

Mild Cognitive Impairment (MCI)

Evan Zahniser, Ph.D., ABPP

Clinical Neuropsychologist
VA Puget Sound, Seattle Division

UW Northwest Geriatrics Workforce Enhancement Center (NW GWEC)
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What Matters
Know and align care with each older adult's specific health outcome goals and care preferences including, but not limited to, end-of-life care, and across settings of care.

Medication
If medication is necessary, use Age-Friendly medication that does not interfere with What Matters to the older adult, Mobility, or Mentation across settings of care.

Mentation
Prevent, identify, treat, and manage dementia, depression, and delirium across settings of care.

Mobility
Ensure that older adults move safely every day in order to maintain function and do What Matters.

4Ms Framework

Age-Friendly Health Systems
An initiative of The John A. Hartford Foundation and the Institute for Healthcare Improvement (IHI) in partnership with the American Hospital Association (AHA) and the Catholic Health Association of the United States (CHA).

For related work, this graphic may be used in its entirety without requesting permission. Graphic files and guidance at ihi.org/AgeFriendly

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Learning Objectives

1. Identify diagnostic criteria and other relevant terminology related to mild cognitive impairment (MCI)
2. Distinguish MCI from normal aging, dementia, and other conditions that affect cognition
3. Describe evidence-based approaches to MCI prevention, diagnosis, and management



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History & Terminology

ORIGINAL CONTRIBUTION

Mild Cognitive Impairment

ARCH NEUROL/VOL 56, MAR 1999
303

Clinical Characterization and Outcome


Ronald C. Petersen, PhD, MD; Glenn E. Smith, PhD; Stephen C. Waring, DVM, PhD;
Robert J. Ivnik, PhD; Eric G. Tangalos, MD; Emre Kokmen, MD

Journal of Internal Medicine 2004; 256: 183-194

KEY SYMPOSIUM

Mild cognitive impairment as a diagnostic entity

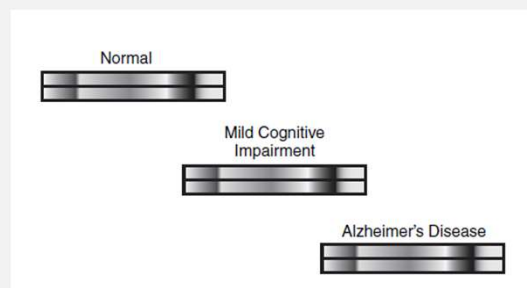
R. C. PETERSEN
From the Department of Neurology, Alzheimer's Disease Research Center, Mayo Clinic College of Medicine, Rochester, MN, USA



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History & Terminology

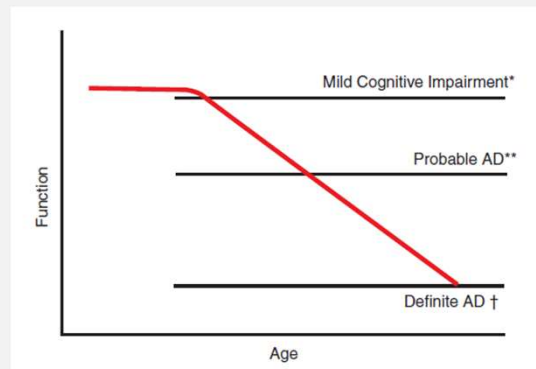
- MCI conceptualized as an intermediate stage between normal aging and dementia
 - Or, more specifically, between normal aging and Alzheimer's disease



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History & Terminology

- In fact, MCI initially was considered a *precursor* to Alzheimer's disease



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History & Terminology

- Initial (1999) MCI criteria were focused on:
 - Memory impairment
 - Other aspects of cognitive functioning remain normal
 - Progression from normal aging → MCI → dementia



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History & Terminology

- MCI definition progressed and expanded over time...
 1. Not all MCIs resemble or progress into Alzheimer's
 - For example, sometimes memory isn't the (main) problem
 2. In fact, not all MCIs progress at all!
 - Some people get worse, some stay the same, some get better
- MCI understood today to reflect any cognitive impairment (not just memory loss) that is:
 - Greater than expected for age, but
 - Subthreshold for dementia



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Diagnostic Criteria for MCI (Petersen et al., 2009; Petersen et al., 2014, Petersen, 2016)

1. Subjective cognitive concerns
2. Objective (i.e., measurable) cognitive impairment
 - a. Cognitive decline greater than expected for age
 - b. Demonstrated by objective cognitive testing
3. Preserved independence in functional abilities
 - a. May have very minor changes in instrumental ADLs, but generally still managing independently
 - b. Basic ADLs fully intact
4. Patient does not meet criteria for dementia



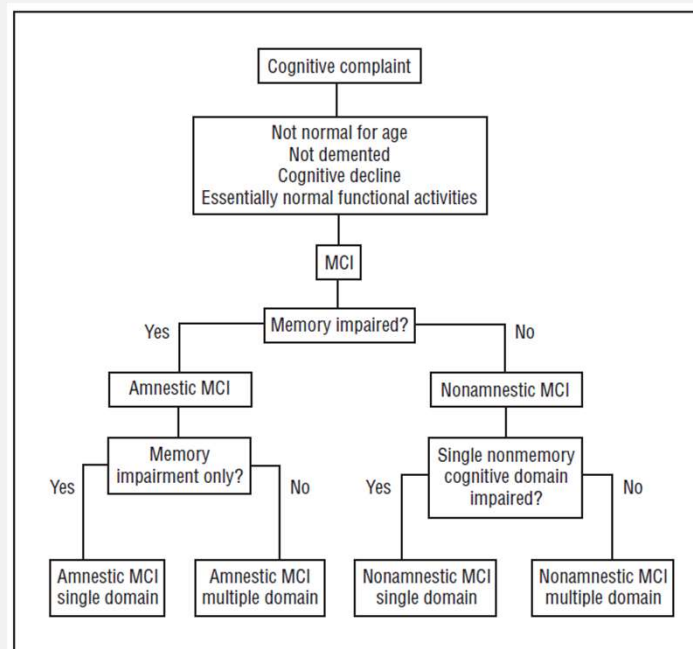
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MCI Subtypes (Petersen et al., 2009; Petersen et al., 2014; Petersen, 2016)

- Sub-categorize MCI based on whether memory impairment is involved
 - “Amnestic” vs. “non-amnestic” MCI
- Further sub-categorize based on number of cognitive domains impacted
 - “Single-domain” MCI vs. “multi-domain” MCI



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(Petersen et al., 2009; Petersen et al., 2014)



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MCI as a Syndrome

- MCI is a “syndrome”
 - A group of signs and symptoms that are known to co-occur
 - A label that describes a patient’s situation
- MCI is *not* a specific disease
 - No explicit mention of underlying etiology, pathogenesis, & natural history
 - Leaves open the question of what has caused the patient’s symptoms



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MCI vs. Normal Aging

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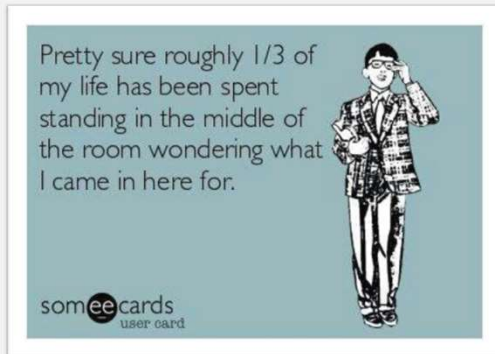
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Cognitive Concerns are Common!



- Reported by ~1/3 of people in the general population (irrespective of age)
 - 30% of young adults and 34% of middle-aged adults identified as forgetful in a community-based study (Ponds et al, 1997)
 - 15% of individuals 55+ y/o reported trouble remembering things frequently over the past year (Cutler & Gram, 1988)
 - 33% of healthy older adults 75+ y/o reported memory complaints (Riedel-Heller et al., 1999)



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Normal Cognitive Aging

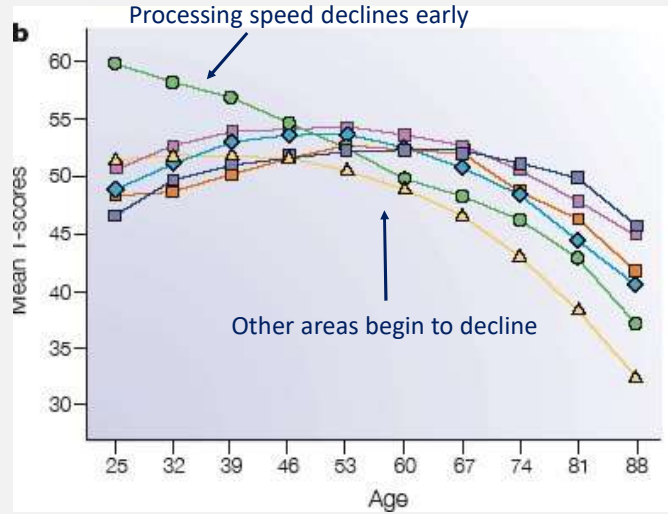
- The brain changes as we age
 - Cerebral volume loss occurs naturally, even in a totally healthy aging brain
- Changes to cognitive functioning occur as part of the normal aging process
 - Most commonly reported concerns among older adults include “short-term” memory loss and problems with conversational word-finding



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Normal Cognitive Aging

- Inductive reasoning
- Spatial orientation
- Perceptual speed
- Numeric ability
- Verbal ability
- Verbal memory

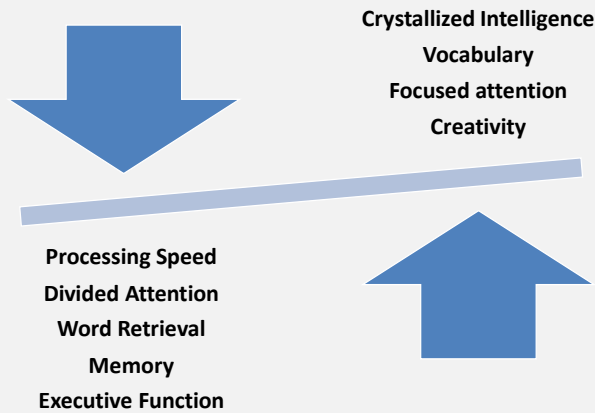


Seattle Longitudinal Study, 1996



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Normal Cognitive Aging



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MCI vs. Normal Aging

- Diagnosing MCI requires identifying cognitive decline that is **greater than expected for age**
 - Comparison of patient's cognitive performance to age-matched normative data
 - Typical approach: Cognitive impairment indicated by cognitive test scores that fall 1 or 1.5 standard deviations below the mean for age-matched peers



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MCI vs. Dementia

- Both conditions involve cognitive decline
 - Greater than expected for age
 - Demonstrated by objective cognitive testing
- MCI = independent functioning intact
- Vs. in dementia, a person's independent functioning is significantly disrupted by their cognitive impairments
 - Marked impairments in instrumental ADLs (e.g., can't track medications independently; can't safely use the stove for meal preparation)
 - May impact basic ADLs (e.g., requires help dressing or reminders to perform basic hygiene activities)

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MCI vs. Dementia

- Distinguishing between MCI and dementia requires thorough assessment of independent functioning
 - Generally intact vs. significantly disrupted will determine MCI vs. dementia diagnosis
 - Cognitive test data are not enough!
 - Depends on clinician assessment via interview with patient
 - Collateral source of information (e.g., family member, caregiver) often essential



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MCI vs. Dementia

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MCI vs. Depression

- Depression is relatively common among older adults
 - As many as 10% of adults age 65+ seen in primary care settings have clinically significant depression (Unützer, N Engl J Med 2007; Lyness, et al. J Gen Intern Med 1999)
- Cognitive complaints (e.g., problems with concentration and memory) are a known symptom
 - Especially among older adults, this may be a primary reported concern



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MCI vs. Depression

- Depression also characterized by:
 - Low mood
 - Anhedonia (loss of enjoyment)
 - Reduced interest in previously preferred activities
 - Low energy (often translating to reduced activity levels)
 - Sleep problems (too little or too much)
 - Feelings of guilt or punishment
 - Etc.
- Note that some of these (e.g., apathy) are also associated with cognitive disorders



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MCI vs. Depression

- Not mutually exclusive – depression can result from neurological changes that may also produce MCI
 - Cognitive decline and mood changes frequently co-occur
- MCI and depression can look very different upon formal workup
 - Interview: E.g., detailed description of episodes of forgetfulness
 - Cognitive testing: Attention and speed problems; variable memory performance
- Cognitive concerns associated with depression improve with treatment (psychotherapy, pharmacotherapy)



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Learning Objectives

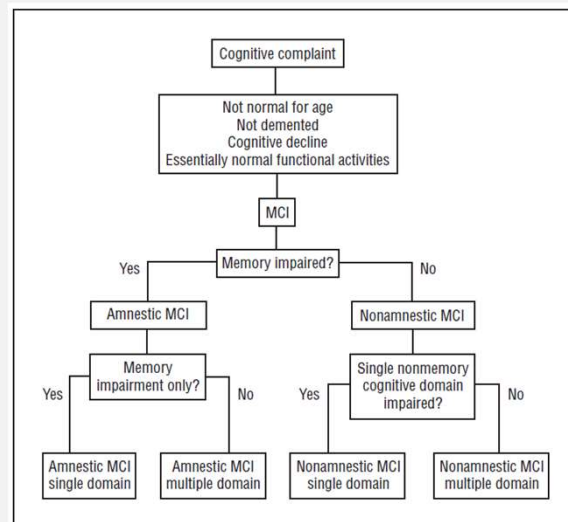
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Diagnosing MCI (Petersen, 2016)

- Clinical evaluation follows diagnostic flowchart
- First, must identify presence of key MCI symptoms:
 1. Cognitive concern
 2. Objective cognitive deficits
 3. Essentially normal ADLs
 4. No dementia
- Then proceed to subtyping



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Diagnosing MCI (Petersen, 2016)

1. Subjective cognitive concerns

- Clinical interview: obtain clinical history from patient (and, ideally collateral)
- Concern regarding a decline in cognition must be elicited from patient, patient's informant (e.g., family member), or one of their healthcare providers
- **MCI does not reflect lifelong low cognitive function – it is a change for the person



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Diagnosing MCI (Petersen, 2016)

- Examples of questions related to cognitive concerns:
 - Have you noticed any changes in memory or other thinking skills?
 - Has anyone else noticed or commented on these changes?
 - When did you first notice these changes?
 - Or: How long has this been going on for you?
 - Was there anything going on at that time that felt like it triggered the changes in your (memory, etc.)?
 - Or, alternatively, did it feel like they just sort of... showed up gradually?
 - Over time, how do you feel like these changes have fared?
 - If clarification needed: Have they been getting worse? Getting better? Perhaps staying about the same?

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A Sidebar: Brief Cognitive Tests

- Strengths:
 - Quick
 - Easy to administer
 - Standardized (i.e., manualized administration)
 - Objective (i.e., follow specific scoring instructions)
 - Research supported → provide meaningful information about cognition

- Some cognitive screening measures have multiple forms
 - Allows for comparisons over time with reduced practice effects



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A Sidebar: Brief Cognitive Tests

- Limitations:
 - Not always sufficiently sensitive (i.e., sometimes miss cognitive impairments)
 - Poor specificity (i.e., high false-positive rates)
 - One-size-fits-all approach
 - Use same (or similar) cutoff criterion for all patients
 - Limited sampling of specific cognitive domains
 - Biased(?) – perform differently for different patient populations^{1,2}
 - Inherent cultural and language confounds

1. Ratcliffe, L. N., McDonald, T., Robinson, B., ... & Hewitt, K. C. (2023). Classification statistics of the Montreal Cognitive Assessment (MoCA): Are we interpreting the MoCA correctly? *The Clinical Neuropsychologist*, 37(3), 562-576. doi:10.1080/13854046.2022.2086487
2. Sachs, B. C., Chelune, G. J., Rapp, S. R., ... & Pajewski, N. M. (2022). Robust demographically-adjusted normative data for the Montreal Cognitive Assessment (MoCA): Results from the systolic blood pressure intervention trial. *The Clinical Neuropsychologist*, 36(8), 2273-2259. doi:10.1080/13854046.2021.1967450



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A Sidebar: Brief Cognitive Tests

- Applications:
 - A low score on a cognitive screening test can occur for many reasons
 - Cognitive dysfunction (i.e., what we are looking for), but also:
 - Acute AMS, older age, lower educational attainment, ESL status, other sociocultural factors, sensory problems, poor engagement with testing, psychiatric disturbance, test anxiety ...
 - Cognitive screening measures are **not diagnostic!**
 - **NOT** sufficient to diagnose MCI (or other cognitive disorders)
 - A low score raises concern for cognitive dysfunction, indicating further evaluation is needed for diagnostic purposes

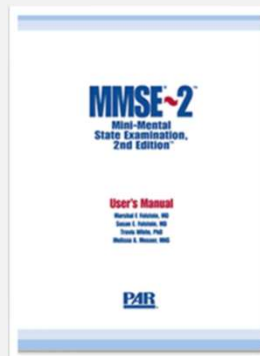
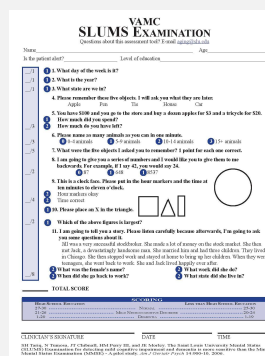
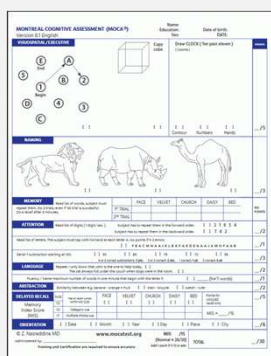


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Diagnosing MCI (Petersen, 2016)

2. Objective (i.e., measurable) cognitive impairment

- Initial step is often basic mental status exam
 - May include brief cognitive screening tests (e.g., MoCA)



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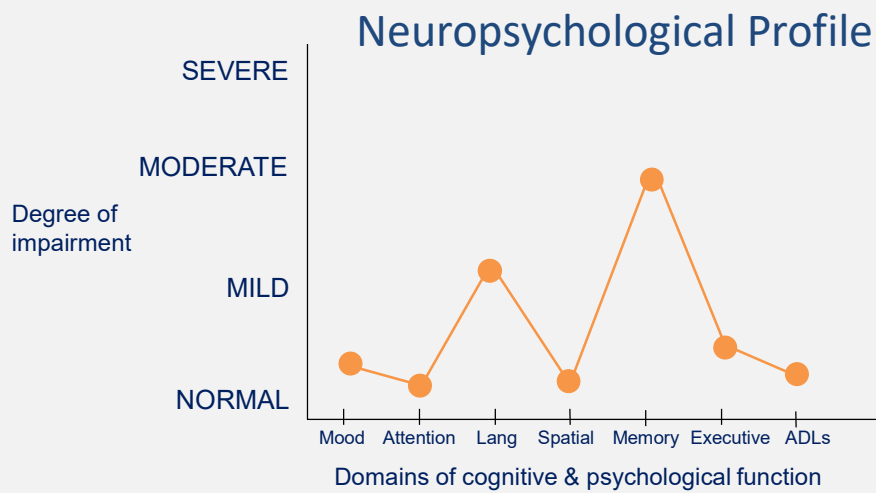
Diagnosing MCI (Petersen, 2016)

2. Objective (i.e., measurable) cognitive impairment

- Initial step is often basic mental status exam
 - May include brief cognitive screening tests (e.g., MoCA)
- Gold standard is formal neuropsychological testing
 - Provides detailed evaluation of patient's cognitive and psychological status
 - Measures wide range of different aspects of cognition (attention, cognitive speed, memory, language, spatial skills, executive functioning, etc.)
 - Compares patient's cognitive functioning against appropriate normative standard (matched for age and other relevant variables)
 - Identifies cognitive domains that are impacted, as well as areas of preserved function

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Diagnosing MCI (Petersen, 2016)



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Diagnosing MCI (Petersen, 2016)

3. Preserved independence in functional abilities

4. Patient does not meet criteria for dementia

- Clinical interview: obtain clinical history from patient (and collateral!)
- Recall that some minor changes in instrumental ADLs may be present, but basic ADLs must remain intact



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Diagnosing MCI (Petersen, 2016)

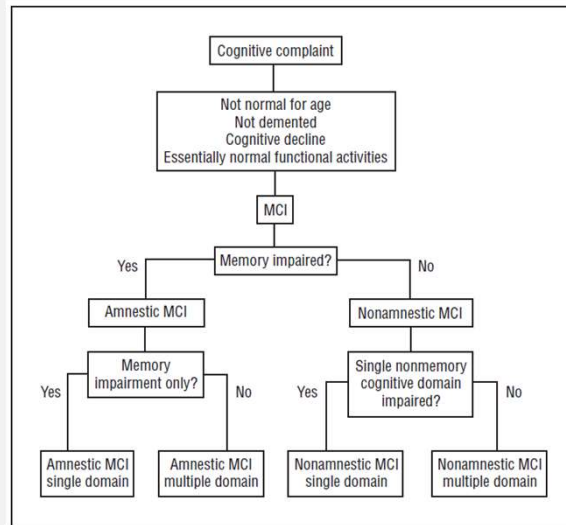
• Examples of questions related to daily functioning:

- Have the changes to your (memory, etc.) affected any of your day-to-day activities?
 - Provide examples: managing medications, handling finances, driving, shopping, meal preparation, using technology (e.g., cell phone)
 - If needed, can ask specific questions:
 - Any instances of forgetting to take your medications, or getting mixed up about what to take when?
 - Any times where you have forgotten to pay a bill, or gotten mixed up and accidentally paid twice?
 - Any motor vehicle collisions (or near misses), or times where you've been pulled over or gotten a ticket?

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Diagnosing MCI (Petersen, 2016)

- Next: Consider MCI subtypes
- Example patient:
 - Meets criteria for MCI
 - Memory impairment involved
 - Language also impacted



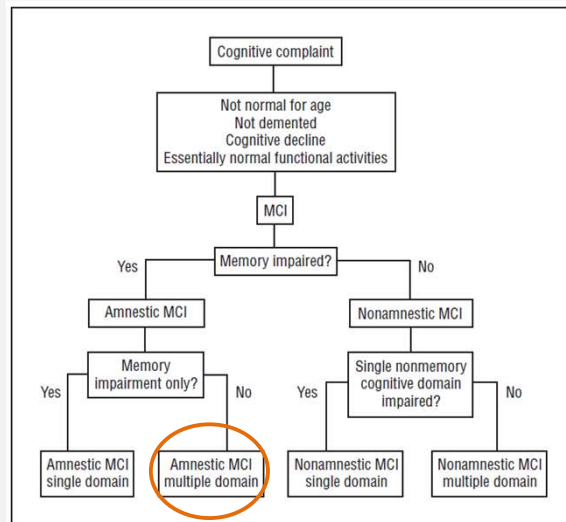
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Diagnosing MCI (Petersen, 2016)

- Next: Consider MCI subtypes
- Example patient:
 - Meets criteria for MCI
 - Memory impairment involved
 - Language also impacted



- Amnesic multidomain MCI



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Diagnosing MCI (Petersen, 2016)

- Along the way:
 - Rule out potential reversible causes of cognitive dysfunction:
 - Chronic vitamin deficiency (e.g., B12)
 - Endocrine dysfunction (e.g., TSH imbalance)
 - Infection (e.g., HIV, neurosyphilis; recurring UTI; etc.)
 - Sub-optimally managed medical condition (e.g., diabetes, OSA)
 - Iatrogenic or medication-related (e.g., anticholinergic medications)
 - Consider whether neuroimaging is appropriate (e.g., concern for possible neoplasm, CVA, or other focal neurologic change)

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Diagnosing MCI (Petersen, 2016)

- Reversible causes ruled out
- Possible to attempt to specify etiology?
 - Consider common causes of cognitive impairment among older adults, including (but not limited to):
 - Alzheimer's disease (AD)
 - Cerebrovascular compromise
 - Lewy Body disease (LBD) / Parkinson's disease (PD)
 - Frontotemporal lobar degeneration (FTLD)
 - Other medical conditions or external factors affecting the CNS
 - Determination of probable etiology is complex – based on integration of symptoms, disease course, medical and other history, cognitive test data, etc.

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MCI: Prognosis & Management

- Although considered an “intermediate” stage between normal aging and dementia, not all MCIs get worse
 - Approximately 10% of MCI cases “convert” to dementia each year
 - Some stay the same; some cases of MCI get better (i.e., cognitive functioning moves back into normal range)
- No pharmacologic treatments for MCI currently approved by FDA



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MCI: Prognosis & Management

- Treatment focuses lifestyle modifications, health bx interventions, etc.
 - Optimizing medical health (especially cerebrovascular risk factors)
 - Increasing adherence to treatments (e.g., CPAP, hearing aids)
 - Consolidate medications; minimize anticholinergic burden
 - Encouraging physical activity, balanced diet, adequate restful sleep, involvement in preferred recreational and social activities
 - Targeting substance use (e.g., “moderate” alcohol consumption)
 - Providing mental health treatment if indicated
 - Compensatory strategies to promote continued independent functioning



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MCI: Prevention

- Most prevention studies have focused on dementia – but findings apply to cognitive decline in general
- Research has consistently demonstrated key lifestyle habits associated with cognitive benefits in older adults:
 - Physical activity
 - Social engagement
 - Cognitively stimulating activity
 - Mediterranean diet
 - Adequate sleep
 - Managing cardiovascular risk
 - Avoiding tobacco smoking
 - Avoiding excessive alcohol use
 - Sense of purpose in life
 - Positive attitudes about aging



O'Connor et al. (2022) Lifestyle factors and successful cognitive aging in older adults. In *Positive Neuropsychology* (Randolph, Ed.).

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MCI: Prevention

- 40%(!) of dementia cases worldwide accounted for by 12 modifiable risk factors:
 - (1) less education, (2) hypertension, (3) hearing impairment, (4) cigarette use, (5) obesity, (6) depression, (7) physical inactivity, (8) diabetes, (9) low social contact, (10) excessive alcohol consumption, (11) traumatic brain injury, & (12) air pollution
 - Several factors distributed unequally (e.g., access to education; health disparities; air pollution)
 - Risk of cognitive decline disproportionately impacts disadvantaged groups for several distinct but overlapping reasons



Lancet Commission on Dementia Prevention, Intervention, and Care (2020) – Livingston, et al.

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MCI: Prevention

- Several specific recommended steps to reduce risk of cognitive decline:
 - Maintain healthy blood pressure
 - BP meds are the only known preventative medication for dementia (and other cognitive disorders)!
 - Encourage use of hearing aids
 - Reduce exposure to air pollution
 - Prevent head injury
 - Limit alcohol use; avoid smoking (or support smoking cessation)
 - Sustain physical activity in mid- and late life
 - Prevent and manage diabetes



Lancet Commission on Dementia Prevention, Intervention, and Care (2020) – Livingston, et al.

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MCI: Prevention

- Emphasize that prevention requires both public health and individually-focused programs
 - Universal primary and secondary education
 - Target health disparities → in the U.S., many risk factors cluster in Black, Asian, and other minority racial-ethnic groups, as well as other vulnerable populations
 - Prevalence of cognitive disorders diminishing in higher-income countries; not the case in low- and middle-income countries



Lancet Commission on Dementia Prevention, Intervention, and Care (2020) – Livingston, et al.

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Case Example (adapted from Petersen, 2016)

- 66-y/o M retired HS teacher presents to PCP with concern for increased forgetfulness over past 1-2 years
 - Forgets details of conversations; occasionally forgets about plans or appts; misplaces items
 - A few instances of forgetting to take his medication for high blood pressure; spouse has been reminding him in recent months
 - Driving without issue; manages finances for his household
 - No major concerns related to mood, sleep, pain, or substance use
 - Medical history notable for HTN & mild hearing loss, otherwise unremarkable
 - Takes losartan for HTN and daily multi-vitamin
 - Family history of dementia (patient's mother diagnosed with probable Alzheimer's disease in her early 80s)



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Case Example (adapted from Petersen, 2016)

- Mental status exam:
 - Mostly WNL (sensory & motor function, language, thought process, mood, affect)
 - Autobiographical memory generally WNL; concern for mild forgetfulness
- Cognitive screening:
 - MoCA = 23/30
 - Falls below expectation and raises concern for possible cognitive dysfunction



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Case Example (adapted from Petersen, 2016)

- **Neuroimaging (brain MRI):**
 - Mild volume loss WNL for patient's age
 - Mild diffuse cerebrovascular changes
- **Lab workup:**
 - Normal TSH, B12, RPR, HIV screen; CMP & CBC unremarkable
- **Neuropsychological evaluation:**
 - Largely normal cognition for age & education
 - Exception is memory
 - Mildly impaired delayed recall of lists, paragraphs, and nonverbal material



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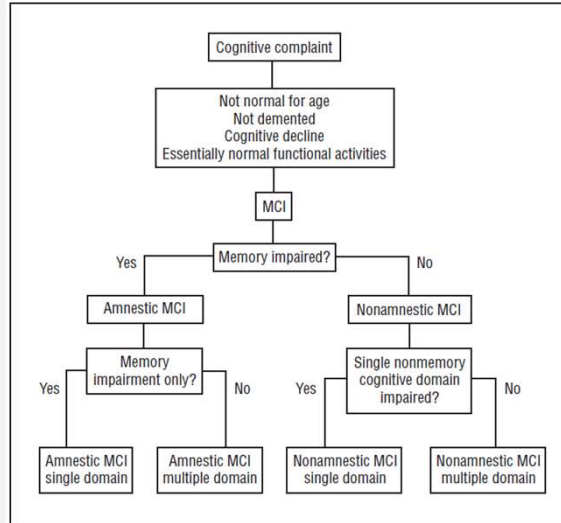
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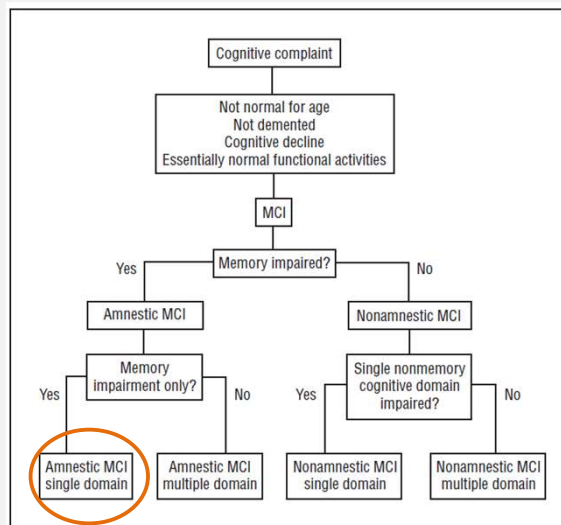
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Case Example (adapted from Petersen, 2016)



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Case Example (adapted from Petersen, 2016)



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Case Example (adapted from Petersen, 2016)

- Per Neuropsychology, etiology not fully clear
 - Potential vascular cognitive impairment (given cerebrovascular changes)
 - Also possible neurodegenerative etiology
 - Recommend repeat evaluation in 12-18 months for monitoring
- Prognosis uncertain – potential for progressive cognitive decline, but also potential stability or improvement



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Case Example (adapted from Petersen, 2016)

- Treatment & management: Emphasize lifestyle modifications, health behavior interventions, etc.
 - Emphasize importance of proactively managing hypertension to reduce cerebrovascular risk
 - Daily use of hearing aids
 - Compensatory strategies to manage mild memory loss
 - Pillbox for medications
 - Calendar (paper or virtual) for appointments; check each morning as part of routine
 - Notes-to-self; cell phone-based reminders; “home base” for important items
 - Encourage physical activity, balanced diet, adequate restful sleep, involvement in preferred recreational and social activities
 - Re-refer to Neuropsych for repeat evaluation in 12-18 months



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Questions?

Please feel free to contact me via email:
- evan.zahniser@va.gov

