Falls Risk Assessment
in Older People

Professor Stephen Lord
Prince of Wales Medical Research Institute
Assessing falls risk
- unrealistic expectations?

- The causes of falls are multifactorial in nature

- There is a desire for a single test or quick assessment of falls risk
Screening or assessment?

Screening – identification of people at risk
- Increased surveillance
- Referral for further assessment and intervention

Assessment - identification of risk factors amenable to treatments / correction
- Tailoring intervention strategies
Simplest screen

- Have you fallen in the past 12 months?
  - Degree of difficulty – easy
  - Sensitivity and specificity – reasonable
  - Information gained about prevention strategies – nil
Hospitals: STRATIFY (Oliver 1997)

- **Items**
  - falls as a presenting complaint
  - agitation
  - frequent toileting
  - visual impairment
  - transfer and mobility score

- Sensitivity 93% and specificity of 88% in development hospital
- Sensitivity 92% and specificity 68% in different hospital
Timed Up and Go Test

- Recommended by American and British Geriatrics Societies
- Surprisingly little validation as a predictor of falls
- Varying methods
  - Usual vs. fast performance
  - Differing walk distances: 3m vs. 8ft
  - Differing instructions about turning: walk to line, walk past line, walk around a cone
- Varying cut-points: 10s, 14s, 15s, 22s
Timed Up and Go Test - recommendations

- Most widely used method
  - Perform at usual (own) pace
  - Chair with seat height of 43cm with armrests
  - Walk distance of 3m
  - Walk past line and turn

- Cut-points
  - 10s for community-dwelling people
  - 15s for frail groups
Assessment batteries

- Berg Balance Scale
  http://www.physicaltherapy.utoronto.ca/assetfactory.asp?id=126

- Tinetti Performance Oriented Mobility Assessment (POMA)

- Physical Performance battery (Guralnik et al)

- Elderly Fall Screening Test

- Gait Abnormality Rating Scale
Guralnik Physical performance battery

- Has been used in very large studies, and normative values have been established
- Comprises
  - timed standing balance
  - repeated chair stands
  - timed walk
- Each item scored / 4 with combined score / 12
SCORING:

A. SIDE-BY-SIDE STAND

Held for 10 seconds .... 1 point
Not held for 10 seconds .... 0 points
Not attempted .... 0 points

IF 0 points, end Stands Test

IF NOT ATTEMPTED, CIRCLE ANSWER:

Tried but unable .... 1
Participant could not stand unassisted .... 2
Not attempted, you felt unsafe .... 3
Not attempted, participant felt unsafe .... 4
Participant unable to understand instructions .... 5

Number of seconds held if less than 10 seconds .... seconds

B. SEMI-TANDEM STAND

Held for 10 seconds .... 1 point
Not held for 10 seconds .... 0 points
Not attempted .... 0 points

IF 0 points, end Stands Test

Number of seconds held if less than 10 seconds .... seconds

C. TANDEM STAND

Held for 10 seconds .... 2 points
Held for 3 to 9 seconds .... 1 point
Not held for at least 3 seconds .... 0 points
Not attempted .... 0 points

Number of seconds held if less than 10 seconds .... seconds

D. TOTAL STANDS SCORE (sum points)

Comments: __________________________________________________________

__________________________________________________________________
Comparison of 8 function tests

- Sit-to-stand 1x & 5x
- Alternate step test (19cm high step)
- Turn test (n steps to turn 180 degrees)
- 6m walk – normal speed
- Pick-up 5kg weight test
- Stair ascent (8 steps - 5cm high, 27cm deep)
- Stair descent (8 steps - 5cm high, 27cm deep)

362 community-dwelling people aged 75+

Compared w.r.t. validity, reliability and feasibility
Sit-to-stand test and Alternate Step Tests
# Functional tests - recommendations

<table>
<thead>
<tr>
<th>Test</th>
<th>Validity</th>
<th>Reliability</th>
<th>Feasibility</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>STS- 5</td>
<td>10</td>
<td>5</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>Alt step</td>
<td>10</td>
<td>4</td>
<td>4</td>
<td>18</td>
</tr>
<tr>
<td>6m walk</td>
<td>10</td>
<td>4</td>
<td>3</td>
<td>17</td>
</tr>
<tr>
<td>Stair des</td>
<td>10</td>
<td>5</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>Stair asc</td>
<td>5</td>
<td>5</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Turn</td>
<td>0</td>
<td>4</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>STS - 1</td>
<td>0</td>
<td>2</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Pick-up</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Need for multiple tests for falls prediction

- Poor performances in two tests did increase risk
- Poor performances in 3+ tests did not increase risk further

<table>
<thead>
<tr>
<th>Impairments</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1.9</td>
</tr>
<tr>
<td>2</td>
<td>4.7</td>
</tr>
<tr>
<td>3</td>
<td>5.0</td>
</tr>
<tr>
<td>4</td>
<td>4.7</td>
</tr>
</tbody>
</table>
QuickScreen Assessment Form

**QuickScreen® Clinical Falls Risk Assessment**

<table>
<thead>
<tr>
<th>MEASURE</th>
<th>RISK FACTOR PRESENT?</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous Falls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One or more in previous year</td>
<td>Yes/No</td>
<td></td>
</tr>
<tr>
<td>Medications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Four or more (excluding vitamins)</td>
<td>Yes/No</td>
<td></td>
</tr>
<tr>
<td>Any psychotropic</td>
<td>Yes/No</td>
<td></td>
</tr>
</tbody>
</table>

**Recommendation:** Review current medications.

**Vision**

| Low contrast visual acuity test | Yes/No | |
| Unable to see all of line 10 | Yes/No | |

**Recommendation:** Give vision information sheet. Examine for glaucoma, cataracts and suitability of spectacles. Refer if necessary.

**Peripheral Sensation**

| Tactile sensitivity test | Yes/No | |
| Unable to feel 2 out of 3 toes | Yes/No | |

**Recommendation:** Give sensation loss information sheet. Check for diabetes.

**Strength/ Reaction Time/ Balance**

| Near tandem stand test | Yes/No | |
| Unable to stand for 15 seconds | Yes/No | |
| Alternating step test | Yes/No | |
| Unable to alternate in 15 seconds | Yes/No | |
| Sit to stand test | Yes/No | |
| Unable to complete in 12 seconds | Yes/No | |

**Recommendation:** Give strength/balance information sheet. Refer to community exercise class or home exercise program if appropriate to individual level of functioning.

**Number of risk factors**

<table>
<thead>
<tr>
<th>Number of risk factors</th>
<th>0-1a</th>
<th>2-3a</th>
<th>4a</th>
<th>5a</th>
<th>6a</th>
<th>6+ a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total risk increase</td>
<td>1a</td>
<td>2.2a</td>
<td>3.7a</td>
<td>4.8a</td>
<td>10.1a</td>
<td></td>
</tr>
</tbody>
</table>

**Risk Increase:** The patient has ________ times the risk of falling as someone with no risk factors.
Fall Risk Assessment - PPA

- Physiological, rather than disease-oriented
- Involves quantitative functional assessment of sensorimotor abilities
- Assumes that most disease processes will be manifest in impaired performances in one or more tests
  - Cataracts - poor vision
  - Neuropathy - poor sensation
  - Prior-polio - weakness
  - Stroke - weakness, incoordination, instability
Contrast sensitivity - MET
Proprioception
Lower Limb Strength
Reaction Time - Hand & Foot
Sway on floor and on foam
PPA Short form

- Significant and independent predictors
  Coefficients

- Visual contrast sensitivity: -0.33
- Proprioception: 0.20
- Quadriceps strength: -0.16
- Simple reaction time: 0.47
- Postural sway on the compliant surface: 0.51

- Percentage of subjects correctly classified: 75%.
# FallScreen

## PHYSIOLOGICAL FALLS ASSESSMENT

**Name:** Mrs Mary Quitecontrary  
**Age:** 70  
**Assessment date:** 1/3/2006  
**Assessment Number:** 1

## TEST RESULTS

<table>
<thead>
<tr>
<th>Measure</th>
<th>Score</th>
<th>Young normal</th>
<th>Age-matched</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vision</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Edge contrast sensitivity (dB)</td>
<td>5**</td>
<td>(23 - 24)</td>
<td>(20 - 24)</td>
</tr>
<tr>
<td><strong>Sensation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proprioception - legs (degrees)</td>
<td>1.8</td>
<td>(0.2 - 1.4)</td>
<td>(0.4 - 2.4)</td>
</tr>
<tr>
<td><strong>Strength</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knee extension strength (kg)</td>
<td>19</td>
<td>(35 - 58)</td>
<td>(15 - 29)</td>
</tr>
<tr>
<td><strong>Speed and Control</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reaction time - hand (ms)</td>
<td>250</td>
<td>(182 - 236)</td>
<td>(197 - 267)</td>
</tr>
<tr>
<td><strong>Balance</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sway on foam - eyes open (mm)</td>
<td>54.07#</td>
<td>(60-110)</td>
<td>(65 - 163)</td>
</tr>
</tbody>
</table>

~ Women aged 70-74 years.  
# Better than average age-matched (i.e. top 10%).  
** Worse than average age-matched.

**Notes:**  
1. Low scores in proprioception, reaction time and sway tests and high scores in edge contrast sensitivity and strength indicate good performances.  
2. Population norms from the Randwick Falls and Fractures Study.
**Falls Risk Test Scores**
The blue bars show performance in each test in relation to norms for persons aged 60 years and over. Scores above zero show above average performances and scores below zero show below average performances. Scores below -1 indicate significant impairments.

Report for: Mrs. Mary Quitecontrary  
Assessment date: 1/3/2006  
Assessment number: 1  
Falls risk score: 2.7

<table>
<thead>
<tr>
<th>Test</th>
<th>Z-score</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edge Contrast sensitivity</td>
<td>-2.37</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proprioception</td>
<td>-0.29</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knee extension strength</td>
<td>-0.14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reaction time - hand</td>
<td>-0.12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sway on foam eyes open</td>
<td>-0.78</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Back to previous page
The Falls Risk Score is indicated by the cross. The lower the score the better. The light curved band shows the normal range across age-groups.

Your score of 1.2 indicates a **moderate** risk of falling.
Dear Mrs Mary Quitecontrary,

Please find attached the report regarding your balance assessment at Prince of Wales Medical Research Institute on 1/3/2006. These test results indicate that you have an increased risk of falling.

You performed well in the important test/s of sway on foam - eyes open. In some areas however, you were below average for your age group, so the following recommendations may be of help to you.

Your vision test was below average. Reduced vision can increase the risk of a trip over an unseen object in the environment such as steps, gutters and footpath cracks and raised edges. It is recommended that you should see an eye specialist for an assessment if you have not done so in the past year. You may also benefit by wearing a single lens pair of glasses, especially when outside. It is recommended that you do not wear bifocal or multifocal spectacles, as the lower sections of these spectacles blur items at critical distances on the ground and this can lead to trips. Wearing a hat when outside also improves vision by reducing glare substantially.

For enquiries regarding this report, please contact the Falls Risk Assessment Program at Prince of Wales Medical Research Institute on 9399 1000.

Yours sincerely,

Dr Fixit
Falls Screening and Assessment Trade-offs

SIMPLE

- Low cost
- Short Time
- Technical Simplicity
- Understanding Causes
- Identifying Factors Amenable to Treatment
- Likelihood of Prevention

COMPREHENSIVE
Conclusions

- Epidemiological studies have identified demographic, physiological and medical risk factors for falls.
- This information can be used to compile evidence-based fall risk screens and assessments.
- The screen or assessment used depends on the resources available and the extent to which the understanding of the causes of falls is required.