Falls and Cognitive Impairment

Falls in different groups

Lord et al, 1993; Forster & Young, 1995; Hill, 1998; Hill & Stinson, 2004
Epidemiology of Falls in Dementia

- 60-90% of older people with dementia (twice the rate of older people without cognitive impairment)
- Approx. 3 times increased fracture risk
- Fallers with dementia are 5 times more likely to be institutionalized


DEMENTIA

- Those with dementia:
  - 42,000,000 worldwide
  - 320,000 Australians
  - Aboriginal and Torres Strait Islander people experience dementia at a rate 3 to 5 times higher than the general Australian population
  (Alzheimer’s Australia, Ferri et al 2005, Alzheimer’s Australia Flicker 2014)

- Main types
  - Alzheimer’s Disease
  - Vascular Dementia
  - Lewy Body Disease
Alzheimer’s Disease
>60% people with dementia
>1 deficits of cognition
Progressive Impairs daily activities and behaviour
Depression
Incontinence
Delusions
Aggression
Weight loss
As advances – motor signs

Vascular Dementia
10-20% people with dementia
Evidence of >1 ischaemic stroke
Deficits in orientation, attention, language, motor, executive
Gait and balance impairment, falls urinary frequency, urgency, mood changes, abnormal executive function

Lewy Body Disease (DLB, PD, PDD)
10-20% people with dementia
Neurodegenerative Lewy bodies in brain (protein – alpha-synuclein)
Cog impaired – fluctuates
Visual hallucinations
Parkinson’s motor symp
Syncope
Auntonomic dysfunction

50-60 increasing age 70-80
Lewy body disease (LBD)

Parkinson’s disease (PD)

Lewy body dementias (LBDs)

PD dementia (PDD)

Dementia with Lewy bodies (DLB)

(Adapted from McKeith, 2010)
And also......

- Frontotemporal dementia
- Early onset dementia
- Mild cognitive impairment

Allan et al, 2009, PLoS One
Behavioural and psychological symptoms of dementia

**Behaviour**
- Aggression
- Agitation
- Aberrant motor behaviour e.g. wandering, repetitive movements
- Sleep/nighttime behaviour
- Appetite/eating
- Hoarding

**Personality alteration**
- Disinhibition
- Passivity
- Apathy
- Attention seeking
- Irritability
- Lability

**Mood**
- Depression
- Anxiety
- Elation/euphoria

**Thought content/perception**
- Hallucinations
- Delusions

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Physical Comorbidities of Dementia (Kurrle 2012)

- Falls
- Epilepsy
- Delirium
- Frailty
- Malnutrition
- Gum Disease/dental disease
- Visual Impairment
- Sleep Disorders
- Incontinence
Falls risk factors

- Previous falls
- Previous injurious falls
- Medications: psychotropics, sedatives, antidepressants
- Medical conditions e.g. stroke
- Dizziness, postural hypotension
- Visual/somatosensory deficits
- Gait/balance impairment
- Foot problems
- Footwear
- Cognition
- Continence problems
- Loss of appetite/weight
- Alcohol intake
- Environment
- Risk taking
- Function

Predictors of falls in people with dementia

- Diagnosis of LBD
- Longer duration of dementia
- Previous history of falls/recurrent falls
- Cardioactive medications
- Autonomic symptoms
- Symptomatic orthostatic hypotension
- Depression
- Physical activity limitation

Allan et al, 2009
Cumulative effect.....

Risk factors:
• Antidepressant use
• Increased sway eyes closed
• Attention & orientation issues
• Anxiety

Whitney et al 2012

What are your observations of

• Gait
• Balance

in people with cognitive impairment?
Table 2
Gait and Balance Impairments in Older People with Dementia

<table>
<thead>
<tr>
<th>Gait impairments in older people with dementia*</th>
<th>Balance impairments in older people with dementia*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slower walking speed</td>
<td>Increased double support time</td>
</tr>
<tr>
<td>Reduced step frequency</td>
<td>Increased sway path</td>
</tr>
<tr>
<td>Shorter step length</td>
<td>Increased unsteadiness</td>
</tr>
<tr>
<td>Increased postural flexion</td>
<td>Impaired one/two leg balance, eyes open/closed</td>
</tr>
</tbody>
</table>

* Compared with age- and sex-matched controls/standardized for age and sex.

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Mechanism of postural control

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Gait and balance changes with dementia

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Shaw et al., 2003
Balance changes with dementia - People with Cognitive Impairment

- those who fall more have:
  • Increased reaction time
  • Increased postural sway
  • Increased leaning balance

- compared to controls
  • Decreases muscle strength (grip and quadriceps)
  • Worse balance (sway on floor and foam, leaning and tandem standing)
  • Poorer mobility – sit to stand, TUG, steps to turn

Taylor 2012, Taylor 2013
What causes balance and gait impairments in people with dementia?

- Peripheral conditions
- Central impairments
  - “Classic” motor disorders in the basal ganglia
  - Central processing problems (including attention, executive functions, processing speed)

Martin 2013, Beauchet 2008, Shaw et al., 2003; Chong et al., 1999

Stage of dementia?

LATE (More severe cognitive decline)

- Gait and balance disorders are related to severity of cognitive decline

  Motor disorders commonly described in later stages e.g. gait apraxia, bradykinesia, extrapyramidal rigidity, resting tremor, cautious gait, gait slowing
Dementia related gait changes

(All stages of dementia)

• Decrease in walking speed
  • Decrease in stride length
  • Increase in support phase
    • parallels severity of Alzheimer’s disease
    • Vascular dementia and dementia with Lewy bodies walked more slowly than AD

Beauchet 2008

EARLY  (Mild or moderate cognitive impairment)

• Increase in stride-to-stride variability

Recent Studies:
• Anti dementia drugs and changes in gait
• Executive function impairment, falls and physical performance

Beauchet 2013
Muir 2013, Mirelman 2012
What is dual task?

Walking while talking

- Interaction of cognition and gait
- Indicates a difficulty with dual task
- Predictor of falls

Ayers 2014
Studies of dual tasks and cognitive impairment

- The effects of a concurrent motor task on walking in Alzheimer's disease.
  - Walking with a motor dual-task produced significantly slower and more variable gait and was feasible for people with severe AD.

Recent findings: what next?

- Vitamin D – its role in cognition and in gait
- Motor signature for types of MCI
- Anatomical changes
- Motor imagery times to detect MCI
Practical issues in Gait and Balance assessment with people with cognitive impairment

- Must include dual task analysis
- Include obstacles in gait analysis
- Include directional changes in gait analysis
- If possible, look at stride to stride variability
- Consider fatigue particularly in “wanderers”