A Physical Therapy Student's Toolbox for Assessing Falls Risk in Seniors

PHYT 724 SUPPLEMENTAL INFORMATION

Capstone Project Spring 2012

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Selecting an Outcome Measure[1,2]

What is the purpose?

- To Discriminate
- To Predictive
- To Evaluate

What type of measure is it?

- General
- Disease specific

What is the mode?

- Performance based
- Self –report

Is it practical?

- Time
- Equipment/Space

Also consider:

- Is the measure related to what the goals of therapy are?
- Is the measure appropriate for the patient's capabilities?
- Does the measure have good psychometrics?
- Is the measure appropriate for the stage of recovery?

Minimal Detectable Change (MDC)[1]

- Evaluates if true change occurred
- Does not provide information about if the change is clinically important
- Vary depending on the patient characteristics

Minimal Clinically Important Difference (MCID)[1]

- Measures if the change that occurred was clinically meaningful
- What is the smallest change that is considered important?

Selected Tests

1. Berg Balance Scale
2. Dynamic Gait Index
3. Functional Gait Assessment
4. Timed Up and Go
5. Tinetti Falls Efficacy Scale
6. Activities-Specific Balance Confidence Scale
7. 10 Meter Walk
8. 6 Minute Walk
9. Tinetti Performance Oriented Mobility Assessment
10. Single Leg Stance Time

***See Appendix A for a more detailed breakdown of each test based on disease type.

The Berg Balance Scale[3-11]

Purpose: Assesses balance and falls risk in seniors

ICF Domain: Activity

Time needed: 15-20 minutes

Equipment needed:

- Stop watch
- Chair with arm rest
- Chair without arm rest
- Ruler
- Step stool (average step height)
- Object to pick up off of floor

Scoring:

- Maximum score is 56
- <45/56 indicates an increased risk of falling
- To use attached score sheet: Have patient complete each task and mark the lowest category that applies. Add scores for each column and then add column totals for final score.

MDCs:

- Acute Stroke: 6.9
- Chronic Stroke: 2.5
- Parkinson's Disease=5
- Elderly with a history of falls=6.5
- ADL dependant seniors=8
- OR Based on initial score
    - 0-24: 4.6
    - 25-34: 6.3
    - 35-44: 4.9
    - 45-56: 3.3

Dynamic Gait Index[12-17]

Purpose: To assess the participants' ability to adapt to external demands on balance

ICF Domain: Activity

Time needed: < 10 minutes

Equipment needed:

- Shoe box
- Two obstacles ex: cone
- Stairs
- 20 ft of walking space

**Can use assistive device if needed

Scoring:

- Maximum Score is 24
- Scores < 19 indicates falls risk
- To use attached score sheet: Have patient complete each task and mark the lowest category that applies. Add scores for each column and then add column totals for final score.

MDCs:

- Acute & Chronic Stroke: 4 points or 16.6%
- Peripheral Vestibular Disorders: 3.2 points
- Parkinson's Disease: 2.9 points or 13.3%
- Community dwelling seniors with a history of falls: 2.9 points

Functional Gait Assessment[18-20]

Purpose: Assess postural stability during gait

ICF domain: Activity

Time needed: 5 minutes

Equipment needed:

- Stopwatch
- 20 feet of walking space
- Steps
- Shoe boxes

**An assistive device can be used

Scoring:

- Maximum score is 30
- Scores ≤22 indicates an increased risk of falling
- To use attached score sheet: Have patient complete each task and mark the highest category that applies. Add scores for each column and then add column totals for final score

MDCs:

- Acute & Chronic Stroke: 4.2 points or 14.1%

MCIDs:

- Vestibular Disorders: 8 points

Normative Values of Impaired Adults:

- 40's: 28.9
- 50's: 28.4
- 60's: 27.1
- 70's: 24.9

Timed Up and Go[21-28]

Purpose: assess mobility, falls risk, and balance in seniors

ICF Domain: Activity

Time needed: < 3 minutes

Equipment needed:

- Standard arm chair
- Stop watch
- 3 meters of walking space

**Can use assistive device if needed

Scoring:

- Time how long it takes the patient to rise from the chair, complete the task, and return to sitting.

- >13.5 seconds indicates an increased falls risk

- To use attached score sheet have the patient complete the task and record the time and any assistive devices used.

- Time how long it takes the patient to rise from the chair, complete the task, and return to sitting.

MDCs:

- Chronic Stroke: 2.9 s
- SCI: 10.8s
- Parkinson's Disease:
  - 11s (H&Y I-III)
  - 3.5 s or 29.8% (H&Y I-IV)
- Alzheimer's Disease: 4.09 s

Tinetti Falls Efficacy Scale[29-32]

Purpose: assesses awareness, balance, and stability during ADL

ICF Domain: Activity & Participation

Time needed: 10-15 minutes

Equipment needed:

- Pen
- Test Form

Scoring:

- Maximum score is 100
- >80 indicates increased risk of falling
- >70 indicates increased fear of falling
- A higher score reflects a higher fear/risk of falling
- To use attached score sheet: Have patient complete each task and mark the category that applies. Add scores for each column and then add column totals for final score

**Fear of falling can be affected by cognitive impairments

MDCs not established

Activities-Specific Balance Confidence Scale[33-36]

Purpose: subjective measure of participants' balance confidence

ICF Domain: Activity

Time needed: 10-20 minutes

Equipment Needed:

- Pen
- Test Form

Scoring:

- Maximum Score is 100%
    - ≥80%: high levels of physical functioning
    - 50-80%: moderate levels of physical functioning
    - <50%: low levels of physical functioning
- <67% indicates a risk for falling
- To use attached score sheet have the patient rate their confidence for each scenario from 0-100%. Sum all of the score for each item and divide by 16 to get the final score.

MDCs:

- Parkinson's Disease: 13%

Tinetti Performance Oriented Mobility Assessment[37-39]

Purpose: Assess mobility in seniors

ICF Domain: Activity

Time needed: 10-15 min

Equipment Needed:

- Armless chair
- Stopwatch
- 15 ft of walking space

Scoring:

- Maximum score is 28
- Total scores <19 indicates falls risk in long term care.
- Total scores <14 indicates falls risk in residential care.
- To use attached score sheet: Have patient complete each task and mark the category that applies. Add scores for each column and then add column totals for final score.

**Be aware there are several different versions of the test

MDCs:

- Long term care: 5

MCIDs:

- Community Dwelling Seniors: 1.6

10 Meter Walk[40-45]

Purpose: to assess walking speed

ICF Domain: Activity

Time needed: <5 minutes

Equipment needed:

- Stopwatch
- 14 meters of walking space

**Assistive devices can be used

Scoring:

- Begin timing when toes of lead foot pass 2 meter mark. Stop timing when toes of led foot pass 8 meter mark. Only 6 meters are timed
- The score is the average of 3 trials.

MDCs:

- Chronic Stroke
  - Comfortable pace: 22% change
  - Fast pace: 16% change
- Parkinson's Disease
  - Comfortable pace: 0.8 m/s
  - Max Speed: 0.25 m/s
- Hip Fracture:
  - 0.17 m/s

MCIDs:

- Geriatrics & Stroke: 0.1 m/s
- Acute Stroke: 0.16 m/s

Six Minute Walk[46-51]

Purpose: assess endurance and distance walked

ICF Domain: Activity

Time needed: 6 minutes

Equipment needed:

- Stop watch
- Premeasured path or a way to measure distance walked

**Assistive device can be used

Scoring:

- Measure the distance a patient can walk in 6 minutes.
- To use attached score sheet have the patient complete the task and record the time and any assistive devices used.

MDCs:

- Chronic Stroke: 36.6 m/120 ft or 13% change
- COPD: 54 m/177ft
- Parkinson's Disease: 82 m/269 ft
- Alzheimer's Disease: 110 ft

MCIDs:

- Geriatrics & Acute Stroke: 50 m/164 ft

Norms:

Age	Male	Female
60-69yr	572m	538m
70-79yrs	527m	471m
80-89yrs	417m	392m

Single Leg Stance[52-55]

Purpose: assess single leg, standing balance

ICF Domain: Activity

Time needed: 30 seconds

Equipment:

- Stopwatch
- Chair or table top

Scoring:

- Time how long the patient can balance on one leg without support.
- Can be done with eyes open and closed
- To use attached score sheet have the patient complete the task and record the time balanced

MDCs:

- Community Dwelling Seniors found to be:
    - 24.1 s
    - 5.5-16.0 s

Norms:

Age	Eyes Open	Eyes Closed
50-59	29.4	21.0
60-69	22.5	10.2
70-79	14.2	4.3

Appendix A

Test	MDC	MCID	Additional Info
Berg Balance Scale	**Acute Stroke:** (Stevensen, 2001; during inpatient rehabilitation) MDC for entire group (n = 48): 6.9 MDC for individuals who ambulate with assistance (n = 16): 8.1 MDC for individuals who ambulate with stand-by-assist (n = 17): 6.0 MDC for individuals who ambulate independently (n = 15): 6.3 **Chronic Stroke:** 6 months to 17 years post-stroke (calculated from statistics in Liston and Brouwer, 1996) 2.5 points **Parkinson's Disease:** (Steffen and Seney 2008; mean Hoehn & Yahr classification = 2) 5 points **Elderly:** (Donoghue et al, 2009) Berg Balance Scale Initial Score MDC 0 – 24 4.6 25 – 34 6.3 35 – 44 4.9 45 – 56 3.3 **Community Dwelling Elderly with a history of falls/near falls:** (Romero et al, 2011; n=42, most had multiple comorbidities) MDC_{95}=6.5 **Seniors ADL Dependant living in residential care facilities:** (Conradsson, 2007; n=45, able to stand up from chair with help from no more than 1 person) 8 point change needed for 95% CI	**Community Dwelling Seniors:** (Pardasaney et al 2012; n=111; S_b=standard deviation of baseline balance score) Total sample: MID(0.3x S_b)=1.65 MID(0.5x S_b)=2.50 Baseline BBS <50/56 MID(0.3x S_b)=1.40 <50/56 MID(0.5x S_b)=2.10 ≥50/56 MID(0.3x S_b)=0.66 ≥50/56 MID(0.5x S_b)=1.00	**Elderly:** (Berg et al, 1992); (Lajoie Y, Gallagher SP.2004). * Score of 56 indicates functional balance * Score of < 45 indicates individuals may be at greater risk of falling **Community dwelling older adults:** (Shumway-Cook et al, 1997) Score of <47 associated with increased risk of falls **Acute Stroke** * Large floor effects at 14 days post stroke (35%) (Mao et al, 2002) * Large floor effects 14 days post stroke = 23.9% (Chou et al, 2006; n = 226; 14 days post stroke) * Large ceiling effects 38 days post stroke = 26% (Salbach et al, 2001; n = 50 first time stroke) Moderately responsive at detecting changes < 90 days of stroke onset; greatest responsiveness between 14 and 30 days. (Mao et al, 2002; n = 123; assessed at 14, 30, 90, and 180 days post stroke). **Parkinson's Disease**: (Lim et al, 2005; n=26, H&Y I-III) Smallest Detectable difference=2.84

Dynamic Gait Index	**Acute and Chronic Stroke:** (Lin et al, 2010; n = 45; mean age = 60.0 (12.6) years; mean time since stroke = 9 months (range 3 to 36 months); tested while undergoing OP PT at 1 week, 2 months, and 5 months; Taiwanese sample) MDC = 4 points Percent change = 16.6% **Peripheral Vestibular Disorders:** (Calculated from Hall & Herdman, 2006) MDC calculated = 3.2 points **Parkinson's Disease:** (Hsieh et al, 2011; H&Y I-III) MDC=2.9 points; MDC%=13.3% **Community Dwelling Elderly with a history of falls/near falls:** (Romero et al, 2011; n=42, most had multiple comorbidities) MDC_{95}=2.9	**Community Dwelling Seniors:** (Pardasaney et al 2012; n=111; S_b=standard deviation of baseline balance score) Total sample: MID(0.3x S_b)=1.23 MID(0.5x S_b)=1.90 Baseline DGI <21/24 MID(0.3x S_b)=1.16 <21/24 MID(0.5x S_b)=1.80 ≥21/24 MID(0.3x S_b)=0.40 ≥21/24 MID(0.5x S_b)=0.60	**Normative values** - Asymptomatic Adults: (Vereeck et al, 2008; n = 318) **Community Dwelling Elderly:** (Shumway-Cook et al,1997; n = 44; age > 65) <19 indicative of fall risks scores of 19/24 or less are 2.58 times more like to have reported a fall in the previous 6 months than subjects with scores above 19 (Whitney et al, 2000) **Multiple Sclerosis:** (Cattaneo et al, 2006; n = 51; relapsing-remitting or secondary progressive MS; mean age 45.3 (18.1) years; mean time since onset 15.6 (7.6) years) <12 indicative of fall-risk **Vestibular patients:** (Whitney et al,2000; n=247, average age=62.5) ≤19 indicative of increased falls risk
Functional Gait Assessment	**Acute and Chronic Stroke:** (Lin et al, 2010; n = 45; mean age = 60.0 (12.6) years; mean time since stroke = 9 months (range 3 to 36 months); tested while undergoing OP PT at 1 week, 2 months, and 5 months; Taiwanese sample) MDC = 4.2 points Percent change = 14.1%	**Vestibular Disorders:** (Marchetti & Lin, 2010) 8 points (from admission to follow-up)	**Older Adults:** (Wrisley & Kumar, 2010; n = 35; aged 60 to 90) • Scores of 22/30 on the FGA were found to be effective in predicting falls in older adults who reside in community-dwellings **Normative values** - Unimpaired Adults: (Walker et al, 2007; n = 200, aged 40 to 89) ○ 40's: 28.9 ○ 50's: 28.4 ○ 60's: 27.1 ○ 70's: 24.9
Timed Up and Go	**Chronic Stroke:** (Flansbjer et al, 2005) MDC (calculated from statistics in Flansbjer et al, 2005) = 2.9 seconds Smallest Real Difference % = 23 % **SCI:** (Lam et al, 2007; SCI meta analysis; ASIA A, B, C, D; C2-L1; only subjects able to complete the walking test were included) A change of 10.8s was found to detect significant clinical change in the TUG **Parkinson's:** **(**Steffen & Seney, 2008; n = 37, mean age = 71 (12); mean H&Y score = 2 (range = 1–4); mean disease duration = 14 (6) years) MDC = 11 (Hsiech et al, 2011; H&Y I-III) MDC=3.5s; MDC%=29.8% **Alzheimer's Disease**: (Ries et al, 2009; n=51)	Not established	**Cut-Scores indicating risk of falls by population :** Population — Cut-score — Author Community dwelling adults — >13.5* — Shumway-Cook et al, 2000 Older stroke patient — > 14* — Andersson et al, 2006 Older adults in a falls clinic — > 15* — Whitney et al, 2005 Frail elderly — > 32.6* — Thomas et al, 2005 LE amputees — > 19* — Dite et al, 2007 * Time in seconds

	MCD_{90}: 4.09 seconds		
(Tinetti) Falls Efficacy Scale	Not established	Not established	Geriatrics: (Tinetti et al, 1990) < 80 increased risk of falling < 70 indicates a fear of falling This relationship may be moderated by cognitive impairment. Hauer, et al. (2010) found impaired elderly participants expressed less concern about falling than non-impaired participants. Normative Data Geriatric: (Huang & Wang, 2008; n = 174 community-dwelling adults aged 60 and older; Taiwanese sample) FES mean score were found to be 91.85 (SD = 16.89); with scores ranging from 11 to 100 Baseline scores were found to skew toward confident (-2.71). 57.1% of participants (n = 96) scored 100, indicating no fear of falling.
Activities-specific Balance Confidence Scale	**Parkinson's Disease:** (Steffen & Seney, 2008; n = 37; mean age = 71; Hoehn and Yahr Scale median score = 2 (range = 1 to 4); participants tested twice within a week by the same rater) MDC = 13	Not established	**Fallers and Non-fallers:** (Lajoie & Gallagher, 2003; n = 125; mean age for fallers = 75.50 (3.14) and 73.80 (2.75) years for non-fallers) score of <67% indicates a risk for falling, can accurately classify people who fall 84% of the time (Myers AM, 1998; n=475) ≥80%: high levels of physical functioning 50-80%: moderate levels of physical functioning <50%: low levels of physical functioning
10 meter walk	**Chronic Stroke:** (Flansbjer et al, 2005) Comfortable gait speed: 22% change Fastest possible gait speed: 16% change **Parkinson's Disease** (Steffen & Seney 2008; average Hoehn & Yahr Stage of 2) Comfortable gait speed: 0.18 m/s Maximum gait speed: 0.25 m/s **Hip Fracture** (Latham et al, 2008; aged > 65 years; mean time since hip fracture with non-complicated surgical repair = 17 days) Gait speed (over 4 meters): 0.17 m/s	**Geriatrics & Stroke:** (Perera, 2006) MCID: 0.1 m/s **Acute Stroke:** (Tilson, 2010; n = 283; mean age = 63.5 (12.5) years; stroke onset < 45 days; gait speed < 0.18 m/s) MCID: 0.16 m/s	**Stroke:** Ambulation ability has been correlated with gait speed (Perry, 1995); changes in gait speed that results in changed classification are meaningful (Schmid, 2007); ambulation ability that is predicted by gait speed is a reliable method of classifying patients (Bowden, 2008) (Fulk et al,2008) >0.30m/s is needed to determine a change has occurred * <.4 m/s were more likely to be household ambulators * .4 -.8 m/s limited community ambulators * >.8 m/s were community ambulators See norms for gait speed by age group Bohannon 1997 article

6 minute walk	**Chronic Stroke:** (Flansbjer et al, 2005) MDC = 36.6 meters (120 feet) or a 13% change **COPD:** (Redelmeier et al, 1997; n = 112, mean age = 67 years, mean FEV1 = 975 ml) MDC = 54 meters (177 feet) **Parkinson's Disease:** (Steffen and Seney, 2008; n = 37, mean age = 71 (12) years; average Hoehn & Yahr Stage of 2) MDC = 82 meters (269 feet) **Alzheimer's Disease**: (Ries et al, 2009; n=51) MCD_{90}: 110ft	**Geriatrics and Acute Stroke:** (Perera et al, 2006) MCID = 50m (164 feet)	**Geriatrics:** (Steffen et al, 2002; n = 96; participants were nonsmokers with no history of dizziness) Mean Distance in Meters by Age & Gender Age Male Female 60-69yr 572m 538m 70-79yrs 527m 471m 80-89yrs 417m 392m **Modified 6MWT:** (Geiger et al, 2007; n = 528 children between 3 and 18 years old) Age Male Female 3-5yrs 536.5 (95.6) 501.9 (90.2) 6-8yrs 577.8 (56.1) 573.2 (69.2) 9-11yrs 672.8 (61.6) 661.9 (56.7) 12-15yrs 697.8 (74.7) 663.0 (50.8) 16-18yrs 725.8 (61.2) 664.3 (49.5)
Tinetti Performance Oriented Mobility Assessment	**Long term self care and SNF**: (Faber et al 2006) MDC_{95}=5 points	**Community Dwelling Seniors:** (Pardasaney et al 2012; n=111; S_b=standard deviation of baseline balance score) *POMA-total score* Total sample: MID(0.3x S_b)=1.04 MID(0.5x S_b)=1.60 Baseline <25/28 MID(0.3x S_b)=0.90 <25/28 MID(0.5x S_b)=1.40 ≥25/28 MID(0.3x S_b)=0.35 ≥25/28 MID(0.5x S_b)=0.53 *POMA-Balance Score* Total sample: MID(0.3x S_b)=0.67 MID(0.5x S_b)=1.00 Baseline <14/16 MID(0.3x S_b)=0.46 <14/16 MID(0.5x S_b)=0.70 ≥1416 MID(0.3x S_b)=0.24 ≥14/16 MID(0.5x S_b)=0.37	**Long term self care and SNF:** (Faber et al 2006; n=245, score of at least 18 on MMSE): cut point: POMA total score: 19 POMA –Balance score: 10 POMA-Gait score: 9 **Residential Care:** (Chiu et al 1995; n=53): POMA-balance subscale: <14 indicates falls risk
Single leg Stance Time	**Community Dwelling Seniors:** (Goldberg et al 2011; n=25 age 60-89) MDC_{95}=24.1 s (Richard 2012) MDC_{95}=5.5-16.0 s (calculated from various studies)	Not established	Normative values of unimpaired adults: (Bohannon R et al, 1984) (Bohannon, RW. , 2006)

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