Test Selection

- What do you want to test?
- Aerobic Capacity
- Strength
- ROM
- Balance
- Functional ability
- Fall Risk

Other considerations for test selection

- Time / equipment / space
- Physical ability of patient
- Cognitive ability of the patient
- Clinician knowledge
  - Is the test valid and reliable?
  - Is the test predictive?
Functional Assessments

- 2 minute step test
- 6 minute walk test
- 30 second chair rise test
- 5 Repetition chair rise test
- Arm Curl Test
- Four Square Step Test (FSST)
- One-Leg Stance Test (OLST)

Functional Assessments

- Functional Reach
- Berg Balance Test
- Fullerton Advanced Balance Scale
- Four Stage Balance Test
- Sit and Reach Test
- Back Scratch Test
- Timed Up and Go Test (TUG)

Functional Assessments

- Gait Speed – Preferred & Maximal
- Dynamic Gait Index (DGI)
- ABC Scale
- Falls Efficacy Scale
2 Minute Step Test

- **Purpose** - To measure aerobic endurance
- **Measure**
  - Resting HR, BP and RR pre and post test
  - (can add O2 sat)
- **Equipment Needed**: stop watch, measuring tape, equip for vitals
- **Have person wear comfortable clothes & shoes**

2 Minute Step Test

- **Have subject raise each knee to a point midway between the patella and iliac crest.**
- **Instruct them to give their best effort and do as many as they can (without overexertion)**
- **Measure HR, BP, and RR immediately upon completion of test.**
- **Score # of times the R knee reaches the required height.**

**Adaptation**

- **Hold on to table, wall or chair**
- **March at a shorter height (Measure)**
- **Allow a moving march**
Normal Range Scores
2 minute step test
Rikli RE & Jones CJ

<table>
<thead>
<tr>
<th>Age</th>
<th>60-64</th>
<th>65-69</th>
<th>70-74</th>
<th>75-79</th>
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<th>90-94</th>
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<td>80-110</td>
<td>73-109</td>
<td>71-103</td>
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<td>68-101</td>
<td>68-100</td>
<td>60-90</td>
<td>55-85</td>
<td>44-72</td>
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</table>

6 Minute Walk Test

- Purpose - To assess aerobic endurance
- Equipment Needed: stop watch, space for testing, cones, lap counter, Chair
- 30 meter corridor
- Measure HR, BP and O2 sat at rest and after test.
- Person may use assistive device.

Instructions

- “The object of this test is to walk as far as possible for 6 minutes. You will walk back and forth in this hallway. Six minutes is a long time to walk so you will be exerting yourself. You will probably get out of breath or become exhausted. You are permitted to slow down, to stop and to rest a necessary. You may lean against the wall while resting, but resume walking as soon as you are able. You will be walking back and forth around the cones. You should pivot briskly around the cones and continue back the other way without hesitation. Now I’m going to show you. Please watch the way I turn without hesitation.”
6 MWT continued

- Demonstrate walking and turning
- “Are you ready to do that?”
- I am going to use this counter to keep track of the number of laps you complete. I will click it each time you turn around at this starting line. Remember that the object is to walk as far as possible for 6 minutes, but don’t run or jog.”
- Start now, or whenever you are ready.

https://www.thoracic.org/statements/resources/pfet/sixminute.pdf

6 MWT Normative Data

<table>
<thead>
<tr>
<th>Mean Distance</th>
<th>MALE</th>
<th>FEMALE</th>
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<tr>
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<td></td>
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<tr>
<td>60-69</td>
<td>372 m</td>
<td>538 m</td>
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<tr>
<td>70-79</td>
<td>327 m</td>
<td>471 m</td>
</tr>
<tr>
<td>80-89</td>
<td>417 m</td>
<td>372 m</td>
</tr>
</tbody>
</table>

Steffen et al, 2002 n = 96

Chair Rise Tests

- Purpose - To measure LE strength in a functional task.
Chair Rise Tests

- 30-second
- 5 Repetition
- Equipment needed: chair, stop watch
- Detects normal age-related decline
- Discriminate between individuals

30 sec chair rise test

- Use 17” chair against wall. Record # of completed sit-stands in 30 seconds.
- Instruct patient to fully extend hips and knees at end of movement.
- Arms crossed in front of body (for norms)
- Seated in middle of chair to begin
- If > ½ way up at end of 30 sec count as a full stand

Adaptations

- Use chair with arms
- Assistive device use
- Document height of chair
Normal Range Scores for 30-sec chair rise
Rikli RE & Jones

<table>
<thead>
<tr>
<th>Age</th>
<th>60-64</th>
<th>65-69</th>
<th>70-74</th>
<th>75-79</th>
<th>80-84</th>
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<td>9-14</td>
<td>8-13</td>
<td>4-11</td>
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</table>

30 Sec Chair Rise - Fall Risk

- CDC.gov - STEADI program - Fall Risk if below average

<table>
<thead>
<tr>
<th>Age</th>
<th>Men</th>
<th>Women</th>
</tr>
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<tbody>
<tr>
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<td>&lt; 19</td>
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<td>&lt; 9</td>
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<td>85-89</td>
<td>&lt; 8</td>
<td>&lt; 8</td>
</tr>
<tr>
<td>90+</td>
<td>&lt; 7</td>
<td>&lt; 8</td>
</tr>
</tbody>
</table>

5 Repetition Chair Rise Test

- Have patient complete 5 chair rises and document time to complete. 16” chair.
- “Stand up and sit down as quickly as possible 5 times keeping your arms folded across your chest.”
- Document height of chair and if arms used.
Timed sit-stand (5 rep) Lasardi et al

- Aim of study was to determine reference values (n = 76)
  - 60-69: 13s
  - 70-79: 12.3s
  - 80-89: 17.1s
  - 90-101: 22.5s

5 Repetition Chair Rise Test

- Bohannon, 2006
- Individuals with scores exceeding the following were considered to have worse than average performance.
  - 60-69 yrs: 11.4 sec
  - 70-79 yrs: 12.6 sec
  - 80-89 yrs: 14.8 sec

Arm Curl Test

- Purpose: To test UE strength required for household and other activities involving lifting and carrying.
- Equipment Needed: Use a 5# DB for women, 8# for men, stop watch.
- Have patient perform a seated bicep curl with dominant arm using good form with back against chair
- Determine the # that can be completed in 30 seconds.
Adaptations

- Use wrist weight
- Allow person to do in standing position
- Allow person to hold weight in 1 position (palm up entire motion)

Norms for Arm Curl test
Rikli RE & Jones CJ Senior Fitness Test Manual

<table>
<thead>
<tr>
<th>Age</th>
<th>60-64</th>
<th>65-69</th>
<th>70-74</th>
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<td>12-17</td>
<td>11-17</td>
<td>10-16</td>
<td>10-15</td>
<td>8-13</td>
</tr>
</tbody>
</table>

Four Square Step Test (FSST)

- **Purpose** - A clinical test of stepping and change of direction to identify multiple falling older adults.
- **Equipment needed:** stop watch, gait belt, 4 canes or equivalent.
  - PVC ½” or 1” diameter. 30-36” long pieces with 4 way connector
FSST

- Form a square on floor with 4 canes.
- Subject stands in square 1 facing square 2.
- Subject moves in sequence: 1 to 2, 2 to 3, 3 to 4, 4 to 1, 1 to 4, 4 to 3, 3 to 2, and 2 to 1.
- Instruct subject to complete sequence as quickly as possible without touching canes.

FSST

- Can use assistive device
- Demonstrate Test
- Allow practice trial
- 2 timed trials and the best is the score
- Both feet must make contact in each square
- Face forward if possible
- Repeat trial if individual does not complete sequence, loses balance, or makes contact with canes.
- Timing starts with first foot contact in square 2 and stops when last foot touches square 1.

FSST

- Observe AND DOCUMENT quality of performance
  - Hesitancy
  - Fear
  - Visual deficits
  - Direction changes
  - Balance difficulty
  - Clearing objects
  - Remembering sequence
FSST Norms

- “The FSST is a reliable and valid tool for measuring the ability to perform multidirectional movements in people with balance deficits secondary to vestibular disorders.
- A cutoff score of greater than 12 sec was found.
- Geri Notes 2008 < 15 sec is normal (Dite & Temple 2002).

One-Leg Stance Test

- Have patient stand on one leg with arms folded across chest.
- Opposite knee is bent and leg forward
- Timing starts when the foot is raised off the ground.
- Timing stops with the following: displacement of WB foot, suspended foot touches ground, or use of suspended limb to support WB limb.
- Stop test at 30 sec. Repeat other side
- Practice and 2 trials - take best score
- Equipment Needed: stop watch, gait belt.

One-Leg Stance Test

- < 5 sec = increased risk of falls.
- 20 sec is Normal.
Unipedal Stance Test
Springer et al 2007 (n = 549)

<table>
<thead>
<tr>
<th>Age</th>
<th>Eyes open Mean 3 trials</th>
<th>Eyes closed Mean 3 trials</th>
</tr>
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<tbody>
<tr>
<td>18-39</td>
<td>43.3</td>
<td>9.4</td>
</tr>
<tr>
<td>40-49</td>
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<tr>
<td>70-79</td>
<td>15.0</td>
<td>2.0</td>
</tr>
<tr>
<td>80-99</td>
<td>6.2</td>
<td>1.3</td>
</tr>
</tbody>
</table>

Functional Reach

- **Purpose** - To test balance - limits of stability

- **Equipment needed**: Yard stick or ruler mounted on wall at shoulder height.

- **Instructions**: "reach as far forward as you can without taking a step, keeping your feet flat on the floor, and keeping your hand at the level of the ruler."

- Practice then 2 trials. Take best or average.
**Functional Reach**

- Scores less than 6 or 7 inches indicate limited functional balance.
- Most healthy individuals with adequate balance can reach 10" or more.
- Item # 8 on Berg - but different instructions

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**BERG Balance Test**

- Purpose: To evaluate static & dynamic balance & fall risk.
- 14 item test with each item scoring from 0-4. Max score of 56.
- Time for test: 15-20 min.
- Equipment Needed: Stop watch, ruler, footstool or step, 2 standard chairs (with and without armrests), shoe or slipper.

---

**BERG**

- Strengths
  - Identifies impairments that can guide treatment interventions
  - Strong predictor of fall risk
  - Challenging for healthy community-dwelling seniors
  - Can predict need for assistive device
- Drawback: Does not include gait items
- See handout for scoring
BERG

- Thorbahn & Newton (1996): Found a cutoff of 45/56 was able to discriminate fallers vs. non-fallers
- Shumway-Cook (1997): Reported a score of 40 or less had a high probability of falls (refer to PT).

MDC Berg

- A change in 4 points is needed to be 95% confident that a true change has occurred if a patient scores 45-56 initially
- 5 points if score is 35-44
- 7 points if score is 25-34
- 5 points if score is 0-24
  - Donoghue 2009.

Berg

- A study of the BBS completed in Finland indicated that a change of 8 points is required to reveal a change in function between 2 assessments among older people who are dependent in ADL and living in residential facilities.
Berg Goals

- Increase Berg score to greater than 45 to demonstrate dynamic ability needed to walk without an assistive device.
- Improve dynamic balance as evidenced by Berg score of 42 or greater for improved safety with self care tasks in bathroom.

Sit and Reach Test

- Purpose: To measure flexibility
- Equipment: 17” chair & ruler
- Place chair against wall and have person sit on front edge of chair
- 1 leg bent with foot flat on floor
- Other leg extended toes up with heel on floor.

Sit & Reach

- 1 hand on top of the other middle fingers even
- Have person reach forward towards toes keeping knee in full extension
- Determine preferred leg for scoring
- 2 practice trials then 2 measured trials and take best score. Measure from middle finger to mid part of top of shoe
Adaptation

- Do not do test on people with osteoporosis
- If unable to fully extend knee measure amount of knee flexion present
- Can use a wheelchair for test

Back Scratch Test

- Purpose: To measure UB flexibility
- Equipment: Ruler
- Demonstrate test, practice to determine preferred side. 2 trials - take best score
- Measure tip of middle fingers. If they do not touch score is a - #. If they overlap score is a + #
- Do not do if neck & shoulder problems

TUG

- Standard chair placed against wall.
- Measure 3 m (9.84 ft) from legs of chair and place cone or tape at mark.
- Subject may use assistive device.
- Subject starts seated with back against chair.
- Podsiadlo & Richardson 1991
Timed up and Go Test (TUG)

- Purpose: To measure ability to transfer from a chair and walk 6 m.
- Equipment Needed: Stop watch, measuring tape, cone or tape to mark floor, space for test, 18" Chair (arm height 65 cm).

TUG

- Instructions to subject: “On go, stand and walk 3 m, turn and return to chair and sit with your back against the chair. Walk as quickly and as safely as possible.”
- Allow a practice trial.
- Time 2 trials. Take best score.

TUG

- Bischoff (2003): Community-dwelling older adults should be able to complete TUG in 12 sec or less. Strong predictor of mobility status.
  - 92% of community-dwelling women could complete test in < 12 sec.
  - Only 9% of institutionalized women had times < 12 sec.
The TUG significantly correlated with knee extensor strength as measured with a dynamometer.

- Schaubert & Bohannon
  - J Strength & Conditioning Research 2005
  - The TUG significantly correlated with knee extensor strength as measured with a dynamometer.

TUG
- Bohannon - 21 studies (meta-analysis)
  - 60-69 7.1-9s
  - 70-79 8.2-10.2s
  - 80-89 10-12.7s

- Pondal & DelSer
  - n = 308 subjects without gait dist
  - 71-75 9.5±2.5s
  - 76-80 9.9±3s
  - 81-85 11.2±3.6s
  - 86-99 12±3.8s

TUG
- Lasardi et al
  - 60-69 7.9s
  - 70-79 7.7s
  - 80-89 13.6s
  - 90-101 17.7s
Shumway - Cook 2000

- PT Journal
- Found a cut off value of 14 sec for the TUG. Older adults who took 13.5 sec or longer to perform the TUG were classified as fallers.

TUG Variations

- TUG Cognitive - complete task while counting backwards from a randomly selected number between 20 and 100.

TUG goals

- Improve TUG to less than 14 sec to demonstrate decreased risk of falls.
- Decrease TUG time from 60 sec to less than 40 sec to improve efficiency getting to bathroom to decrease episodes of incontinence.
4 Stage Balance Test

- Part of CDC Fall Risk Assessment
- 4 progressively more challenging positions
- Patients are not able to use assistive device

Gait Speed - Preferred & Maximal

- Measure a standard distance (eg. 4 meters) and place a marker at the start and finish.
- Start the patient 2 m in front of the marker and have them walk 2 m past the mark.
- Begin stop watch when the person’s 1st foot crosses the start line and end when the 1st foot crosses the finish line.

Gait Speed

- Preferred Speed
  - Ask the patient to walk at their preferred walking speed.

- Maximal Speed
  - Ask the patient to walk as quickly as possible, but safely.

- Practice trial then test twice and score best performance
Gait Speed

- Average adult speed = 1.2m/s
- NH residents = <.5m/s
- MDC Gait speed: .05 - .1 m/s

- Fritz S & Lusardi M. 2009

Walkie Talkie Test

- Purpose: To evaluate a person’s ability to divide attention between 2 tasks (walking and talking)
- 9 meter space to walk
- Tester begins a conversation with the individual being tested. Stopping walking in order to respond to the tester is a sign that the participant is unable to divide attention adequately between the tasks.
- Score Sheet p. 102

Dynamic Gait Index

- Developed to assess the likelihood of falling in older adults.
- Designed to test 8 facets of gait
- Time for test: 15 min.
- Scoring is based on 4 point scale: 0-3
- Equipment Needed: Box, 2 cones, stairs, 20ft walkway. Gait belt may be needed.
- Assistive device may be used.
DGI

- <= 19/24 is predictive of falls in elderly (Shumway-Cook 1997).
- Greater than 22 = safe ambulators.
- MDC DGI = 2.9 (Romero 2011)

Activities - Specific Balance Confidence (ABC) Scale

- Purpose: Self report of one’s perceived balance confidence. Can be self administered or in person. 5-15 min.
- 16 items - Individuals give a rating of their confidence in doing activities without losing their balance or becoming unsteady.
- Choose a number between 0 and 100%.

ABC Scale

- Indicate your level of confidence doing activity
- Choose a percentage on the scale from 0-100%
- If you do not currently do the activity try to imagine how confident you would be if you had to
- If you normally use a walking aid or hold on to someone for support for the activity rate as if you were using aid.
ABC Scale

- 80% = high level of physical functioning.
- 50-80% = moderate level of physical functioning.
- < 50% = low level of physical functioning (Myers AM 1998).
- < 67% = older adults at risk of falling (LaJoie Y 2004).
- * scores < 80 indicate a balance problem

ABC Goals

- Pt to report improved confidence with mobility outside the home as evidenced by ABC score of greater than 80%.

Questionnaires

- Patient Specific Functional Scale
- Falls Efficacy Scale International
- Falls Efficacy Scale & Modified Version
Cognitive Screening Tools

- Mini Mental
- SLUMS
- Allen Cognitive Test
- MOCA
- Placemat Test
- Clock Face Test
- Blessed Orientation Memory Test
- Trails A & B

Additional Measurable Tests

- Seated Step Test
- Toe Tap Test
- Geriatric Depression Scale
- Postural Assessment Scale for Stroke Patients (PASS)
- Short Physical Performance Battery (SPPB)
- 400-Meter Walk Test

More Tests

- Hand Grip dynamometry
- 9 Hole Peg Test
- Saint Louis University Mental Status Exam (SLUMS)
- MOCA
- Mini Mental State Exam (MMSE)
- Gait Abnormality Rating Scale (GARS)
And More Tests

- DASH
- NIH Stroke Scale
- SF-36 Health Survey
- Barthel Index
- Foam and Dome Test
- Patient Specific Functional Scale
- CTSIB

Functional Testing

- Which tests could you use on a patient this week?

Thank you

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