Understanding and Preventing Falls in Dementia

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Objectives

- Introduce the role of cognitive function in postural control
- Improve the understanding of fall risk assessment and fall prevention in the cognitively impaired older adult

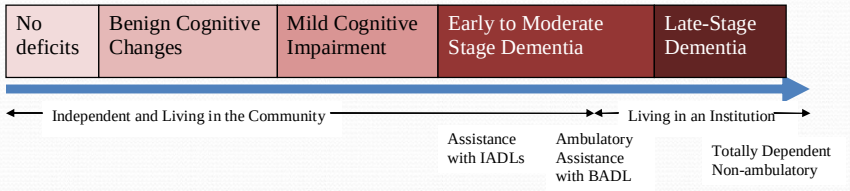
Cognitive Impairment & Dementia

Cognitive Function & Aging- Epidemiology

- Benign age-associated changes
- Mild Cognitive Impairment prevalence
  - 16-20% adults over age 65 years
- Dementia prevalence
  - 55% of people with dementia living in community
  - Under diagnosed
  - 35% dementia diagnosis on inpatient geriatric rehabilitation

Cognitive Function & Aging

- Cognitive function is a continuum:
  - Normal through benign age-associated changes to end-stage dementia
  - Not normal part of aging to pass through this entire spectrum
- Cognitive impairment is not a single point in time
  - Important: any impairment is relevant not just diagnosis of dementia



Dementia – It is not one disease

- Most common types:
  - Alzheimer's disease (50-70%)
  - Vascular dementia (25%)
    - Prevalence rates linked to rates of stroke – 10x risk
    - 10% conversion to dementia within 1 yr after first stroke
  - Lewy body dementia (15-35%)
    - 35-90% have concurrent pathology of AD
  - Fronto-temporal dementia
    - Most common in 40-60 yrs
- Important to distinguish between dementia types
  - Heterogeneous
  - Different pathological processes

Falls in Older Adults

Epidemiology of Falls in Older Adults

- Falls in older adults are a common event
  - 30% community-dwelling adults over 65 will fall at least once each year
    - 50% will have recurrent falls
    - 50% will sustain an injury
      - 10-15% suffer serious injury
      - 2-6% suffer a fracture
      - 0.2-1.5% suffer a hip fracture
- 1.3 million Canadian older adults fall each year

(PHAC 2005)

Fall Risk Factors in Older Adults

- Clinical practice guidelines for fall prevention emphasize intrinsic risk factors:
  - Balance
  - Gait
  - Vision
  - Lower extremity muscle strength
- Consideration for extrinsic risk factors:
  - Medications
  - Home environment

Postural Stability

Linking thinking and mobility

Postural Stability

- Requires the integration of information from multiple systems:
  - Vision
  - Somatosensory system
  - Vestibular system
  - Motor system
  - Reaction time
  - Cognition (Horak 2006)

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Postural Stability

- Coordination of motor and sensory systems
  - Linked by higher order neurological processes and cognition
  - Perception of environmental stimuli
  - Responding to alterations in the body's orientation in the environment to control body movement (Horak 2006; Lord et al 2007)

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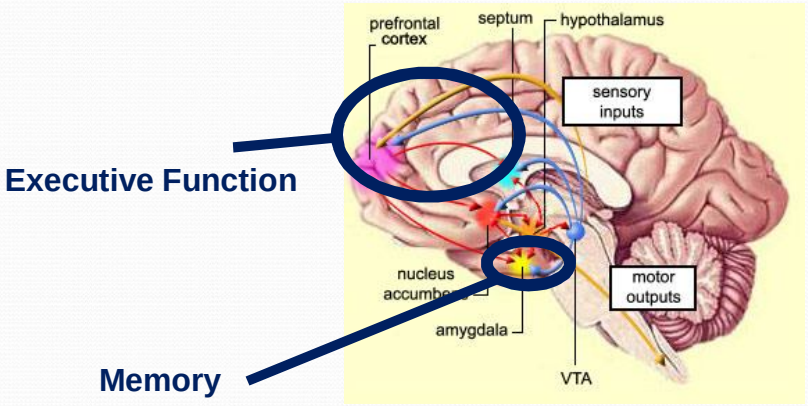
Neuroanatomy of Postural Stability



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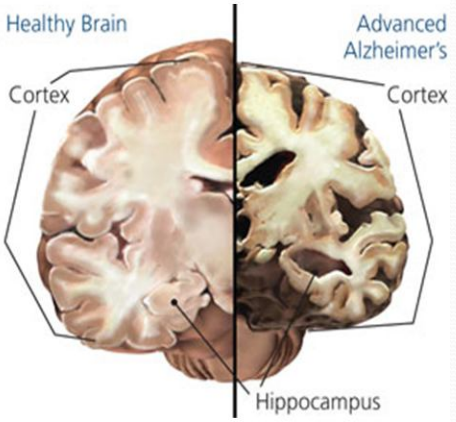
Neuroanatomy of Postural Stability

- Pathology – Alzheimer Disease
  - Impaired brain structures
    - Frontal-subcortical circuits
    - Hippocampus



(Annweiler et al. Am J Alzheimers Dis 2012)

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Cognitive Function & Postural Stability

- Cognition has a key role in the regulation of gait and balance (Woollacott & Shumway-Cook 2002)
- Gait and balance:
  - "should be treated as a higher level of cognitive functioning" (Hausdorff et al. 2005)
  - Higher level cognitive domains
    - Executive function, attention

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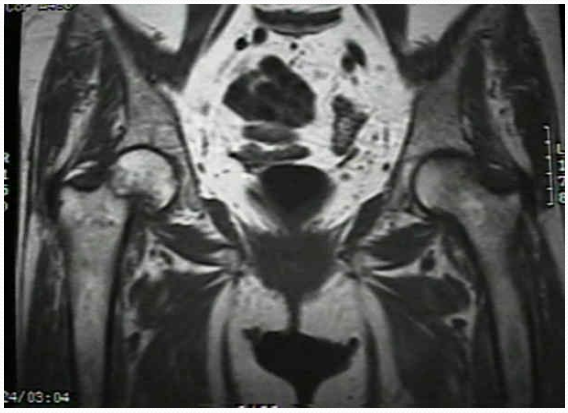
Falls and Cognitive Impairment

Falls in the Cognitively Impaired

- Why focus on this population of older adults?

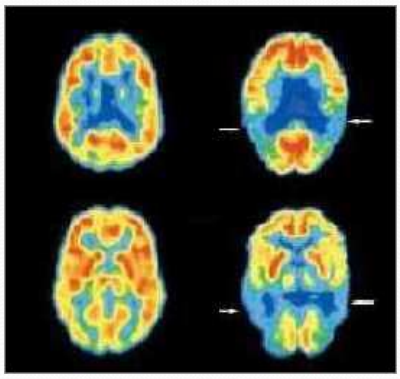


Falls in the Cognitively Impaired

- Annual fall risk 60-80% (Shaw 2007)
- ↑ risk for fall-related injuries
  - hip fractures (Kallin 2005; Tinetti 1988)
- ↑ morbidity and mortality
  - ↓ functional outcomes
  - ↑ institutionalization (Morris 1987)
- ↓ access to rehabilitation (Beaupre 2008)
- Currently 480,600 people with dementia in Canada
  - 103,700 new cases per year
  - By 2038: 1,125,200 people with dementia
    (Rising Tide: the impact of dementia on Canadian society, Alzheimer Society of Canada 2010)

Cognitive Impairment and Fall Risk

- The mechanisms of the increased fall risk in the cognitively impaired are not completely understood (Shaw 2007)
- Limited research:
  - Risk factors
  - Interventions to prevent falls



Cognitive Impairment and Fall Risk

- What is it about cognitive impairment?

Cognitive Impairment and Fall Risk

- What do we mean by "Cognitive Impairment"?
  - Disease-specific diagnosis
  - Deficits on measures of global cognitive function
  - Deficits in specific cognitive domains
- Need to be clear what we mean by "cognitive impairment"
  - Essential in order to translate the research into clinical practice to prevent falls

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Cognitive Impairment and Fall Risk

- Systematic review & meta-analysis, n=27 studies
- Cognitive impairment not consistently associated with falls
  - 56% of studies positive association
- Measures of global cognitive function (i.e. MMSE)
  - Only 38% found positive association
  - Not sufficient to identify fall risk
  - No consensus on score that denotes increased risk
- Measures of executive function consistently associated with falls

(Muir et al. Age Ageing. 2012)

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Cognitive Impairment and Fall Risk

- What is unique about people with cognitive impairment who fall?
  - Older people with dementia who fall are different:
    - More likely to be older, female, living in institution
    - Higher prevalence and severity of risk factors shared with cognitively normal older adults
- Cognitive impairment/dementia may be a proxy for many possible related fall risk factors:
  - Behavioural issues
  - Lack of insight
    - Increased risk-taking activity
  - Mobility deficits
  - Difficulty with performance of activities requiring divided attention
  - Visual-spatial deficits

Cognitive Impairment and Fall Risk

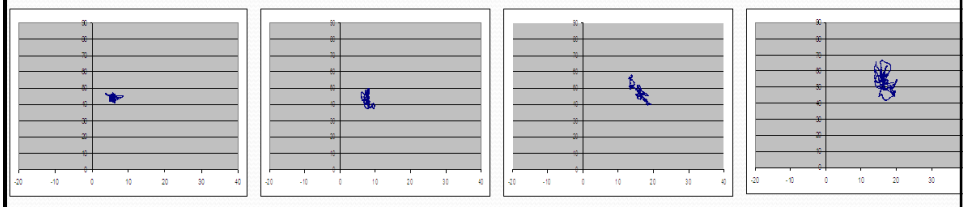
- Mild Cognitive Impairment:
  - Associated with increased fall risk (Liu-Ambrose et al. 2008)
    - Impaired balance performance
  - Changes in gait under dual-task testing the same as AD (Muir 2010)
    - Gait velocity and variability values indicate increased fall risk
  - Should not be treated according to guidelines for the cognitively normal

Cognitive Impairment and Fall Risk

- Dementia:
  - Risk factors for falls include (Harlein 2009):
    - Symptomatic orthostatic hypotension
    - Motor impairments
      - Parkinsonism
      - Ataxia
      - Impaired balance
    - Type of dementia
    - Severity of dementia
    - Behavioural disturbances
      - Wandering

Balance Impairment in the Cognitively Impaired

A. Control



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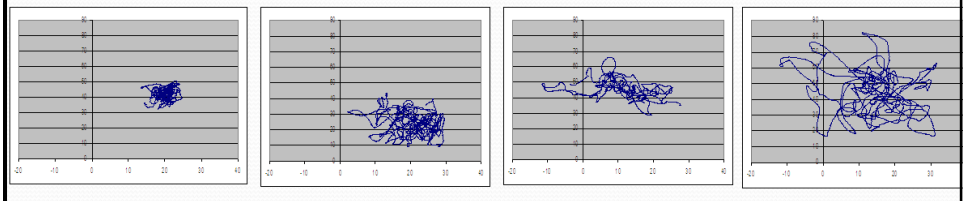

B. Alzheimer's disease

Cognitive Impairment and Fall Risk

- Prevalence of gait and balance disorders (Allan 2005)

	Percentage (%)
Parkinson's Disease with Dementia	93
Vascular Dementia	79
Lewy Body Dementia	75
Parkinson's Disease	43
Alzheimer Disease	25

Fall Risk Assessment

Identification & Stratification of Fall Risk

- Our ability to identify people at an increased fall risk and who may benefit from intervention is only as good as the tools we use

American & British Geriatrics Society Fall Prevention Guidelines 2011

- Most prominent set of fall prevention guidelines
- Recommend assessment of cognition if full falls evaluation required
  - no direction on how or what domain to assess
- Assessment of gait and balance function key feature in the guidelines to identify risk:
  - Reliability of standard balance tests questionable among people with cognitive impairment and dementia
    - Severity of cognitive impairment needs to be considered

Fall Prevention in Older People with Cognitive Impairment and Dementia

American & British Geriatrics Society Fall Prevention Guidelines 2011

- Summary statement:
  - "At this time, there is insufficient evidence to recommend, for or against, single or multifactorial interventions in community-living older adults with known cognitive impairment."
- So what do we do?

Fall Prevention among the Cognitively Impaired

- People with cognitive impairment tend to be excluded from studies on fall prevention interventions
  - Small number of studies that included >50% with cognitive impairment and dementia
- Limited research:
  - Studies with entire sample comprised of cognitively impaired older adults and falls
  - Modification of risk factors
  - Institutional/residential settings
  - Community-dwelling

Fall Prevention among the Cognitively Impaired

- "Prevention of Falls in People with Dementia"
  - paper by Fiona Shaw, published 2007
- Multifactorial interventions in cognitively normal older adults successful in reducing number and rate of falls
  - This has not translated successfully to older adults with cognitive impairment (Shaw et al. BMJ 2003)
    - Multifactorial intervention did not prevent falls compared to usual care group
    - Successful in the modification of some fall risk factors

Fall Prevention Among the Cognitively Impaired

- Why a lack of response for multifactorial interventions?
  - Different underlying mechanisms for some risk factors for falls
  - Dementia carries unique set of risk factors that are not addressed by interventions originally designed for cognitively normal older adults
  - Need to consider what factors may be modifiable
  - Type of dementia
  - Disease severity

Fall Prevention among the Cognitively Impaired

- "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."
  - Dr. Jacqueline Close, ANZFPS 2010
- Examples of where this may apply are:
  - Treatment of osteoporosis with bisphosphonates
  - Vitamin D

Fall Prevention among the Cognitively Impaired

Extrapolating from the existing fall literature:

- Community setting:
  - Exercise has strong evidence to prevent falls
    - If benefits from exercise is the result of improved strength, balance & reaction time – no reason cognitively impaired won't benefit
  - Non-exercise single interventions
    - Cognitively impaired people will have been included in some of these studies – should benefit
  - Multifactorial interventions
    - Shaw et al 2003 – no reduction in falls; but improved gait and reduction of environmental risk factors
    - Cognitively impaired people will have been included in some of these studies – should benefit

Fall Prevention among the Cognitively Impaired

- Nursing home setting – studies did not exclude people with cognitive impairment/dementia
  - Jensen et al 2003 – multifactorial intervention
    - Intervention: Staff education on fall prevention, environment adaptations, exercise, drug review, hip protectors and post-fall problem solving conferences
    - Outcome: Reduction in falls in people MMSE>19 and fewer femoral fractures in people with MMSE<19
  - Becker et al. 2003 – multifactorial intervention
    - Intervention: Staff & resident education on fall prevention, environment adaptations, progressive balance & resistance exercises, hip protectors
    - Outcome: reduction in rate of falls and fallers

Exercise Effects among the Cognitively Impaired

Extrapolate from studies on exercise in people with cognitive impairment:

- Older adults with cognitive impairment:
  - Can comply with:
    - Multifactorial interventions (Shaw 2003)
    - Programs to improve physical function (Brill 1995; Jensen 2003)
    - Complex exercise programs (Schwenk 2010)
  - Post hip fracture make gains comparable to the cognitively normal on inpatient rehab (Muir 2009)
  - Exercise training increases fitness, physical function, cognitive function, and positive behavior (Heyn 2004)

Pragmatic Recommendations for Reducing Falls in Older Adults with Cognitive Impairment and Dementia

- Balance and gait changes are an early feature of cognitive impairment
  - People with MCI should not be treated using guidelines for people who are cognitively normal
  - Standard tests may not identify problems in early stages of disease
  - Tests may be too complicated for people to follow
- Assessment of executive function should be standard
- Multifactorial assessment
  - Review of medication – psychotropics, cardiac
  - Assessment for orthostatic hypotension
- Physical activity programs
- Environmental modification
- Calcium and Vitamin D
- Hip protectors

Pragmatic Recommendations for Reducing Falls in Older Adults with Cognitive Impairment and Dementia

- Future directions in fall prevention in people with cognitive impairment & dementia
  - Recognized as patient populations with unique challenges, needs and require better treatment options
  - More research is required:
    - Risk factors for falls
    - Specifics of interventions
    - Older people with dementia are a heterogeneous group
      - Different dementia types
      - Different living situations
      - Different disease severity

Thank You

Questions?