combination with “grounded-ness” for overall control
  (B) (P) Moving from core versus distal movements (effect on posture, balance)
  (B) (P) “Where the head goes, the body follows.”

(P) Pain

(B) (P) Breath

(B) PRACTICE – “Where does practice fit into your life?”

- Current balance research:
  ▪ 50 hours/6 months required (about 2 hours/week) to improve
- Habits: Exercise and other health behaviors
  ▪ Fun
  ▪ Repetition
  ▪ Cues and other support emphasis
- during commercials
- with music
- while vocalizing / verbalizing
- metronome
- tapping/vocalizing rhythm before beginning to move
(B) (P) (E) **SAFETY**

(B) **Safe mobility** (includes many strategies)
- Assistive Devices
- Assisted by another person
- Assisted by stable objects (sturdy furniture, wall)

(B) **Safe practice at home**
- Chair in front, standing in corner
- Countertop or sturdy furniture
- Chair behind (non-moving or tipping)

(P) **Attend to symptoms**
- If dizzy, pain, SOB, palpitations = STOP (and let someone know)

And onward...
Statistics on Seniors and Falls

United States Statistics on Falls

- (2014) ONE out of FOUR people 65 YEARS and older FALL each year.
- Falling once DOUBLES your chances of FALLING AGAIN.
- (2018) Falls are the LEADING cause of non-fatal INJURY and DEATH in those 65 years and older, at a cost of $50 BILLION annually.
- (2014) Falls are the MOST COMMON cause of traumatic BRAIN INJURY in all ages.
- 20-30% of all FALLS result in MODERATE to SEVERE INJURY. (lacerations, fractures, etc.)

Statistics Specific to Wisconsin

- (2008) About HALF of all SENIORS who fall do NOT resume INDEPENDENT living.
- (2013) Wisconsin has TWICE the NATIONAL RATE of DEATHS due to falls. We are often ranked FIRST of all 50 states.
- (2015) We spend $771 MILLION in hospitalization costs ANNUALLY
- In 2003, of those admitted to NURSING HOMES, 40% had FALLEN in the 30 DAYS PRIOR to admission.

Prevention

RESEARCH shows that focusing effort on these three areas helps PREVENT FALLS:

1. EXERCISE and balance practice, and safe MOBILITY
2. HOME safety
3. MEDICATION review and MANAGEMENT
4. EVIDENCE-BASED self-management PROGRAMS such as Stepping On*, Otago, Ta’i Chi and No Falls are proven to prevent or reduce falls.

*Stepping On falls prevention program reduces fall risk by 50%. (Journal of Safety Research 02/2015)
What Conditions Make You More Likely to Fall?

Research has identified many conditions that contribute to falling. These are called risk factors. Many risk factors can be changed or modified to help prevent falls. They include:

- Lower body weakness
- Vitamin D deficiency (that is, not enough vitamin D in your system)
- Difficulties with walking and balance
- Use of medicines, such as tranquilizers, sedatives, or antidepressants. Even some over-the-counter medicines can affect balance and how steady you are on your feet.
- Vision problems
- Foot pain or poor footwear
- Home hazards or dangers such as
  - broken or uneven steps, and
  - throw rugs or clutter that can be tripped over.

Most falls are caused by a combination of risk factors. The more risk factors a person has, the greater their chances of falling.
Criteria Check List for Fall Prevention Community Exercise Classes

A review of evidence-based fall prevention exercise strategies shows the following criteria are necessary to be effective in preventing falls in community-dwelling older adults:

- **Multiple-component exercise**: Exercise interventions which incorporate many elements including strength, balance, power, and postural control. Class should include a standardized routine including warm-up, balance, and strength exercises with progression of difficulty of the exercises.

- **Balance** should be the most important mode of exercise. Balance exercise should include static, dynamic, dynamic gait training, dual-task training. Repetition and progression to more challenging exercises over the course of the intervention is vital. Support can be progressed from two-handed support, to one-hand support, to no hands.
  - **Static balance activities**: Exercises that challenge the center of mass/gravity (reaching and weight shifting) while feet are fixed, progressing from wider base of support to narrower base of support to single leg stance. Sensory challenges can be added including standing on unstable surfaces or standing with eyes closed.
  - **Dynamic balance activities**: Exercises that challenge to center of mass/gravity while the feet are moving. These activities may include reaching, stepping, stair-stepping, and lateral movements. Many Tai Chi movements and dance incorporate dynamic balance activities.
  - **Dynamic gait training**: Activities using dance steps, turns, figure-8’s, directional changes, changes in speed, obstacle courses, and walking in various directions (forward, backward, sideways and diagonals).
  - **Dual-task training**: Activities which involve a primary task while performing a secondary task. This requires the older adult to focus attention on two things at once while maintaining balance and performance. Examples include walking and counting or walking while carrying a full cup of liquid. Tai Chi and dance often contain dual-task training where balance must be maintained while remembering movement patterns.

- **Strength** is an important exercise mode for fall prevention but is not effective for fall prevention without balance exercise component. Important aspects:
  - Lower extremity and postural muscle with progression as able
  - Moderate- to high-intensity
  - Minimal upper extremity support

- **Dosage**: Research shows that to be effective to improve balance, exercise dose is 50 hours of moderate to high balance challenge over a 6-month time period and ongoing. This can be broken down to one-hour classes two times per week or through home exercise to reach two hours per week of exercise.

Walking should not be major part of a fall prevention class. Walking is beneficial for its cardiovascular effects but does not reduce fall risk.
Criteria Check List for Fall Prevention Community Exercise Classes

References


How do you know if an exercise class is good for preventing falls?

Research shows to look for these

**Activity variety**: The best classes include both strength exercises and balance challenges. Class should include a warm-up and activities that become more challenging over time.

**Balance** should be the most important kind of activity. Balance activities should challenge you when you are moving, when multi-tasking and when standing still. Examples include balancing with feet together, heel to toe, one legged standing, reaching, turning and shifting weight.

**Everyday strength**- such as carrying groceries or getting up from a chair or toilet -is important for safe movement. BUT improving strength alone is not enough to prevent a fall!

What are activities I could do that have both strength and balance? Activities that have balance and strength include Tai Chi, dance, ping pong, tennis, pickle ball and some fitness classes. Science shows that Tai Chi has been proven to decrease your fall risk! Some places to find classes like these: Senior centers, community centers, YMCA’s, places of worship, and recreation departments such as Madison School and Community Recreation (MSCR).
How do you know if an exercise class is good for preventing falls?

Are there types of activities and exercises that do NOT make a difference in preventing falls?
- Walking and pool exercises are good for you, but they have NOT been shown to decrease falls risk. So, walking and pool exercise should NOT be the biggest part of fall prevention class.

How much activity do I need to decrease my risk of falling?
- Studies show that you must exercise about 2 hours each week for at least 6 months to decrease your risk of falling. It is OK to mix it up and break it up! For example, you could do 1 hour 2 times each week, or 30 minutes 4 times each week. You could go to a class, exercise at home, or do a little of each to add up to 2 hours.

Safe Communities of Madison-Dane County’s List of Current Falls Prevention Classes
http://www.safercommunity.net/falls_prevention_classes.php

Word Search Game! Find these words above. Circle all that you see!

activity  Tai Chi  pickle ball  strength  walking
multi-tasking  everyday  carrying  toilet  chair
risk  senior centers  difficult  falls  NOT
challenging  decrease  hour(s)  2  home  30
pool  science  YMCA  6
NAME __________________________

<table>
<thead>
<tr>
<th>BALANCE TEST SCORES</th>
<th>PRE-test date:</th>
<th>POST-test date:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Timed Up and Go (TUG)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walk, Turn, Sit to/from Stand</td>
<td>Notes:</td>
<td>Notes:</td>
</tr>
<tr>
<td>- TUG Standard</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*Record after one trial.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unstable on turning?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walking aid used?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of aid: _______________</td>
<td></td>
<td></td>
</tr>
<tr>
<td>________ seconds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>________ Seconds</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TUG Cognitive (while counting backward by 3’s from 75.)</strong></td>
<td>________ Seconds</td>
<td>________ Seconds</td>
</tr>
<tr>
<td><strong>TUG Manual (while carrying full cup of water)</strong></td>
<td>________ Seconds</td>
<td>________ Seconds</td>
</tr>
<tr>
<td><strong>4-Stage Balance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>* = optional tests</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*Feet together: __________ sec</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*Partial heel to toe: __________ sec</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heel to toe: __________ sec</td>
<td></td>
<td></td>
</tr>
<tr>
<td>On one leg: __________ sec</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notes:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Trail Making Test</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognitive Challenge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part A: __________ seconds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Part B: __________ seconds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notes:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Goal scores**

- **Timed Up and Go (TUG):** An older adult who takes more than 13.5 seconds to stand up from a chair, walk 3 meters with their walking device, turn around, walk back and sit down is at high risk for falling. (TUG Cognitive: 15 seconds TUG Manual: 14.5 seconds)
- **4-Stage Balance Test:** An older adult who cannot hold the heel toe position for at least 10 seconds is at increased risk of falling.
- **Trail Making Test Part A:** 78 seconds or less. Part B: 273 seconds or less. The quicker you can successfully complete this task, the more able you are to be flexible in your mental processing.
What You Can Do to Prevent Falls and Improve Your Balance

- Research has identified many risk factors that contribute to falling.
- Most falls are caused by the interaction of multiple risk factors.
- The more risk factors a person has, the greater their chance of falling.
- Some risk factors are modifiable. Talk to your doctor to help you to reduce or minimize your risk factors for falls.

To prevent falls, you and your healthcare providers should focus FIRST on these modifiable risk factors:

- Lower body weakness
- Difficulty with walking or balance
- Use of medications that are linked with falls
- Postural dizziness
- Poor vision
- Problems with feet and/or shoes
- Home hazards

What resources are there to help me?

- Ask your doctor for a referral to physical therapy (PT) to help balance, walking and strength. PT is covered by Medicare.
- Schedule an appointment for a falls risk analysis through one of the UW Geriatrics Falls Clinics; they accept self-referrals.
  - 2 Locations: East Clinic 265-1210; University Station 263-7740
- Participate in falls prevention classes in your community. Find out more at www.safercommunity.net or 608-441-3060
- Safe At Home – home safety assessment through Home Health United; free of charge; Call 608-223-7970 for more information