

Cognitive Impairment and Falls

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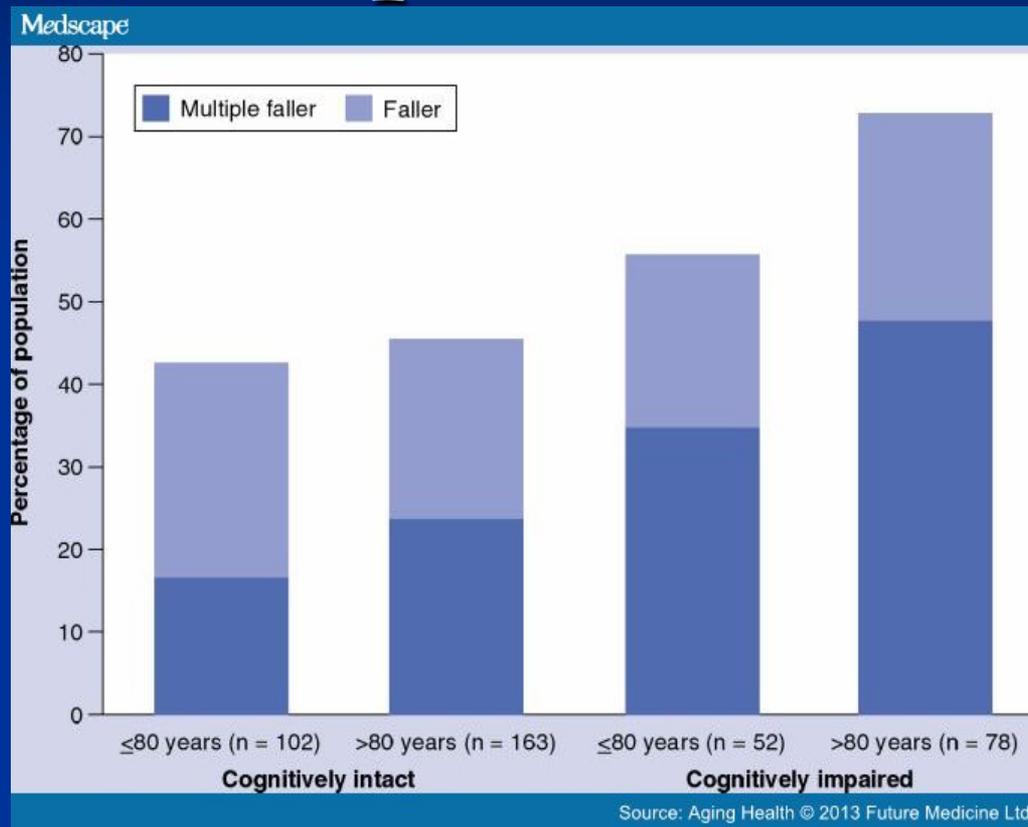
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Objectives

By the conclusion, learner will be able to:

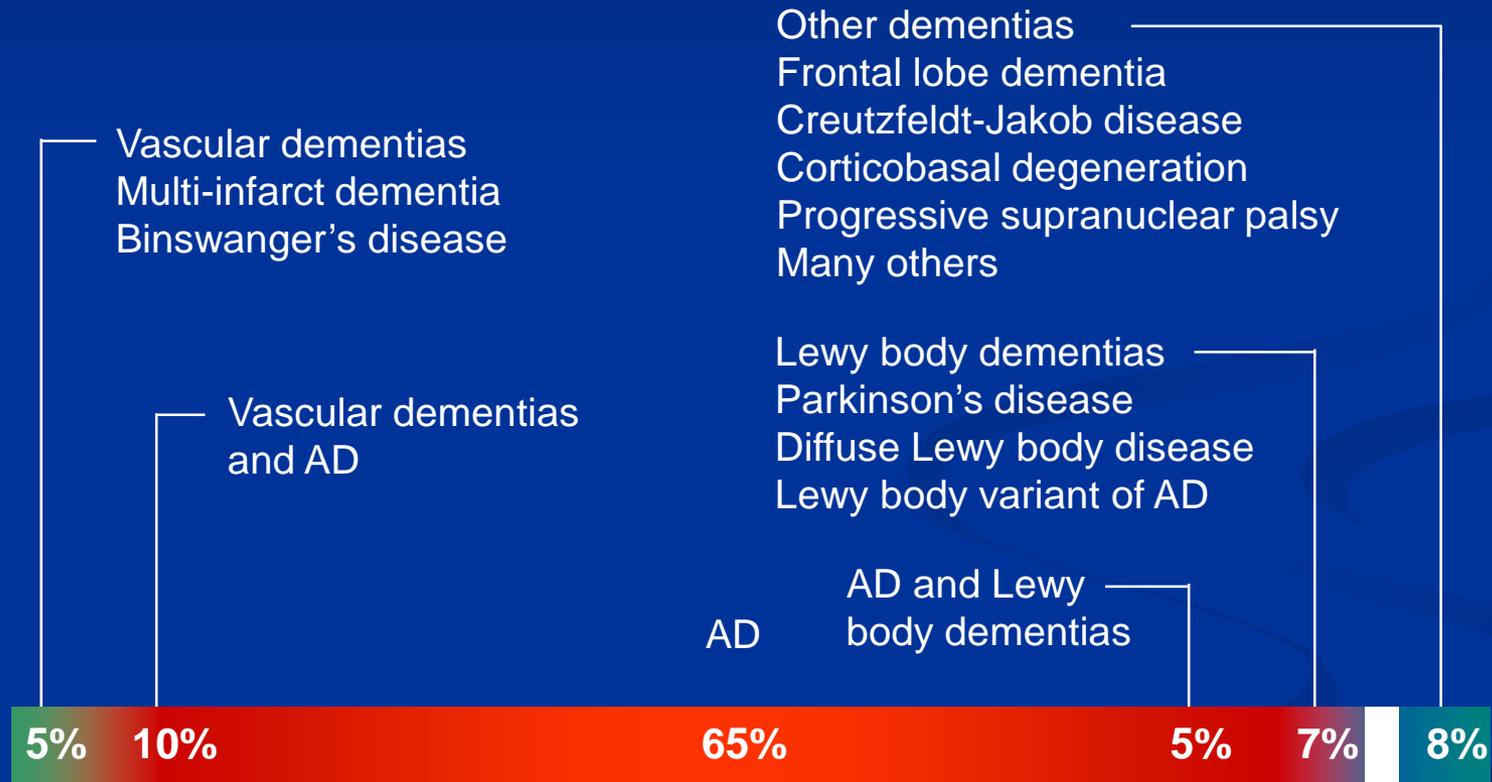
- Explain the potential affect of Executive Dysfunction upon fall risk
- Identify three dementia related behavioral issues associated with increased fall risk
- Discuss 5 evidenced-based interventions that can reduce future falls.

Falls in Normal vs Cognitive Impairment



Taylor ME, Delbaere K, Lord SR, Mikolaizak AS, Close JCT. Physical impairments in cognitively impaired older people: implications for risk of falls. *Int. Psychogeriatr.* doi:10.1017/S1041610212001184 (2012)

DIFFERENTIAL DIAGNOSIS OF DEMENTIA



Differential dx of Dementia

Motor Signs

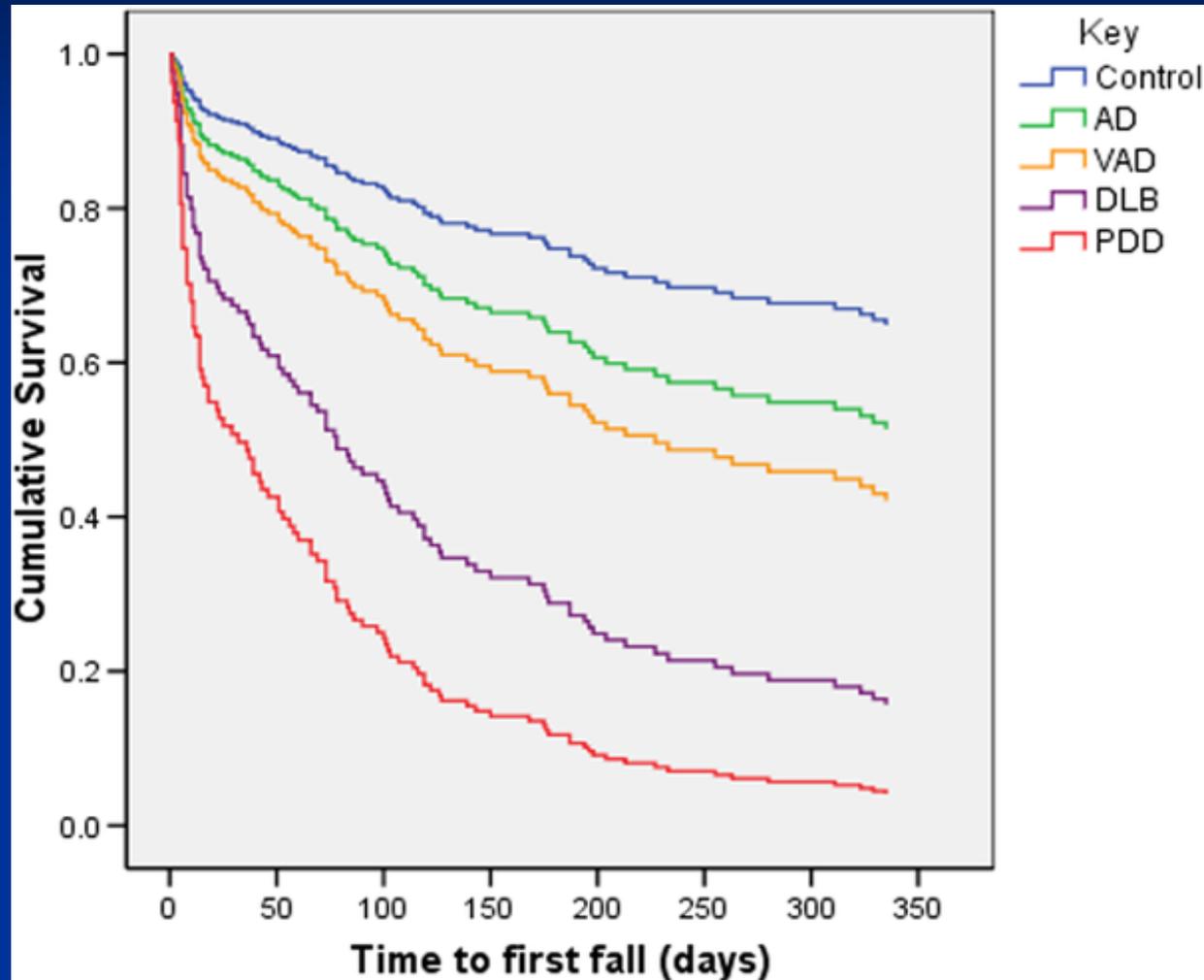
- Parkinson's
- Dementia with Lewy Bodies
- Vascular dementia
- Jakob-Creutzfeld
- Neurosyphilis
- B12 deficiency
- Thyroid disease
- Tumors
- NPH
- Subdural Hematoma

No Motor Signs

- ◆ AD
- ◆ Frontotemporal dementia
- ◆ Korsakoff's psychosis
- ◆ Metabolic and toxic encephalopathies
- ◆ Multiple Infarcts (rare)

Survival curve time to first fall by diagnosis

Allan et. al. 2009



Allan LM, Ballard CG, Rowan EN, Kenny RA (2009) Incidence and Prediction of Falls in Dementia: A Prospective Study in Older People. PLoS ONE 4(5): e5521. doi:10.1371/journal.pone.0005521

- Video Clip of Stephanie
Bridenbaugh MD

Dual Task Gait Assessment

Bridenbaugh and Kressig, 2011

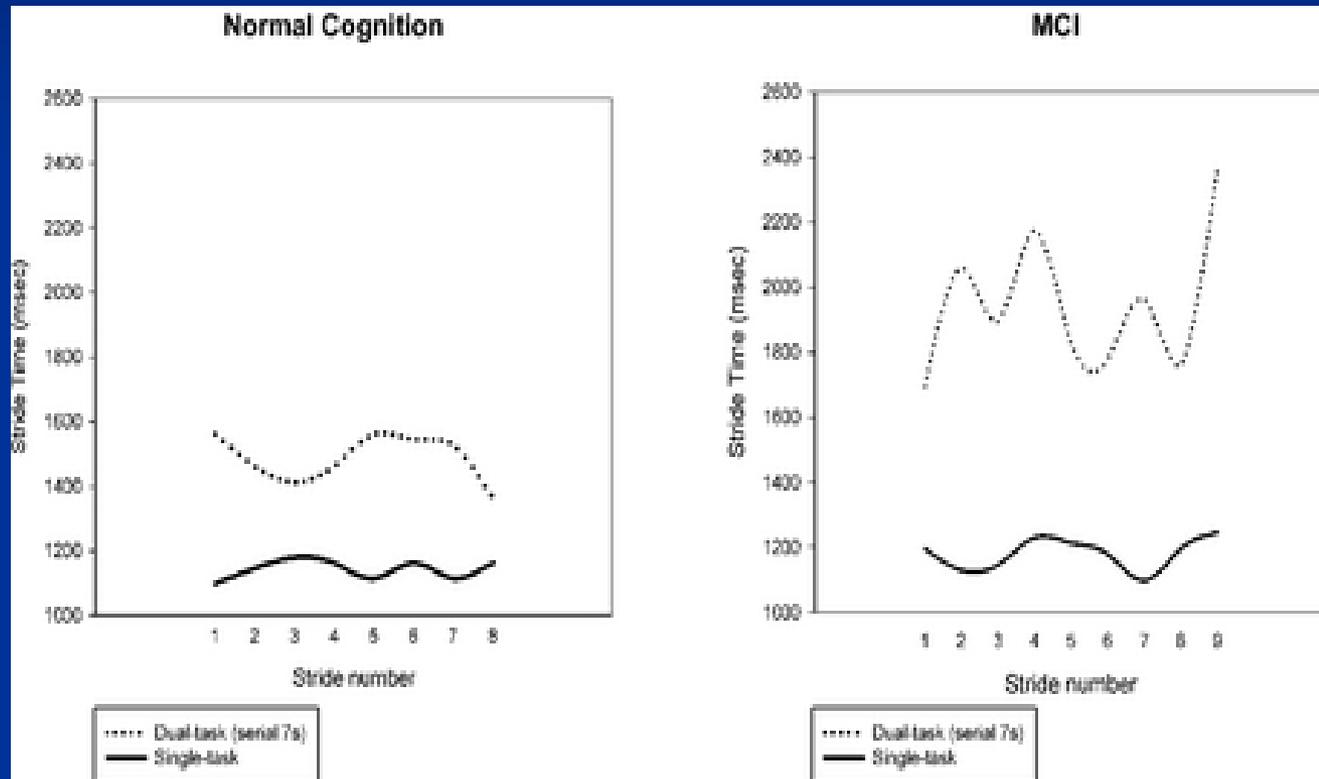
A dual-task paradigm, walking while simultaneously performing a second cognitive task, to assess the effects of divided attention on motor performance and gait control

Examples:

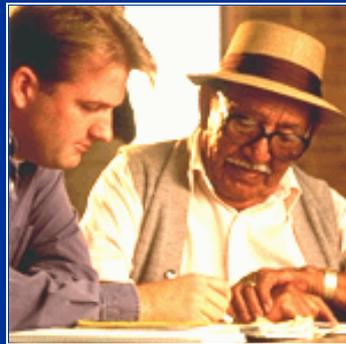
Walking while counting backwards by serial 7's.

Walking while reciting the alphabet backwards

Gait and Cognition: Understanding Brain Function and the Risk of Falling with Mild Cognitive Impairment (Montero-Odasso et al. 2012)



WHAT IS MILD COGNITIVE IMPAIRMENT (MCI)?

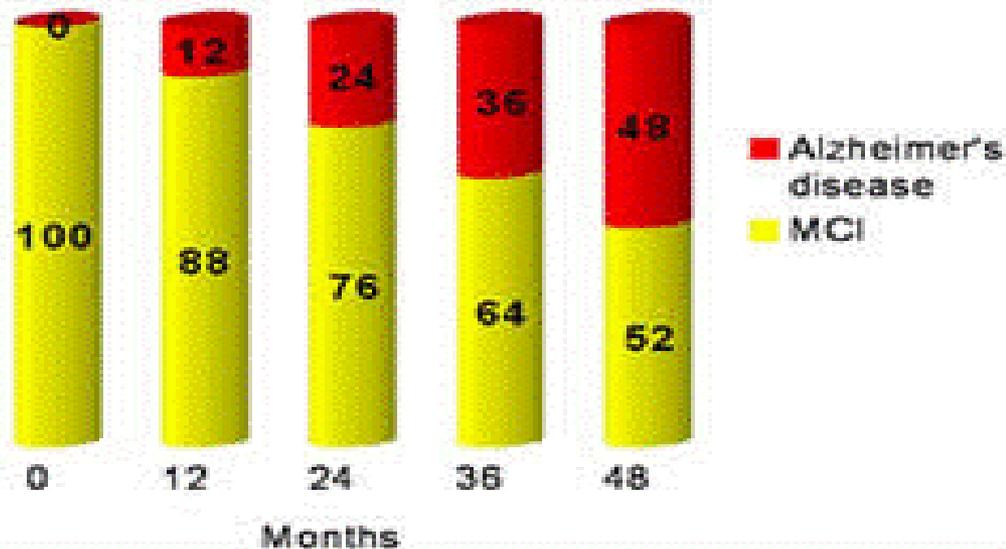


Mild Cognitive Impairment

- MCI is characterized by decline in one or more areas of thinking such as:
 - memory, executive functioning, language or visuospatial perception.
- Appear to be able to function normally
- **YET** show signs of memory loss, confusion, apathy and have some difficulties in daily life tasks
- **Compensation strategies** are used by MCI patients to carry out daily living tasks and responsibilities

MCI to Dementia

Annual Rates of Conversion from MCI to Dementia Over 48 Months



MCI vs DEMENTIA

MCI = cognitive changes
with NO functional loss

Dementia = cognitive changes
WITH functional loss

MCI and Falls

Kearney et al. 2013

- **MCI has** been significantly correlated to fall risk.
- Diminished executive function has been established as an independent risk factor for falls in the elderly.
- Cognitive flexibility to adapt to changing contingencies is a key element associated with falling.
- Lack of judgment in the presence of poor cognitive flexibility compounded fall risk!

Executive Functions

“General purpose control mechanisms that modulate the operation of various Cognitive sub-processes and thereby regulate the dynamics of human cognition”

- (Miyake, Friedman, Emerson et al., 2000)

Executive Functions

- Planning
- Initiating/terminating
- Generating
- Switching/alternation
- Problem-solving/reasoning
- Estimation
- Evaluation
 - risk/benefit
 - future consequences

Conceptualizing Mobility

Holtzer, 2014

Gait performance: ability to walk in uninterrupted conditions

Gait adaptability: ability to maintain locomotion in the presence of cognitive and environmental perturbations



- Video Clip of How and Why the Elderly Fall

Meta-analysis of cohorts with executive dysfunction and single falls

Muir, et al, 2012

A meta-analysis of 27 prospective cohort studies with at least 1 year of follow-up in healthy community-dwelling older adults found that **executive dysfunction** was associated with risk of any fall (odds ratio (OR) = 1.44, 95% confidence interval (CI) = 1.20–1.73) and falls associated with serious injury.

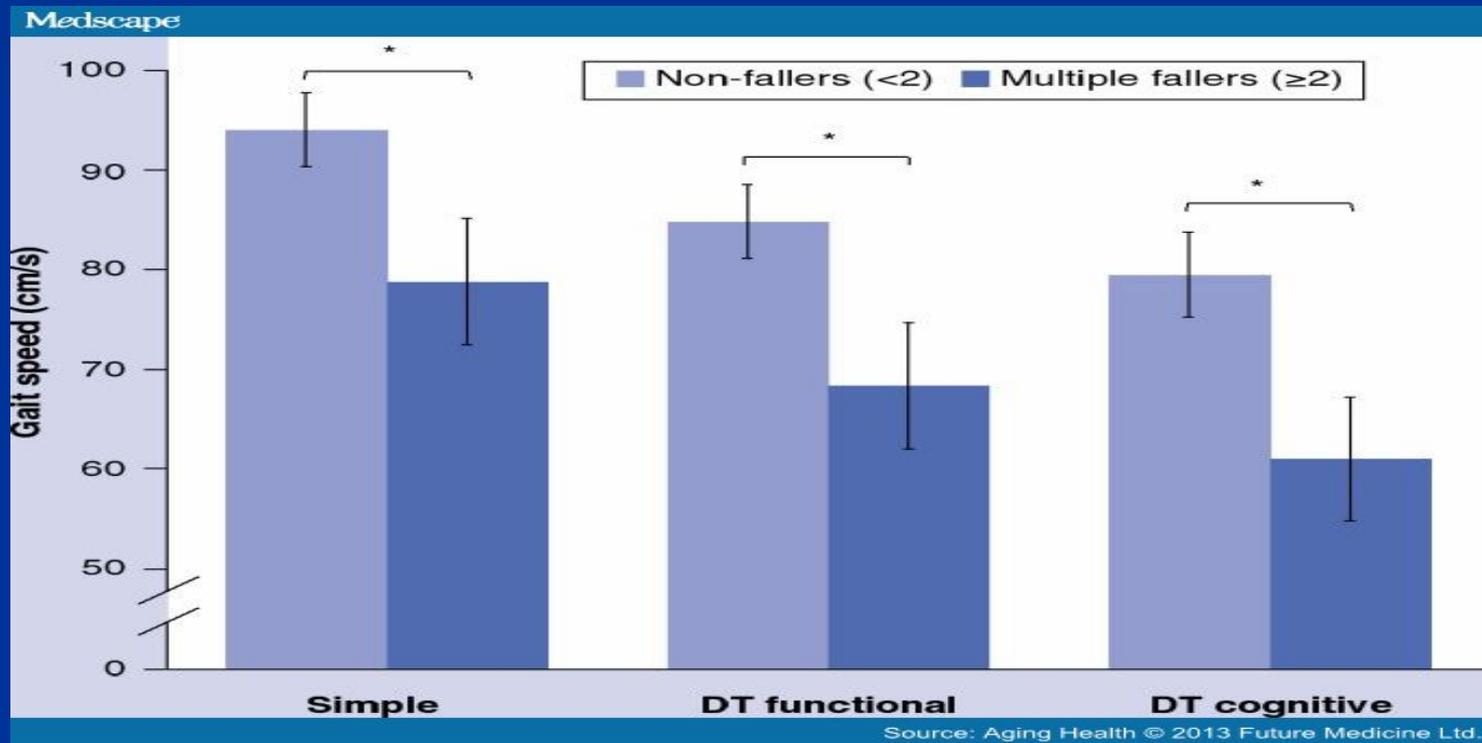
Single Falls vs. Multiple Falls

Martin et al, 2013

- Population based, prospective design, one year length
- People with single falls did not differ from non-fallers in health status, balance or cognitive function
- Poorer executive and visuospatial functions were most likely to predict risk of multiple falls in community dwelling people
- Risk of multiple falls increased by physical impairments and were magnified by poorer cognitive function

Cognitively impaired Fallers vs Non-Fallers

walking, carrying coffee, cognitive task



Taylor ME, Delbaere K, Mikolaizak AS, Lord SR, Close JCT. Gait parameter risk factors for falls under simple and dual task conditions in cognitively impaired older people. *Gait Posture* doi:10.1016/j.gaitpost.2012.06.024 (2012)

Risk Factors for Falls

- *Psychosocial & demographic factors*
- Advanced age
- Male gender
- History of falls
- Walks with an aid
- Inactivity
- ADL limitations
- Living alone

Risk Factors for Falls

■ *Medical factors*

- Dementia duration
- Dementia severity
- Parkinson's disease/parkinsonism
- Arthritis/musculoskeletal complaint
- Symptomatic orthostatic hypotension
- Peripheral neuropathy
- Autonomic neuropathy
- Cardiac arrhythmia
- Cataracts
- Impaired vision

Risk Factors for Falls

- *Medication factors*
- Psychoactive medications
- Antidepressants
- Cardiovascular medications
- NSAIDs
- Polypharmacy

Risk Factors for Falls

- *Neuropsychological factors*
- Wandering/behavioral factors
- Attention and orientation
- Poor memory
- Depression/depressive symptoms
- Impaired executive function
- Anxiety
- Fear of falling

Risk Factors for Falls

- *Balance & mobility factors*
- Impaired stability when standing
- Impaired stability when leaning and reaching
- Impaired gait and mobility

Risk Factors for Falls

- *Sensory & neuromuscular factors*
- Poor visual contrast sensitivity
- Muscle weakness
- Slow reaction time
- Impaired proprioception

Risk Factors for Falls

- *Environmental factors*
- Home hazards
 - extension cords, scatter rugs, slippery surfaces, slippery stairs, poor lighting
- Weather related hazards
 - Rain, ice, wind
- Environmental hazards
 - Uneven sidewalks, lack of railings, no place to sit or rest

History

- Ask all patients about falls in past year
- Establish if recurrent vs. single episode
- Determine circumstances of fall- “true fall vs. syncope”
- Evaluate associated symptoms – dizziness, lightheadedness, vision disturbance, LOC, gait or balance problems
- Determine whether injury occurred
- Review medications – number of medications (4 or more increases fall risk) recent changes, sedating drugs, narcotics (Beers’ List)

Physical Exam

- Check vitals –orthostatics if indicated
- Visual assessment
- Test for lower extremity strength
- Perform targeted neuro exam – proprioception, sensation and COGNITIVE SCREENING
- Do cardiovascular work-up if falls history suggests syncopal event

Falls Interventions

- May require more than one intervention
- Gait, balance and exercise programs (PT referral, Tai Chi)
- Medication modification
- Postural hypotension treatment
- Environmental hazard modification
- Cardiovascular disorder treatment
 - if cardiac source is identified as cause of fall

Falls Interventions

- Physical Therapy referral
 - MMSE
 - Geriatric Depression Scale
 - ROM
 - Muscle Performance
 - Quality of gait
 - Ability of patients to multitask – balance while talking on phone, walk and talk
 - Use of assistive devices
 - Aging in place

Falls Interventions

Medication Adjustments

- Reduction of sedating and narcotic medications
 - consider Beers' List
- Taper to lowest effective dose or stop
- Be able to justify the addition of a new medication

Falls Interventions

Postural Hypotension

- Reduce medications that contribute
- Teach patients to change position slowly
- Consider liberalizing salt intake
- Encourage adequate hydration

Falls Interventions

- Environmental Hazard Modification
- This may be done as part of the Physical Therapy referral or as a separate Home Health Evaluation
- Hazards include
 - Clutter
 - Electric cords
 - Slippery throw rugs and loose carpet
 - Poor lighting
 - Lack of stair rails
 - Lack of shower rails / grab bars
 - Proper shoes

Take Home Message

- Do Not Distract People While Ambulating, Transferring or Performing Gait Related Tasks!

Anticipate Potential Issues Dementia and Falls

- Impulsivity
- Poor Judgment for risks
- Poor insight for consequences
- Distraction-inability to focus on one stimulus

Anticipate Potential Issues Dementia and Falls

- Clutter- visual overload
- Agnosia- failure to recognize objects
- Perceptual difficulties- depth, distance

Anticipate Potential Issues Dementia and Falls

- Relocation
- Wandering
- Unmet needs: thirst, hunger, elimination
- Boredom

Summary

Impaired executive function is particularly relevant for older adults with balance and gait impairments

As we age we have a less reliable response of cognitive abilities to compensate for physical deficits and competing stimuli

Cognitive dysfunction is associated with multiple falls and declines in gait speed in the elderly

Conclusions

- Gait adaptation becomes more difficult with aging
- Fall risk for individuals with MCI can be modified by enhancing executive function
- Research evidence to suggest we can improve executive function through
 - Cognitive rehabilitation
 - Exercise and balance training
 - Dual-task training

Thanks for your attention! I hope you learned something new.



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