### Functional Tests & Measures for Acute Care Practice

#### Selected Tools & Resources

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Compiled by SL Gorman, PT, DPTSc, GCS

Last Updated: November 2013

DISCLAIMER: All patients should be adequately supervised and guarded during testing at all times, including the use of appropriate footwear and gait belt as needed. The therapist is responsible for patient safety during testing.

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**Acute Care Index of Function [ACIF]**

**Purpose:** Developed by physical therapists in an acute neurosurgical/neuromedicine unit to measure basic mobility for patients and assist in discharge placement decisions.\(^1\)\(^-\)\(^3\) Assesses mental status impairment and activity limitations in bed mobility skills, transfers, and basic gait/wheelchair mobility.\(^1\)\(^-\)\(^3\) One study also validated the use of the ACIF with acute lower extremity orthopedic patients.\(^4\)

**Time:** 12 minutes.\(^1\)

**Equipment:** Mat, wheelchair, assistive device, stairs

**Scoring:** A weighted score is calculated based on totals from 4 subscales:

- **Mental status:** verbal commands, commands, learning, safety awareness
- **Bed mobility:** roll supine to right, roll supine to left, supine to sit, sit to supine
- **Transfers:** wheelchair to mat, mat to wheelchair, sit to stand, stand to sit, sitting balance, standing balance
- **Mobility:** gait with device, gait without device, ascend stairs, descent stairs, propel wheelchair, set-up wheelchair (can score this section without the 2 wheelchair items)

Ordinal scales are used for all subscales to reflect patient performance. Each category is individually scored as a percentage of the total subsection points available, and then a weighted total is calculated with the mobility and transfer subscales being weighted higher in the total score. Total score is a percentage expressed either as percentage (e.g., 40%) or decimal (e.g., 0.40).

Refer to the included scoring sheet for calculation details and directions for details of how to score individual items.

**Reliability:** Inter-rater reliability is good to excellent (kappa = 0.88 to 0.98) for physical function items and adequate to excellent (kappa = 0.60 to 0.98) for the mental function items.\(^2\) Inter-rater reliability for the subscale scores and total scores was excellent (ICC = 0.98 and 1.00).\(^2\)

**Validity:** ACIF scores compared to therapist judgment demonstrated consistency (Spearman rank-order correlation coefficient = 0.81) showing strong criterion-related validity.\(^2\)

**Results:**

*Responsiveness to change:*

- Neurologic patients demonstrated differences between admission and discharge scores ranging between 8 points to 20 points, therefore specific thresholds are not recommended.\(^1\)
- Lower extremity orthopedic patients showed significant mean ACIF changes of 6.27% on the mental status subscale and between 15.42% and 18.42% for the mobility subscales.\(^4\)

*Prediction of discharge setting:*\(^4\) Discharge ACIF scores predicted discharge destination:

- Skilled nursing facility discharge < 0.30 (in 100% of patients)
- Acute rehab discharge = 0.31 to 0.70 (in 65% of patients)
- Home discharge > 0.70 (in 72% of patients)
References:


## ACUTE CARE INDEX OF FUNCTION

<table>
<thead>
<tr>
<th>MENTAL STATUS (MS)</th>
<th>YES</th>
<th>NO</th>
<th>( \frac{(MS)}{6} = MS )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Verbal Commands</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Commands</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Learning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Safety Awareness</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BED MOBILITY (BM)</th>
<th>Unable</th>
<th>Dep</th>
<th>Indep</th>
<th>( \frac{(BM)}{40} = BM )</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Roll supine to right</td>
<td>0</td>
<td>4</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>6. Roll supine to left</td>
<td>0</td>
<td>4</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>7. Supine to sit</td>
<td>0</td>
<td>4</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>8. Sit to supine</td>
<td>0</td>
<td>4</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TRANSFERS (T)</th>
<th>Unable</th>
<th>Dep</th>
<th>Indep</th>
<th>( \frac{(T)}{60} = T )</th>
</tr>
</thead>
<tbody>
<tr>
<td>9. Wheelchair to mat</td>
<td>0</td>
<td>4</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>10. Mat to wheelchair</td>
<td>0</td>
<td>4</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>11. Sit to stand</td>
<td>0</td>
<td>4</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>12. Stand to sit</td>
<td>0</td>
<td>4</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>13. Sitting balance</td>
<td>0</td>
<td>4</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>14. Standing balance</td>
<td>0</td>
<td>4</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MOBILITY (M)</th>
<th>Unable</th>
<th>Dep</th>
<th>Indep</th>
<th>Without using wheelchair items ( \frac{(M)}{70} = M ) or Including wheelchair items ( \frac{(M)}{100} = M )</th>
</tr>
</thead>
<tbody>
<tr>
<td>15. Gait with device</td>
<td>0</td>
<td>4</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>16. Gait without device</td>
<td>0</td>
<td>4</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>17. Ascend stairs</td>
<td>0</td>
<td>4</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>18. Descend stairs</td>
<td>0</td>
<td>4</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>19. Propel wheelchair</td>
<td>0</td>
<td>4</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>20. Set-up wheelchair</td>
<td>0</td>
<td>4</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

Comments:

**Unable:** Patient cannot physically perform the activity.

**Dependent:** Patient assists to perform the activity but requires physical or verbal assist to complete.

**Independent:** Patient performs the activity meeting all stated criteria without verbal or physical assist.
Acute Care Index of Function Instructions for Administration
I. Directions for mental status evaluation
   A. Guidelines
      1. Mental status items measure the presence or absence of a defined behavior (yes=present, no=absent).
      2. If a patient can follow verbal commands as defined, she/he is also given credit for ability to follow commands.
      3. In rating ability to learn, the patient is given a yes if he demonstrates the ability to initiate the sequence of steps of a simple motor task taught up to 24 hours earlier.
      4. In rating safety awareness, the patient is given a "no" if he requires verbal or physical intervention to maintain safety during the administration of this measure.
   B. Directions
      1. Able to follow verbal commands: The therapist verbally instructs the patient to perform one of the following simple motor tasks:
         a. close your eyes
         b. open your eyes
         c. lift your arm
         d. lift your leg
         The task should be within the patient's capabilities. The command may be given no more than twice.
      2. Able to follow commands with visual cueing. The therapist gives one of the above verbal commands while simultaneously performing the motor task. No physical contact with the patient is allowed. The command may be given a maximum of three times.
      3. Able to learn: The patient is informed that he will be given a task and will be expected to remember how to perform the task later. On initial contact, the patient is instructed in a sequence of steps of a motor task. Within 24 hours, the patient is asked to perform the initial step of the task without assistance. The task should be appropriate to the patient's physical status.
      4. Safety awareness: If because of impaired judgment, the patient requires supervision in performing any functional task to ensure safety (ie. to avoid situations that could potentially harm the patient) safety awareness is marked no.

II. Directions for physical function evaluation
   A. Guidelines
      1. The patient is not allowed to use bed rails, tables, or armrests during the performance of items 5 to 8.
      2. The patient may use any method that is functional to carry out a task.
      3. Note that rating of physical assistance for sitting or standing balance applies to
patients who require assistance to maintain the position as well as patients who cannot meet the other stated criteria.

4. In rating transfers, the rater is allowed to perform the necessary setup for a transfer if the patient is not being tested specifically on wheelchair setup.

5. The patient can be tested with any mobility devices that are functional for him/her.

6. In rating gait with or without a device, the patient may use any prosthesis or orthosis necessary.

B. Directions

1. Rolling supine to right and left: Patient is positioned supine. Patient is asked to roll from supine position to right side. Patient is returned to the supine position and is then asked to roll from supine to left side.

2. Supine to sit: Patient is positioned supine. Patient is asked to come to a sitting position on the side of a supporting surface.

3. Sit to supine: Patient is sitting on the side of the supporting surface. The patient is asked to lie down.

4. Transfer wheelchair/chair to bed/mat: Patient is sitting in a wheelchair. Patient is asked to move from wheelchair to mat.

5. Transfer from bed/mat to wheelchair/chair: Patient is sitting on the edge of the supporting surface. Patient is asked to move from mat to wheelchair.

6. Sit to stand: Patient is seated on supporting surface. Patient is asked to come to a standing position.

7. Stand to sit: Patient is standing with back to supporting surface. Patient is asked to sit down.

8. Sitting balance: Patient is asked to maintain balance unsupported while seated on the edge of mat with feet flat on the floor. Patient clasps hands together (assistance may be given for this). Patient reaches forward and then returns to balanced position. Repeat process reaching to the left and to the right.

9. Standing balance: Patient is asked to maintain balance unsupported while standing. Patient clasps hands together (assistance may be given for this). Patient reaches forward and then returns to balanced position. Repeat process reaching to the left and to the right.

10. Gait with device: Patient is asked to ambulate with any assistive device necessary, including an orthosis, prosthesis or parallel bars for a distance of 50 ft on a level surface. Within this distance, patient must turn around 180 degrees one time and walk backward
three steps. A patient who ambulates with the parallel bars may only receive a grade of dependent even if she/he meets all other criteria.

11. Gait without a device: Patient is asked to ambulate without an assistive device, orthosis or prosthesis is acceptable, for a distance of 30 to 50 feet on a level surface. Within this distance, the patient must turn around 180 degrees one time and walk backward three steps.

12. Ascend stairs: Patient is asked to ascend five stairs. Patient may use handrail or any assistive device necessary.

13. Descend stairs: Patient is asked to descend five stairs. Patient may use handrail or any assistive device necessary.

14. Wheelchair mobility-setup: Patient approaches surface to transfer appropriately, locks brakes, and removes necessary wheelchair parts for the transfer.

15. Wheelchair mobility-propulsion: Patient propels wheelchair a distance of 30 to 50 feet on a level surface. The patient must then display the ability to propel backward, turn around 180 degrees, and maneuver corners to the right and left.

III. Directions for scoring
   A. Subscale scores
      1. Total all the points circled in each section.
      2. Total the maximum possible points for all applicable items in each section.
      3. Divide the total points circled by the maximum points possible and multiply by 100.

   B. Total score
      1. Multiply the subscale scores by the weighting factors indicated in the formula at the top of the ACIF form.
      2. Add the weighted subscale scores and divide by 6.

   C. Measurement Dimension
      1. Unable: Patient cannot physically assist to perform the activity
      2. Dependent: Patient assists to perform the activity but requires physical or verbal assistance to complete the activity.
      3. Independent: Patient performs the activity meeting all stated criteria without verbal or physical assistance.
Activity Measure for Post Acute Care™ Inpatient Basic Mobility Short Form [“6 Clicks”]

**Purpose:** The AM-PAC™ was designed using the WHO’s ICF model and domains of activity limitations to assess difficulty in the execution of a task or action by an individual. The inpatient basic mobility short form, representing the mobility domain of the AM-PAC™ and consisting of six items from the total 131 basic mobility items, contains activities likely to be encountered on a daily basis by most adults and are appropriate for inpatient settings.

**Time:** Less than 10 minutes

**Equipment:** To assess patient performance (and not use professional judgment): bed, chair with arms (w/c or bedside commode can be substituted), and 3-5 steps with a railing.

**Scoring:** Clinicians answer the 6 items on the “6 Clicks” based on observed patient activity and/or professional judgment.

“6 Clicks” uses two types of questions and response options:
- A) Difficulty items answer the question “How much difficulty does the patient currently have...” and the difficulty is scored on a 4 point ordinal scale:
  1: Unable
  2: A lot
  3: A little
  4: None
- B) Help from another person items answer the question “How much help from another person does the patient currently need...” and the help required is scored on a 4 point ordinal scale:
  1: Total
  2: A lot
  3: A little
  4: None

Clinicians may use these guidelines to translate traditional levels of assistance ratings into AM-PAC™ item responses:
- Total/Unable = total/dependent assist
- A lot = max/mod assist
- A little = min/contact guard assist or supervision
- None = modified independence or independence

Add the individual scores on the 6 items to obtain a raw score (6 = lowest functioning to 24 = highest functioning). You can translate the raw score into a standardized AM-PAC™ score using the conversion table. A conversion table for the CMS Functional Modifier “G-Code’ is also available.

**Reliability & Validity:** “6 Clicks” items were selected from the larger Active Measure-Post Acute
Care™ item pool, and have been found valid, sensitive, and responsive. Test-retest reliability (ICC=0.97, 95% CI 0.92-0.98) and subject-proxy reliability were good to excellent.

Results:

Predicts discharge during acute hospitalization (raw score):

- Home = 20.1
- Home with home care = 17.9
- Skilled nursing facility = 14
- Inpatient rehabilitation facility = 13.6
- Long-term acute care = 11.5

Website: Visit the AM-PAC™ Short Forms website for updates and more information on this measure: [http://www.bu.edu/bostonroc/instruments/am-pac/shortforms/](http://www.bu.edu/bostonroc/instruments/am-pac/shortforms/)

References:


Boston University AM-PAC™ “6 Clicks”
Basic Mobility Inpatient Short Form

Please check the box that reflects your (the patient’s) best answer to each question.

<table>
<thead>
<tr>
<th>How much difficulty does the patient currently have…</th>
<th>Unable</th>
<th>A Lot</th>
<th>A Little</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Turning over in bed (including adjusting bed, clothes, sheets and blankets)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Sitting down on and standing up from a chair with arms (e.g., wheelchair, bedside commode, etc.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Moving from lying or back to sitting on the side of the bed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How much help from another person does the patient currently need…</th>
<th>Total</th>
<th>A Lot</th>
<th>A Little</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Moving to and from a bed to a chair (including a wheelchair)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Need to walk in hospital room?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Climbing 3-5 steps with a railing?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Raw Score: ________________  CMS 0-100% Score: ________________
Standardized Score: ________________  CMS Modifier: ________________

Note: Use the AM-PAC Basic Mobility Inpatient Short Form Conversion Table to convert raw scores.

Revised: 2/1/2013
### Boston University AM-PAC™ “6 Clicks”
Basic Mobility Inpatient Short Form Score Conversion Table*

<table>
<thead>
<tr>
<th>AM-PAC Raw Score</th>
<th>AM-PAC t-Scale Score</th>
<th>Scale Score Standard Error</th>
<th>CMS 0-100% score</th>
<th>CMS ‘G Code’ Modifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>23.55</td>
<td>4.57</td>
<td>100.00%</td>
<td>CN</td>
</tr>
<tr>
<td>7</td>
<td>26.42</td>
<td>4.33</td>
<td>92.36%</td>
<td>CM</td>
</tr>
<tr>
<td>8</td>
<td>28.58</td>
<td>4.04</td>
<td>86.62%</td>
<td>CM</td>
</tr>
<tr>
<td>9</td>
<td>30.55</td>
<td>3.69</td>
<td>81.38%</td>
<td>CM</td>
</tr>
<tr>
<td>10</td>
<td>32.29</td>
<td>3.42</td>
<td>76.75%</td>
<td>CL</td>
</tr>
<tr>
<td>11</td>
<td>33.86</td>
<td>3.22</td>
<td>72.57%</td>
<td>CL</td>
</tr>
<tr>
<td>12</td>
<td>35.33</td>
<td>3.08</td>
<td>68.66%</td>
<td>CL</td>
</tr>
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<td>13</td>
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<td>14</td>
<td>38.10</td>
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<td>15</td>
<td>39.45</td>
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<td>54.16%</td>
<td>CK</td>
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<td>42.13</td>
<td>3.03</td>
<td>50.57%</td>
<td>CK</td>
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<td>18</td>
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<td>3.20</td>
<td>46.58%</td>
<td>CK</td>
</tr>
<tr>
<td>19</td>
<td>45.44</td>
<td>3.55</td>
<td>41.77%</td>
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<td>20</td>
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<td>50.25</td>
<td>4.69</td>
<td>28.97%</td>
<td>CJ</td>
</tr>
<tr>
<td>22</td>
<td>53.28</td>
<td>5.43</td>
<td>20.91%</td>
<td>CJ</td>
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<tr>
<td>23</td>
<td>56.93</td>
<td>6.22</td>
<td>11.20%</td>
<td>CI</td>
</tr>
<tr>
<td>24</td>
<td>61.14</td>
<td>6.94</td>
<td>0.00%</td>
<td>CH</td>
</tr>
</tbody>
</table>

*Use this form to convert AM-PAC Basic Mobility Inpatient Raw Scores.

Revised 2/1/2013
Functional Status Score in the ICU [FSS-ICU]

Purpose: Assessment of functional status using a scoring system based on the validated Functional Independence Measure (FIM) and using a limited number of items routinely examined in the ICU setting and important for activity independence and determination of discharge disposition.¹

Time: Less than 10 minutes in most patients. All 5 items are routinely tested individually in inpatient settings, including ICU and long-term acute care.¹⁻³

Equipment: Hospital bed and assistive device for the sit to stand and ambulation items, as needed by the patient.

Scoring: A score is assigned for each of 5 tasks: rolling, transfer from supine to sit, sitting at the edge of bed, transfer from sit to stand, and ambulation.

0 = unable to perform the task (either due to physical limitation or medical status)
1 = total assistance (patient performs < 25% of task or requires more than 1 persons)
2 = maximal assistance (patient performs 25-49% of task)
3 = moderate assistance (patient performs 50-74% of task)
4 = minimal assistance (patient performs 75% or more of task)
5 = supervision or set up
6 = modified independence (requires use of assistive device but no physical assistance)
7 = complete independence

A raw score is calculated for the 5 items, ranging from 0 to 35 (0 = least functional, 35 = maximally functional).

Reliability & Validity: The five items were selected as these are important functional tasks in the ICU setting and are familiar to rehabilitation professionals.¹⁻² The scoring system is based on the scoring for the FIM, which has been shown to be reliable and valid in a variety of rehabilitation patient populations and settings.⁴ Reliability and validity in the ICU population specifically has not been determined.²

Results:

Responsiveness: Patient score gains can be reported for individual patients to show progress, as well as changes in scores for individual items. Average scores at initial ICU assessment were 10 (range 5-13) and at ICU discharge averaged 14 (range 10-23) in one study with 19 patients.¹

A study in long-term acute care showed significant FSS-ICU score increases from admission (mean of 9) to discharge (mean of 14).³ Additionally, scores improved in all 5 categories, with largest changes seen in supine to sit transfers.

Effect size in long-term acute care hospitalized patients was 0.25 (small), but increased
to large effect size in subgroups later discharged to home (0.90), inpatient rehabilitation (0.91), and skilled nursing unit (0.80).³

_Discharge disposition_: Higher scores on the FSS-ICU at discharge in patients in long term acute care were related with discharge to home, inpatient rehabilitation, or skilled nursing unit discharge.³

References:


Physical Function ICU Test (Scored) [PFIT-s]

**Purpose:** PFIT components were developed and selected for clinical usefulness, primarily in ICU setting with mechanically ventilated patients, by critical care physical therapists. Endurance, muscle strength, and cardiovascular capacity are primarily assessed via the PFIT. The PFIT-s is an adapted version with improved clinometric properties.

**Time:** The PFIT-s has 4 items, time to administer test is dependent on patient endurance and performance abilities, but is routinely less than 5 minutes.

**Equipment:** An assistive device for achieving standing may be required, dependent on patient performance. A watch will be needed to determine cadence.

**Scoring:**

1. Assistance required for sit to stand transfer:
   - From a standardized chair, have the patient perform sit to stand. Record how many people are required to assist. Using an assistive device is not defined as assistance, only physical assistance is recorded.
   - Record a score:
     - 0 = Unable
     - 1 = Assist x 2 persons
     - 2 = Assist x 1 person
     - 3 = No assistance

2. Cadence (steps/min) while marching in place:
   - **Patient Directions:** “We would like you to march in place for as long as you can. We are going to record how long you walk for and how many steps you do. This test is designed to record your maximum exercise ability, so it is very important that you march in place for as long as you possibly can.”
   - Give standardized encouragement every 10 seconds: “Keep going for as long as you can,” “You’re doing well,” “Well done.”
   - Record the cadence (steps/min) and determine a score:
     - 0 = unable
     - 1= > 0-49 steps/min
     - 2 = 50-79 steps/min
     - 3 = 80 or greater steps/min

3. Shoulder strength:
   - **Medical Research Council grading scale is used:**
     - Grade 5: Muscle contracts normally against full resistance.
     - Grade 4: Muscle strength is reduced but muscle contraction can still move joint against resistance.
     - Grade 3: Muscle strength is further reduced such that the joint can be moved
only against gravity with the examiner's resistance completely removed.
Grade 2: Muscle can move only if the resistance of gravity is removed.
Grade 1: Only a trace or flicker of movement is seen or felt in the muscle or fasciculations are observed in the muscle.
Grade 0: No movement is observed.

Score the patient as follows:
0 = grade 0, 1, or 2
1 = grade 3
2 = grade 4
3 = grade 5

4. Knee strength:
   Medical Research Council grading scale is used:
   Grade 5: Muscle contracts normally against full resistance.
   Grade 4: Muscle strength is reduced but muscle contraction can still move joint against resistance.
   Grade 3: Muscle strength is further reduced such that the joint can be moved only against gravity with the examiner's resistance completely removed.
   Grade 2: Muscle can move only if the resistance of gravity is removed.
   Grade 1: Only a trace or flicker of movement is seen or felt in the muscle or fasciculations are observed in the muscle.
   Grade 0: No movement is observed.

Score the patient as follows:
0 = grade 0, 1, or 2
1 = grade 3
2 = grade 4
3 = grade 5

Calculate an ordinal score (add the score for each of the 4 test items, 0-12 points possible). Use the following conversion scale to obtain an interval PFIT-s score:

<table>
<thead>
<tr>
<th>Scale</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ordinal</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Interval</td>
<td>0</td>
<td>2</td>
<td>3.2</td>
<td>3.9</td>
<td>4.4</td>
<td>4.9</td>
<td>5.4</td>
<td>5.9</td>
<td>6.4</td>
<td>7.1</td>
<td>7.9</td>
<td>8.8</td>
<td>10</td>
</tr>
</tbody>
</table>

Reliability: Inter-rater reliability was excellent (ICC for items, between 0.996-1.00). Standard error of marching in place cadence was 0.76 reps/min.

Validity: Moderate convergent validity with the TUG (r = -0.60), the 6 Minute Walk Test (r = 0.41), and the MRC muscle test (r = 0.49).

Results: No adverse events were noted in a study with 12 participants who were mechanically ventilated¹ or in a larger study of 144 patients in ICU.²
**Responsiveness to change:**
Effect size index of 0.82 indicates large responsiveness to change. MCID 1.5 points on the 10 point interval scale.

**Predictive Validity:**
Higher ICU admission PFIT-s scores are associated with discharge home, reduced likelihood of discharge to inpatient rehabilitation, reduced acute care hospital length of stay, and improved quality of life at 3, 6, and 12 month follow up.

ICU admission PFIT-s scores could not predict ICU or hospital readmission, 28 day mortality, or 12 month mortality.

**References:**

Performance-Oriented Mobility Assessment [POMA or Tinetti]

Purpose: Developed by geriatrician to assess task-oriented abilities specific to gait and balance. The POMA uses a balance subscale of 9 items and a gait subscale of 7 items.

A newer version of the POMA exists, incorporating more vestibular items (i.e., single limb stance, head turning, turning while walking) for a total of 37 points. Little research is available on the newer scale.

Time: 10-15 minutes

Equipment: Hard armless chair, stopwatch, 15’ walkway

Scoring: Generates a balance and a gait score, which are added for a total POMA score. 16 items are scored on an ordinal scale (0-2).

- Balance Score = 16
- Gait Score = 12
- Total POMA Score = 28

Refer to the included scoring sheet for calculation details and details of how to score individual items. The original POMA (28 points total) is included in this packet, as the newer POMA is usually too high level for acutely ill patients.

Reliability: Inter-rater reliability fair to good (Kappa = 0.40-0.75) in group of raters with varied experience\(^1\) between 0.80 and 0.93.\(^2\) Percent agreement > 85% indicated good inter-rater reliability.\(^1\) Test-retest reliability varied between 0.72 and 0.86.\(^2\)

Validity: Moderate correlations with Physical Performance Test (0.78) and high correlations with Berg Balance Scale (0.91). Also moderately correlated with ankle range of motion (0.63) and functional obstacle course (-0.73 to -0.78).\(^1\) High correlations between the POMA (both scales and total score) and walking speed, TUG, FICSit-4, and GARS demonstrate concurrent validity.\(^2\)

Results: Unless noted, values reflect total POMA scores

- Sensitivity: 68% (to identify SNF patients who would benefit from PT)\(^1\)
- Specificity: 78% (for SNF patients who would benefit not from PT)\(^1\)

- Minimal detectable change (MDC): in individuals = 5 points; for groups (n=30) = 0.8 points\(^2\)

- Identify SNF patients who would benefit from PT: POMA balance subscale score < 14/16\(^1\)

- Predict fall risk: 25-28 = low fall risk; 19-24 = medium fall risk; < 19 = high fall risk\(^3\)

References:


**Performance Oriented Mobility Assessment (POMA)-Balance Scale**

Initial instructions: Subject is seated in hard, armless chair. The following maneuvers are tested.

1. **Sitting Balance**
   - Leans or slides in chair = 0
   - Steady, safe = 1  
   ___

2. **Arises**
   - Unable without help = 0
   - Able, uses arms to help = 1
   - Able without using arms = 2  
   ___

3. **Attempts to Arise**
   - Unable without help = 0
   - Able, requires > 1 attempt = 1
   - Able to rise, 1 attempt = 2  
   ___

4. **Immediate Standing Balance** (first 5 seconds)
   - Unsteady (swaggers, moves feet, trunk sway) = 0
   - Steady but uses walker or other support = 1
   - Steady without walker or other support = 2  
   ___

5. **Standing Balance**
   - Unsteady = 0
   - Steady but wide stance (medial heals > 4 inches apart) and uses cane or other support = 1
   - Narrow stance without support = 2  
   ___

6. **Nudged** (subject at maximum position with feet as close together as possible, examiner pushes lightly on subject’s sternum with palm of hand 3 times)
   - Begins to fall = 0
   - Staggers, grabs, catches self = 1
   - Steady = 2  
   ___

7. **Eyes Closed** (at maximum position of item 6)
   - Unsteady = 0
   - Steady = 1  
   ___

8. **Turing 360 Degrees**
   - Discontinuous steps = 0
   - Continuous steps = 1  
   ___

9. **Sitting Down**
   - Unsafe (misjudged distance, falls into chair) = 0
   - Uses arms or not a smooth motion = 1
   - Safe, smooth motion = 2  
   ___

**BALANCE SCORE:**  ____/16
Performance Oriented Mobility Assessment (POMA)-Gait Scale

Initial Instructions: Subject stands with examiner, walks down hallway or across room, first at “usual” pace, then back at “rapid, but safe” pace (using usual walking aids)

10. **Initiation of Gait** (immediately after told to “go”)
   - Any hesitancy or multiple attempts to start =0
   - No hesitancy =1

11. **Step Length and Height**
    - *Right swing foot*
      - Does not pass left stance foot with step =0
      - Passes left stance foot =1
    - Right foot does not clear floor completely with step =0
    - Right foot completely clears floor =1
    - *Left swing foot*
      - Does not pass right stance foot with step =0
      - Passes right stance foot =1
    - Left foot does not clear floor completely with step =0
    - Left foot completely clears floor =1

12. **Step Symmetry**
    - Right and left step length not equal (estimate) =0
    - Right and left step length appear equal =1

13. **Step Continuity**
    - Stopping or discontinuity between steps =0
    - Steps appear continuous =1

14. **Path** (estimate to floor tiles, 12” diameter; observe excursion of 1’ over about 10’ of the course)
    - Marked deviation =0
    - Mild/moderate deviation or uses walking aid =1
    - Straight without walking aid =2

15. **Trunk**
    - Marked sway or uses walking aid =0
    - No sway but flexion of knees or back or spreads arms out while walking =1
    - No sway, no flexion, no use of arms, & no use of walking aid =2

16. **Walking Stance**
    - Heels apart =0
    - Heels almost touching while walking =1

**GAIT SCORE** = _____/12
<table>
<thead>
<tr>
<th>Performance Oriented Mobility Assessment (POMA)</th>
<th>Date</th>
<th>Date</th>
<th>Date</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Balance Subscale:</strong> Subject is seated on hard, armless chair</td>
<td></td>
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<tr>
<td>SITTING BALANCE</td>
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<td></td>
</tr>
<tr>
<td>Leans or slides in chair =0, Steady, safe =1</td>
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<tr>
<td>ARISES</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Unable without help =0; Able, uses arms =1, Able without using arms = 2</td>
<td></td>
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<tr>
<td>ATTEMPTS TO RISE:</td>
<td></td>
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<tr>
<td>Unable w/o help=0; Able, requires &gt; 1 attempt =1; Able in 1 attempt =2</td>
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<tr>
<td>IMMEDIATE STANDING BALANCE (first 5 seconds)</td>
<td></td>
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</tr>
<tr>
<td>Unsteady (sway/stagger/feet move)=0; Steady, w/ support =1; Steady w/o support =2</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>STANDING BALANCE</td>
<td></td>
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</tr>
<tr>
<td>Unsteady =0; Steady, stance &gt; 4 inch BOS &amp; requires support =1; Narrow stance, w/o support =2</td>
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<tr>
<td>STERNAL NUDGE (feet close together)</td>
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<tr>
<td>Begins to fall =0; Staggers, grabs, catches self =1; Steady =2</td>
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<tr>
<td>EYES CLOSED (feet close together)</td>
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<tr>
<td>Unsteady =0; Steady =1</td>
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<tr>
<td>TURNING 360 DEGREES</td>
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<td></td>
</tr>
<tr>
<td>Discontinuous steps =0; Continuous steps =1</td>
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<tr>
<td>TURNING 360 DEGREES</td>
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</tr>
<tr>
<td>Unsteady (staggers, grabs) =0; Steady =1</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>SITTING DOWN</td>
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<tr>
<td>Unsafe (misjudges distance, falls) =0; Uses arms, or not a smooth motion =1; Safe, smooth motion =2</td>
<td></td>
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<tr>
<td><strong>BALANCE TOTAL</strong></td>
<td>/16</td>
<td>/16</td>
<td>/16</td>
<td>/16</td>
</tr>
<tr>
<td><strong>Gait Subscale:</strong> Subject may ambulate with assistive device as needed</td>
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<tr>
<td>GAIT INITIATION (immediate after told “go)</td>
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<tr>
<td>Any hesitancy, multiple attempts to start =0; No hesitancy =1</td>
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<tr>
<td>STEP LENGTH</td>
<td></td>
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</tr>
<tr>
<td>R swing foot passes L stance leg =1; L swing foot passes R =1</td>
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<tr>
<td>FOOT CLEARANCE</td>
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<tr>
<td>R foot completely clears floor =1; L foot completely clears floor =1</td>
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<tr>
<td>STEP SYMMETRY</td>
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</tr>
<tr>
<td>R and L step length unequal =0; R and L step length equal=1</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>STEP CONTINUITY</td>
<td></td>
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<tr>
<td>Stop/discontinuity between steps =0; Steps appear continuous =1</td>
<td></td>
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<tr>
<td>PATH (excursion)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Marked deviation =0; Mild/moderate deviation or use of aid =1; Straight without device=2</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>TRUNK Marked sway or uses device =0; No sway but knee or trunk flexion or spread arms while walking =1; None of the above deviations=2</td>
<td></td>
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<tr>
<td>BASE OF SUPPORT Heels apart =0; Heels close while walking =1</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>GAIT SCORE TOTAL</strong></td>
<td>/12</td>
<td>/12</td>
<td>/12</td>
<td>/12</td>
</tr>
<tr>
<td><strong>ASSISTIVE DEVICE USED</strong></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL SCORE (BALANCE + GAIT)</strong></td>
<td>/28</td>
<td>/28</td>
<td>/28</td>
<td>/28</td>
</tr>
<tr>
<td><strong>FALL RISK</strong> - (minimal &gt;23, Mod. 19-23, High &lt; 19)</td>
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</tbody>
</table>
**Berg Balance Scale** [BBS, also known as Berg Balance Test]

**Purpose:** Designed to measure functional balance, primarily in standing, in older adults in the clinical setting.

**Time:** 15-20 minutes

**Equipment:** Standard chair, footstool or step, stopwatch, ruler or yardstick

**Scoring:** 16 items are scored on a 5 point ordinal scale (0-4). Each item has unique scoring criteria requiring the rater to have the directions when scoring. Maximum score = 56

**Reliability:** High inter- and intra-rater reliability. Cronbach’s alpha of 0.96 demonstrates excellent internal consistency. In children with cerebral palsy, had high test-retest and inter-rater reliability (ICC >0.95).

**Validity:** Moderate to high correlations with other clinical measures (POMA balance subscale, Barthel, TUG, and gait speed) and the Mini-BESTest. In children with cerebral palsy, high correlations with GMFM, walking speed, and 10 second sit-to-stand test.

**Results:**

- **Normal:**
  - Age 60-69: male ≥ 55; female ≥ 54
  - Age 70-79: male ≥ 52; female ≥ 52
  - Age 80-89: male between 51-54; female between 49-52

- **Sensitivity:** 64% (correctly predicts fallers)
- **Specificity:** 90% (correctly predicts non-fallers)

**Minimal Detectable Change:**
- Actual change has occurred with a ±6 point change (90% CI)
- In persons with MS = 7 point change
- In persons with chronic stroke (95% CI) = 5 points (or 10% improvement from baseline)

**Minimal Important Change:**
- In persons with balance disorders, a change of 7 points or greater indicates an important difference

**Predict fall risk:**
- 41-56 = low risk; 21-40 = medium fall risk; 0-20 = high fall risk
- 45 and below = risk for falls
- 40 and below = risk for falls
- < 36 indicates risk for falls within 6 months (close to 100% of patients)
- Scores ranging from 46-54, a 1 point drop increases fall risk by 6-8%
**Predict safe ambulation:**

>45 for independent safe ambulation

> 48 suggests individual who is safe, independent ambulator vs. individual who may require assistive devices or supervision

**Predict walking ability:**

0–20 = wheelchair bound; 21–40 = walking with assistance; 41-56 = walking independently

BBS score of ≤ 20 and a FIM walk test item score of 1 or 2 at inpatient rehab admission = the patient is likely to only achieve household ambulation speeds by time of discharge

NOTE: A pediatric adapted version, the Pediatric Balance Scale (PBS), is a modified version found to have good test-retest and inter-rater reliability in school-age children with mild to moderate motor impairments.

References:


Berg Balance Scale General Instructions

Please document each task and/or give instructions as written. When scoring, please record the lowest response category that applies for each item.
In most items, the subject is asked to maintain a given position for a specific time. Progressively more points are deducted if:

- the time or distance requirements are not met
- the subject’s performance warrants supervision
- the subject touches an external support or receives assistance from the examiner

Subject should understand that they must maintain their balance while attempting the tasks. The choices of which leg to stand on or how far to reach are left to the subject. Poor judgment will adversely influence the performance and the scoring.

1. **SITTING TO STANDING**
   Instructions: Please stand up. Try not to use your hand for support.
   (4) - Able to stand without using hands and stabilize independently
   (3) - Able to stand independently using hands
   (2) - Able to stand using hands after several tries
   (1) - Needs minimal aid to stand or stabilize
   (0) - Needs moderate or maximal assist to stand

2. **STANDING UNSUPPORTED**
   Instructions: Please stand for two minutes without holding on.
   (4) - Able to stand safely for 2 minutes
   (3) - Able to stand 2 minutes with supervision
   (2) - Able to stand 30 seconds unsupported
   (1) - Needs several tries to stand 30 seconds unsupported
   (0) - Unable to stand 30 seconds unsupported

   If a subject is able to stand 2 minutes unsupported, score full points for sitting unsupported. Proceed to item #4.

3. **SITTING WITH BACK UNSUPPORTED BUT FEET SUPPORTED ON FLOOR OR ON A STOOL**
   Instructions: Please sit with arms folded for 2 minutes.
   (4) - Able to sit safely and securely for 2 minutes
   (3) - Able to sit 2 minutes under supervision
   (2) - Able to sit 30 seconds
   (1) - Able to sit 10 seconds
   (0) - Unable to sit without support 10 seconds

4. **STANDING TO SITTING**
   Instructions: Please sit down.
   (4) - Sits safely with minimal use of hands
   (3) - Controls descent by using hands
   (2) - Uses back of legs against chair to control descent
   (1) - Sits independently but has uncontrolled descent
   (0) - Needs assist to sit
5. TRANSFERS
Instructions: Arrange chair(s) for pivot transfer. Ask subject to transfer one way toward a seat with armrests and one way toward a seat without armrests. You may use two chairs (one with and one without armrests) or a bed and a chair.
(4) - Able to transfer safely with minor use of hands
(3) - Able to transfer safely definite need of hands
(2) - Able to transfer with verbal cuing and/or supervision
(1) - Needs one person to assist
(0) - Needs two people to assist or supervise to be safe

6. STANDING UNSUPPORTED WITH EYES CLOSED
Instructions: Please close your eyes and stand still for 10 seconds.
(4) - Able to stand 10 seconds safely
(3) - Able to stand 10 seconds with supervision
(2) - Able to stand 3 seconds
(1) - Unable to keep eyes closed 3 seconds but stays safely
(0) - Needs help to keep from falling

7. STANDING UNSUPPORTED WITH FEET TOGETHER
Instructions: Place your feet together and stand without holding on.
(4) - Able to place feet together independently and stand 1 minute safely
(3) - Able to place feet together independently and stand 1 minute with supervision
(2) - Able to place feet together independently but unable to hold for 30 seconds
(1) - Needs help to attain position but able to stand 15 seconds feet together
(0) - Needs help to attain position and unable to hold for 15 seconds

8. REACHING FORWARD WITH OUTSTRETCHED ARM WHILE STANDING
Instructions: Lift arm to 90 degrees. Stretch out your fingers and reach forward as far as you can. (Examiner places a ruler at the end of fingertips when arm is at 90 degrees. Fingers should not touch the ruler while reaching forward. The recorded measure is the distance forward that the fingers reach while the subject is in the most forward lean position. When possible, ask subject to use both arms when reaching to avoid rotation of the trunk.)
(4) - Can reach forward confidently 25 cm (10 inches)
(3) - Can reach forward 12 cm (5 inches)
(2) - Can reach forward 5 cm (2 inches)
(1) - Reaches forward but needs supervision
(0) - Loses balance while trying/requires external support

9. PICK UP OBJECT FROM THE FLOOR FROM A STANDING POSITION
Instructions: Pick up the shoe/slipper, which is place in front of your feet.
(4) - Able to pick up slipper safely and easily
(3) - Able to pick up slipper but needs supervision
(2) - Unable to pick up but reaches 2-5 cm (1-2 inches) from slipper and keeps balance independently
(1) - Unable to pick up and needs supervision while trying
(0) - Unable to try/needs assist to keep from losing balance or falling
10. TURNING TO LOOK BEHIND OVER LEFT AND RIGHT SHOULDERS WHILE STANDING
Instructions: Turn to look directly behind you over toward the left shoulder. Repeat to the right. Examiner may pick an object to look at directly behind the subject to encourage a better twist turn.
(4) - Looks behind from both sides and weight shifts well
(3) - Looks behind one side only other side shows less weight shift
(2) - Turns sideways only but maintains balance
(1) - Needs supervision when turning
(0) - Needs assist to keep from losing balance or falling

11. TURN 360 DEGREES
Instructions: Turn completely around in a full circle. Pause. Then turn a full circle in the other direction.
(4) - Able to turn 360 degrees safely in 4 seconds or less
(3) - Able to turn 360 degrees safely one side only 4 seconds or less
(2) - Able to turn 360 degrees safely but slowly
(1) - Needs close supervision or verbal cuing
(0) - Needs assistance while turning

12. PLACE ALTERNATE FOOT ON STEP OR STOOL WHILE STANDING UNSUPPORTED
Instructions: Place each foot alternately on the step/stool. Continue until each foot has touched the step/stool four times.
(4) - Able to stand independently and safely and complete 8 steps in 20 seconds
(3) - Able to stand independently and complete 8 steps in > 20 seconds
(2) - Able to complete 4 steps without aid with supervision
(1) - Able to complete > 2 steps needs minimal assist
(0) - Needs assistance to keep from falling/unable to try

13. STANDING UNSUPPORTED ONE FOOT IN FRONT
Instructions: (DEMONSTRATE TO SUBJECT) Place one foot directly in front of the other. If you feel that you cannot place your foot directly in front, try to step far enough ahead that the heel of your forward foot is ahead of the toes of the other foot. (To score 3 points, the length of the step should exceed the length of the other foot and the width of the stance should approximate the subject’s normal stride width.)
(4) - Able to place foot tandem independently and hold 30 seconds
(3) - Able to place foot ahead independently and hold 30 seconds
(2) - Able to take small step independently and hold 30 seconds
(1) - Needs help to step but can hold 15 seconds
(0 ) - Loses balance while stepping or standing

14. STANDING ON ONE LEG
Instructions: Stand on one leg as long as you can without holding on.
(4) - Able to lift leg independently and hold > 10 seconds
(3) - Able to lift leg independently and hold 5-10 seconds
(2) - Able to lift leg independently and hold ≥ 3 seconds
(1) - Tries to lift leg unable to hold 3 seconds but remains standing independently.
(0) - Unable to try of needs assist to prevent fall
# Berg Balance Scale

<table>
<thead>
<tr>
<th>BALANCE ITEM</th>
<th>SCORE (0-4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sitting unsupported</td>
<td></td>
</tr>
<tr>
<td>2. Change of position: sitting to standing</td>
<td></td>
</tr>
<tr>
<td>3. Change of position: standing to sitting</td>
<td></td>
</tr>
<tr>
<td>4. Transfers</td>
<td></td>
</tr>
<tr>
<td>5. Standing unsupported</td>
<td></td>
</tr>
<tr>
<td>6. Standing with eyes closed</td>
<td></td>
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<tr>
<td>7. Standing with feet together</td>
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<tr>
<td>8. Tandem standing</td>
<td></td>
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<tr>
<td>9. Standing on one leg</td>
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<tr>
<td>10. Turning trunk (feet fixed)</td>
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<tr>
<td>11. Retrieving objects from floor</td>
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<tr>
<td>12. Turning 360 degrees</td>
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<tr>
<td>13. Stool stepping</td>
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<tr>
<td>14. Reaching forward while standing</td>
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</tbody>
</table>

**TOTAL (0-56)**
**Timed Up & Go Test [TUG]**

**Purpose:** Developed as a quick, clinical test of functional gait abilities for the elderly.¹

**Modifications:** Having patient perform TUG with usual gait speed and at a face pace is one modification. TUG-manual requires patient perform holding a full cup of water, while TUG-cognitive requires the patient count backwards from a randomly selected number between 20 and 100.² Modified TUG (mTUG) incorporates split times to break the TUG into subsections (sit to stand, stand to walking, walk, turn, walk back, turn and sit).³

**Time:** Dependent on patient performance, 1-2 minutes to set up.

**Equipment:** Standard chair with arms, 3 meter (‘10’) walkway, cone or marker. For TUG manual a cup of water is needed, and for modified TUG two carpets or mats are needed.

  Note: The patient wears their usual footwear and may use their assistive device as needed. This should be noted in documentation to allow repeatability and increase reliability.

**Scoring:** The patient is timed (in seconds) performing the test starting with the word “Go” and ending when the patient sits down. The patient should be given one trial run before being timed so they are familiar with the test before being timed. If the patient cannot complete the test a second time, this should be documented.

**Reliability & Validity:** Inter-rater reliability was excellent (0.98 to 0.99) for TUG, TUG-manual, TUG-cognitive.² mTUG has high inter-rater reliability and demonstrated concurrent validity with Berg Balance Scale, Functional Reach, and between mTUG split times and total TUG time.³ In children with cerebral palsy the TUG had high test-retest and inter-rater reliability (ICC >0.95)⁴ and in children with TBI good reliability was also found (ICC = 0.86) using the average of first two trials.⁵ Also high correlations with GMFM, walking speed, and 10 second sit-to-stand test were found in children.⁶

**Results:**

*Normal:*
  - < 10 seconds in healthy elders between 60-80⁶
  - 70-79 years old: males between 7-11 seconds; females between 8-10 seconds⁶
  - 80-89 years old: males between 9-11 seconds; females between 9-12 seconds⁶
  - TUG-manual = 11.6 seconds; TUG-cognitive = 9.8 seconds⁷
  - <13.5 seconds for TUG; < 14.5 seconds for TUG-manual; <15 seconds for TUG-cognitive (prediction rates for fallers between 87-90%)²

*Standard error of measurement:* 1 second⁸

*Sensitivity (correctly predicts fallers):* 87%²
  - 80% (using ≥ 13.5 second cut off)⁸

*Specificity (correctly predicts non-fallers):* 87%²
  - 100% (using ≥ 13.5 second cut off)⁸
**Minimal detectable change:**

- In persons with MS = 10.6 seconds
- In persons with chronic stroke = 8 seconds (or 28% improvement from baseline)
- In persons with Alzheimer disease = 4.09 seconds
- In persons with Parkinson disease = 3.5 seconds (or 29.8% improvement from baseline)

**Predict fall risk:**

- > 11.1 seconds in patients with vestibular disorders = increased risk of falls
- > 13.5 seconds in elderly patients = high risk of falls

**References:**


**TUG, TUG-manual, & TUG-cognitive**

The individual must stand up from a chair (not pushed up against a wall), walk a distance of 3 meters, turn around, walk back to the chair and sit down. One practice trial is permitted to allow the individual to familiarize him/herself with the task. Timing commences with the verbal instruction “go” and stops when the client returns to seated position (bottom touches chair). The individual wears their regular footwear and is permitted to use their walking aid (cane/walker). No physical assistance is given. TUG-manual requires patient hold a full cup of water during performance, while TUG-cognitive requires the patient count backwards from a randomly selected number between 20 and 100 during performance.

Figure 1. TUG, TUG-manual, and TUG-cognitive set up.

**Modified TUG (mTUG)**

mTUG uses the same patient instructions and general set up, but to make it easier for the therapist to collect split times, two mats are used under the chair and at the 3 meter mark. The following split times are collected:

- Sit to stand
- Gait initiation (stand to first step off 1st mat)
- Walk 3 meters (step off 1st mat to step onto 2nd mat)
- Turn (step onto 2nd mat, turn)
- Walk 3 meters (step off 2nd mat and return)
- Turn and sit (step onto 1st mat, turn, and sit)

See Figure 2 for an example of set up.
Figure 2. mTUG set up.
**Timed Walking Tests** [6 Minute Walk Test (6MWT) and 2 Minute Walk Test (2MWT)]

**Purpose:** These are tests of functional walking abilities, and can reflect issues around endurance during gait. These tests have been used in people with stroke, head injury, Parkinson’s disease, and various cardiovascular and pulmonary disorders.

**Time:** Depending on test, either 6 minutes or 2 minutes.

**Equipment:** stopwatch, method to measure distance walked

**Scoring:** The distance walked in either 6 minutes or 2 minutes is recorded. Repeatability research demonstrated significant increases in distance walk on 6MWT on second attempt, so it is preferable to use second attempt (if possible for patient to complete two attempts).

Note: Be careful when referencing values in papers to ensure you are using the same units (either feet or meters). To convert, 1 foot = 0.3048 meters or 1 meter = 3.281 feet.

**Reliability:** For 6MWT: Excellent test-retest reliability (ICC = 0.97-0.99). Adequate inter-rater reliability (ICC = 0.78) and intra-rater reliability (ICC = 0.74). 6MWT results show moderate to strong correlation with physical function in critical illness survivors. Test-retest reliability in pediatric clients was high (ICC=0.94) and good correlations with 6MWT and maximal oxygen uptake on treadmill testing. The 6MWT can be used in pediatric clients as young as 3 years when modified using a measuring wheel as incentive.

**Validity:** Excellent concurrent validity of 6MWT to VO₂ max, gait speed, FIM locomotor subscale and adequate concurrent validity with VO₂ peak, FIM motor and FIM total. Excellent convergent validity of 6MWT with 2MWT, BBS, Reintegration to Normal Living Index and adequate convergent validity to quadriceps eccentric paretic strength. In persons with stroke, excellent predictive validity was seen when compared to mean number of steps/day.

**Results:**

**Normal:**

60-69 years: male 521-623 meters; female 497-579 meters
70-79 years: male 478-575 meters; female 440-507 meters
80-89 years: male 356-478 meters; female 345-440 meters
90% of truly stable older adults in long-term care will show random fluctuations in 2MWT within 15 meters

**Responsiveness to change:** Post-intervention increases ranged between 28.2 m to 102.8 m for 6MWT. Additionally, the 6MWT was shown to be sensitive to change in patients with stroke.

**Minimal detectable change:**

6MWT in persons with MS = 76.2 meters
6MWT in persons post stroke in inpatient rehab (90% CI) = 54.1 meters
6MWT in persons with Alzheimer disease (90% CI) = 33.5 meters
Timed 25 foot walk in persons with MS = 12.6 seconds
2MWT in persons with chronic stroke (95% CI) = 13 meters (or 23% improvement from
Minimal Clinically Important Difference: in persons with idiopathic pulmonary fibrosis = 24 to 25 meters\(^8\)

**Pediatric:**

Normalization is by height, not age, in pediatric clients/patients.

See table for ages 7 to 16 years for the 6MWT.\(^{11}\)

Normal weight children norm = 663 meters; obese children norm = 571 meters\(^{12}\)

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References:


**Gait Speed** [also known as comfortable speed and fast speed, walking speed, or gait velocity]

**Purpose:** Customarily, a 10 meter distance (32.81 feet) is used and the patient is timed walking the middle 6 meters of the distance, or alternatively a 15 meter distance is used with the middle 10 meters being timed. Gait speed has been used to determine functional status, discharge location, and the need for rehabilitation in multiple diagnostic categories.

**Modifications:** Many variations of this test exist, including measuring the patient walking any distance while timing. It is important to note that the patient’s acceleration and deceleration should not be part of the timed portion of the test, if possible. The goal is to time the patient walking a steady pace. Hospitalized patients should be able to walk at least 20 feet before considering using this exam. If possible (which may not be the case in acute care due to endurance issues), have the patient perform 2-3 trials and use average or best (document which) for increased reliability. Additionally, if possible, you may collect comfortable (at the patient’s usual pace) and fast (as fast as the patient can safely walk) gait speed.

**Time:** Dependent on patient performance, usually less than 2 minutes; 4 minutes reported in acute care settings.

**Equipment:** stopwatch, ability to measure distance (consider using floor tiles to assist with this)

**Scoring:** See Figure 1 for example. Take the distance (feet or meters) and divide by the time (in seconds). Note: Be careful when referencing values to ensure you are using the same units (either ft/s or m/s). To convert, 1 foot = 0.3048 meters or 1 meter = 3.281 feet.

**Reliability & Validity:** Test-retest reliability (ICC between 0.80 - 0.88), intra-rater reliability (ICC between 0.91 -0.99) are excellent. Concurrent validity with Index of Severity for Knee Osteoarthritis (r = 0.66) and construct validity with self-reported physical function and Sickness Impact Profile. Gait velocity was the best predictor of walking category (household vs. community) in persons following stroke.

**Results:**

**Normal (comfortable speed):**
- 6-12 years: males 1.18 m/s; females 1.13 m/s³
- 13-19 years: males 1.22 m/s; females 1.22 m/s³
- 20-69 years: males 1.37 m/s; females 1.32 m/s³
- 70 + years: males 1.24 m/s; females 1.12 m/s³
- 60-69 years: males 1.46-1.73 m/s; females 1.33-1.55 m/s⁴
- 70-79 years: males 1.25-1.52 m/s; females 1.23-1.43 m/s⁴
- 80-89 years: males 1.06-1.36 m/s; females 1.03-1.26 m/s⁴
- Healthy adults: approximately 1.33 m/s or between 1.2 – 1.4 m/s²

**Normal (fast speed):**
- 60-69 years: males 1.89-2.22 m/s; females 1.73-2.00 m/s
- 70-79 years: males 1.58-2.09 m/s; females 1.63-1.84 m/s
- 80-89 years: males 1.45-1.85 m/s; females 1.43-1.74 m/s
**Ambulation Categories:**
- Household ambulator: < 0.4 m/s
- Limited community ambulator: between 0.4 m/s and 0.8 m/s
- Community ambulator: between 0.8 m/s and 1.2 m/s
- Speed needed to cross street with normal walking speed: > 1.2 or 1.4 m/s

**Predicts ADL function:**
- < 0.6 m/s = dependent in ADLs and IADLs
- > 1.1 m/s = independent in ADLs

**Predicts admission & discharge:**
- < 0.6 m/s = more likely to be hospitalized; > 1.0 m/s = less likely to be hospitalized
- < 0.7 m/s = discharge to skilled nursing likely; > 0.7 m/s = discharge to home more likely

**Predicts need for fall risk intervention:**
- > 1.0 m/s = less likely to have adverse event
- < 1.0 m/s = needs intervention to reduce fall risk

**Predicts mortality:**
- ≥ 0.82 m/s = 1.23 times less likely to die
- ≤ 0.82 m/s = greatest likelihood of death
- ≤ 0.8 = increased risk of mortality in older men over 70 years

**Minimal Detectable Change:**
- For patients undergoing rehab after stroke:
  - Who required physical assistance to walk = 0.07 m/s
  - Who could walk without physical assistance = 0.36 m/s
- For patients in rehab after surgical repair of hip fracture = 0.082 m/s
- For persons with chronic stroke:
  - Comfortable gait speed = 0.2 m/s (or 34% improvement over baseline)
  - Fast gait speed = 0.1 m/s (or 21% improvement over baseline)
- For persons with Alzheimer disease = 0.094 m/s
- For hospital inpatients = 0.18 m/s

**Minimal Clinically Important Difference:** in persons with stroke in outpatient rehab = 0.175 m/s

Figure 1. Suggested method for collecting 10 meter walk test times
References:
1. Braden HJ, Hilgenberg s, Bohannon RW, Ko MS, Hasson S. Gait speed is limited but improves over the course of acute care physical therapy. J Geriatr Phys Ther. 201235(3):140-144.


Function In Sitting Test [FIST]

Purpose: This test was designed to examine the functional deficits seen with sitting balance dysfunction, using everyday tasks. It includes static and dynamic sitting activities ordered from easiest to hardest. Items also cover reactive and proactive balance tasks in sitting. Initial validation was in persons with acute stroke, but other neurologic populations in both acute care and inpatient rehabilitation can use the FIST as well.

Time: Less than 10 minutes

Equipment: hospital bed (no overlay mattress), stool or step (if patient’s feet cannot reach floor), light weight object (pen, tape measure), tape measure, stopwatch

Scoring: 14 items are scored on a 5 point ordinal scale (0-4), which is consistent for all items.

FIST Web-based Training: (http://www.samuelmerritt.edu/fist) includes downloadable versions of the training manual, documentation sheets, and video clips showing varied performance of each item.

Reliability & Validity: The FIST showed high internal consistency (coefficient alpha = 0.98 and person separation reliability = 0.98) and concurrent validity with sitting balance grades (0.93) and modified Rankin Score (-0.73). Intra-rater reliability (ICC=0.996) and inter-rater reliability (ICC=0.991) are both excellent. Concurrent validity FIST to both the FIM and Berg Balance Scale at admission and discharge was good to excellent (Spearman’s rho r=0.684 to 0.787). FIST admission scores showed good to moderate correlations (Spearman’s rho r=0.645 to 0.693) with FIM and Berg Balance Scale at discharge supporting predictive validity of the FIST.

Results:

Standard Error of Measurement: 2.03, indicating a change in score of > 2 points exceed the error of the measure.

Minimal Detectable Change: > 5 points (90% confidence) or > 6 points (95% confidence)

Responsiveness: in patients (n=51) in inpatient rehabilitation a large effect size (0.95) and standardized response mean (0.94) were found.

Website: Visit the FIST Web-Based Training website for updated information and more details:
http://www.samuelmerritt.edu/fist

References:


## Function in Sitting Test (FIST) Results

<table>
<thead>
<tr>
<th>FIST Test Item</th>
<th>Date:</th>
<th>Date:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>½ femur on surface; hips &amp; knees flexed to 90°</td>
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<tr>
<td>□ Used step/stool for positioning &amp; foot support</td>
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<tr>
<td><strong>Randomly Administered Once</strong></td>
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<tr>
<td>Anterior Nudge: superior sternum</td>
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<tr>
<td>Posterior Nudge: between scapular spines</td>
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<tr>
<td>Lateral Nudge: to dominant side at acromion</td>
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<tr>
<td><strong>Static sitting</strong>: 30 seconds</td>
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<tr>
<td><strong>Sitting, shake ‘no’</strong>: left and right</td>
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<tr>
<td><strong>Sitting, eyes closed</strong>: 30 seconds</td>
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<tr>
<td><strong>Sitting, lift foot</strong>: dominant side, lift foot 1 inch twice</td>
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<tr>
<td><strong>Pick up object from behind</strong>: object at midline, hands breadth posterior</td>
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<tr>
<td><strong>Forward reach</strong>: use dominant arm, must complete full motion</td>
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<tr>
<td><strong>Lateral reach</strong>: use dominant arm, clear opposite ischial tuberosity</td>
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<tr>
<td><strong>Pick up object from floor</strong>: from between feet</td>
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<tr>
<td><strong>Posterior scooting</strong>: move backwards 2 inches</td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Anterior scooting</strong>: move forward 2 inches</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Lateral scooting</strong>: move to dominant side 2 inches</td>
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<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>/ 56</td>
<td>/ 56</td>
<td>/ 56</td>
</tr>
<tr>
<td><strong>Administered by:</strong></td>
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<tr>
<td><strong>Notes/comments:</strong></td>
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</table>

### Scoring Key:

- **4** = Independent (completes task independently & successfully)
- **3** = Verbal cues/increased time (completes task independently & successfully and only needs more time/cues)
- **2** = Upper extremity support (must use UE for support or assistance to complete successfully)
- **1** = Needs assistance (unable to complete w/o physical assist; document level: min, mod, max)
- **0** = Dependent (requires complete physical assist; unable to complete successfully even w/physical assist)
Resources for Functional Tests & Measures

Multiple online resources, training DVDs and websites can help you locate, use, score, and integrate functional measures into your practice. Here is a list of selected resources that might be valuable in acute care practice.

Rehabilitation Measures Database:
http://www.rehabmeasures.org/default.aspx

Neurology Section Outcome Measures Recommendations:
http://www.neuropt.org/go/edge

PTNow

StrokEngine Assess:
http://medicine.mcgill.ca/strokengine-assess

Center for Outcome Measurement in Brain Injury:
http://www.tbims.org/combi/list.html

Spinal Cord Injury Rehabilitation Evidence:
http://www.scireproject.com

Orthopaedic Scores:
http://www.orthopaedicscore.com/

Geriatric Examination Toolkit:
http://web.missouri.edu/~proste/tool/

Geriatrics at Your Fingertips:
http://www.geriatricsatyourfingertips.org/

PROMIS® Dynamic Tool to Measure Health Outcomes from a Patient Perspective
http://www.nihpromis.org/measures/measureshome

NIH Toolbox Assessment of Neurological and Behavioral Function
http://www.nihtoolbox.org/Pages/default.aspx

Evidence Based Review of Stroke Rehabilitation

Physiopedia Outcome Measures
http://www.physio-pedia.com/Outcome_Measures

Special Considerations in Acute Care Environments:

- Floor and ceiling effects of measure
- Activity level measures look at function—important for discharge
- Ability to capture expected change (both during acute episode and later in continuum of care)
- Augment with physiologic measures to assess patient tolerance & endurance—heart rate, respiratory rate, blood pressure, oxygen saturation
Smartphone & Tablet Apps with Functional Tests & Measures

Smartphone and/or tablet applications ("apps") can be used to perform and calculate results for some functional tests & measures. Some may allow you to email results or to integrate/upload in EHR. Accessibility will vary depending on the operating system of your smartphone/tablet, and some apps may not be optimized for tablet use. Additionally, some of these apps are free while others may require purchase. A selection of apps that have tests and measures that may be applicable to acute care practice are listed below by their name.

www.apps4pt.tk (website with PT-specific apps and reviews)
Cardio Calc
Med Calc
ePSS (AHRQ)
AGS iGeriatrics
Geriatrics at Your Fingertips
NIHSS
iPT
EIM STEADI
TinettiX
Unit conversion apps (to convert ft/sec to m/sec)