Risk Factors for Falls in Cognitive Impairment

A/Prof Jacqueline Close
Falls and Injury Prevention Group – NeuRA
Prince of Wales Clinical School
University of New South Wales
Background
Epidemiology of falls in CI/ Dementia

- Annual incidence of falls in cognitively impaired populations is 70-80% ie. double the normal population
- Fractures are up to 3x more common
- Gait abnormalities are more common
- Psychotropic drug use more common
- Orthostatic hypotension more common
- 26% of hospital admissions in people with dementia are fall related
Older people presenting to ED

- 24 month prospective identification of all people aged 70+ presenting to POWH ED
- Data collected on reason for presentation, previous presentations and admissions, discharge destination, LOS, and DRG information
- 18,902 ED presentations
- Mean age 80.8 (6.73) yrs
- 54% female
Fallers

- A fall contributed to 3,220 (17%) presentations in 2,703 individuals.
- 1:6 presentations to ED = fall (4.4 cases/day)
- Fallers were older (82.5yrs v 80.5yrs)
- More likely to be female (63.2% v 52.3%)
- More likely to live in RACF (18.4% 12.4%)
- More likely to have had a hospital admission in the previous year
- More likely to be admitted (49.8%)
1,036 cases received acute care only (78%)

Geriatric Medicine – 43.6%
Acute LOS – 14.4 days

Orthopaedics – 36.9%
Acute LOS – 13.7 days

Acute and Rehabilitation
LOS women – 30.1 days
LOS men – 35.6 days
Delirium / Dementia code present in 351 (36%) admissions

Comparison of LOS data
Total
25.4 v 18.9 days p<0.0001

Acute LOS
18.4 v 12.3 days p<0.001

Rehabilitation LOS
37.2 v 33.8 p=0.053
“As the majority of trials specifically excluded older people who were cognitively impaired, the results of this review may not be generalisable to this important group of people at risk. Research on the impact of management programmes for other risk factors such as cognitive impairment and urinary incontinence on risk and rate of falling appears justified”
“There is insufficient evidence to recommend for or against multifactorial or single interventions to prevent falls in older persons with known dementia living in the community or in long-term care facilities.”
Extrapolation from existing trials

If the mechanism by which the intervention has its effect is understood and not felt to be affected by the presence of cognitive impairment / dementia then it is reasonable to extrapolate data from trials undertaken in cognitively intact populations.

Example 1. Treatment of osteoporosis with bisphosphonates.

Note: It assumes that the relative contribution of risk factors to overall risk in cognitively impaired people is comparable to that of cognitively intact subjects.
Extrapolation

Sensory input → Central Processing → Effector Response
Understanding the risk
Falls in Cognitively Impaired Subjects

- Prospective risk factor study
- Aged 60+
- Diagnosis of CI ± dementia
- Recruited from hospital, clinics, adverts etc
- Had to have consenting “carer”
Methods

- Demographic information
- Medical history & medication use
- Previous falls
- Physiological measures
- Neuropsychological measures
Follow Up

- 1 year follow up
- Monthly falls calendars
- Fall defined using ProFaNE consensus definition
- Multiple faller defined as someone with 2 or more falls in the one year follow-up
Methods (Case Control Study)

- Case Control Study
- 414 community dwelling older people
  - 138 with cognitive impairment / dementia
  - 276 age and sex matched cognitively intact
- Compared physiological function and prospective falls
Physiological Profile Assessment (PPA)

- Melbourne Edge Test
- Proprioception
- Simple Reaction Time
- Quadriceps Strength
- Postural Sway

Fall Risk Score: predicts recurrent falls with 75% accuracy (Lord et al., 2003)
Co-Ordinated Stability

error score=16
Near Tandem Stand
Results
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Cognitively Intact N=276</th>
<th>Cognitively Impaired N=138</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean ± SD</td>
<td>81.61 ± 5.84</td>
<td>81.95 ± 6.71</td>
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<tr>
<td>Female, n (%)</td>
<td>136 (49)</td>
<td>68 (49)</td>
</tr>
<tr>
<td>MMSE, mean ± SD</td>
<td>28 ± 1.6</td>
<td>23 ± 4.1**</td>
</tr>
<tr>
<td>Education, yrs, mean ± SD</td>
<td>11.4 ± 3.4</td>
<td>9.9 ± 3.0**</td>
</tr>
<tr>
<td>Characteristic</td>
<td>Cognitively Intact</td>
<td>Cognitively Impaired</td>
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<tr>
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<tr>
<td>Stroke, n (%)</td>
<td>11 (4)</td>
<td>19 (14)</td>
</tr>
<tr>
<td>Depression, n (%)</td>
<td>40 (18)</td>
<td>40 (29)</td>
</tr>
<tr>
<td>Total Number Medications, mean + SD</td>
<td>5.6 ± 3.2</td>
<td>7.5 ± 4.2</td>
</tr>
<tr>
<td>Psychoactive med use, n (%)</td>
<td>46 (17)</td>
<td>50 (36)</td>
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</tbody>
</table>
History of Falls in previous year

- Intact:
  - 19% Single Fall
  - 14% Multiple Falls

- Impaired:
  - 27% Single Fall
  - 38% Multiple Falls

$p < 0.001$
Physiological Comparisons at Baseline

**Hand Reaction Time**

- Intact: 260 milliseconds
- Impaired: 320 milliseconds

*Significance: p < 0.001*  

**Quadriceps Strength**

- Intact: 28 kilograms
- Impaired: 18 kilograms

*Significance: p < 0.001*
Physiological Comparisons at Baseline

Sway on foam

Co-Ordinated Stability

\[ p < 0.001 \]
## Follow-up falls data

<table>
<thead>
<tr>
<th>0</th>
<th>Intact</th>
<th>Impaired</th>
</tr>
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<tbody>
<tr>
<td>53%</td>
<td>32%</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>1</th>
<th>Intact</th>
<th>Impaired</th>
</tr>
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<tbody>
<tr>
<td>23%</td>
<td>23%</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>2+</th>
<th>Intact</th>
<th>Impaired</th>
</tr>
</thead>
<tbody>
<tr>
<td>24%</td>
<td>45%</td>
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</table>
Balance: Co-ordinated Stability

Co-ordinated Stability Score (errors)

<table>
<thead>
<tr>
<th>Cognitively Intact</th>
<th>Cognitively Impaired</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-multiple fallers</td>
<td>Multiple fallers</td>
</tr>
</tbody>
</table>
Hand Reaction Time

Cognitively Intact
- Non-multiple fallers
- Multiple fallers

Cognitively Impaired
- Non-multiple fallers
- Multiple fallers
Physiological Predictors in CI population

Best model – correctly classifies 71% of people

Timed near tandem stand

OR 0.80 (95%CI 0.71-0.90)

Z HRT

OR 1.51 (95%CI 1.04-2.19)

Best clinical model- correctly classifies 68% of people

Timed near tandem stand

OR 0.831 (95%CI 0.75-0.92)
Discussion

- Cognitively impaired people perform worse on physiological tests when compared to cognitively intact.

- Sensorimotor deficits are associated with prospective falls in people with cognitive impairment.

- Within the cognitively impaired group, a simple measure of balance and reaction time can classify 71% of the population.
Discussion

- Likely that people with cognitive impairment will benefit from an exercise intervention
- Pilot data suggests that it is possible to deliver a tailored exercise and environmental intervention
- Remains to be seen if this can reduce falls
- Important not to exclude people with cognitive impairment from some interventions
Acknowledgements

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