Mild Cognitive Impairment and Meaningful Activities

Disclosure
Avoid all drugs when possible;
Most are bad for the brain
Kemin, Nutricia, Sanofi-Aventis, Boehringer-Ingelheim

Mild Cognitive Impairment: Definition
MCI is a dynamic state between normal cognition and dementia, where interventions can be taken to stop or delay the progression to dementia.
Persons with MCI have intact ADLs but may have mild problems with IADLs

Memory Declines from a Young Age
Salthouse, Neurobiology of Aging 2009

Mild Cognitive Impairment OUTCOMES
- Poor functional recovery from major event
- 30% dead within 5 years
- 30% develop Alzheimer’s disease within 5 years

“Memory is a passion no less powerful or pervasive than love.”
Elie Wiesel
“All Rivers Run to the Sea”
Mild Cognitive Impairment is NOT BENIGN

Families and physicians fail to recognize MCI. In 3,242 non-demented patients aged 75 to 89, family practitioners recognized 12%.

**TABLE 2. MCI Subtype Classification**

<table>
<thead>
<tr>
<th>Subtype</th>
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<tbody>
<tr>
<td>MCI, amnestic, single domain</td>
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<tr>
<td>MCI, amnestic, multiple domains</td>
</tr>
<tr>
<td>MCI, non-amnestic, single domain</td>
</tr>
<tr>
<td>MCI, non-amnestic, multiple domains</td>
</tr>
<tr>
<td>MCI mild cognitive impairment</td>
</tr>
</tbody>
</table>


**Mini-Mental Status Examination**

- Educationally dependent
- Both false positives and false negatives
- Minimal testing of visuospatial system

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**SLUMS**

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ROCs For SLUMS & MMSE for MCI ≥ HS Education

<table>
<thead>
<tr>
<th>Test</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLUMS</td>
<td>78%</td>
<td>72%</td>
</tr>
<tr>
<td>MOCA</td>
<td>67%</td>
<td>72%</td>
</tr>
<tr>
<td>STMS</td>
<td>63%</td>
<td>74%</td>
</tr>
</tbody>
</table>

Rapid Cognitive Screen (RCS)

The Rapid Cognitive Screen for Mild Cognitive Impairment (MCI)

(0–5 = dementia; 6–7 = MCI; 8–10 = normal)

Recall: Five objects—Apple, Pen, Tie, House, Car. [Recall objects after clock drawing. 3 points.]

Clock Drawing: Draw with time at 10 minutes to 11 o'clock. (4 points)

Insight: Jill was a very successful stockbroker. She made a lot of money on the stock market. She then met Jack, a devastatingly handsome man. She married him and had 3 children. They lived in Chicago. She then stopped work and stayed at home to bring up her children. When they were teenagers, she went back to work. She and Jack lived happily ever after.

What state did they live in? (1 point)

RCS vs MiniCog for MCI

RCS optimal cutoff scores were ≥7 for MCI (sensitivity=0.89, specificity=0.82) and ≥5 for dementia (sensitivity=0.92, specificity=0.84).

MCI Rates of Progression

<table>
<thead>
<tr>
<th>Source</th>
<th>Study Location</th>
<th>No. of Participants</th>
<th>Baseline Age Range</th>
<th>Annual Rate of Progression</th>
<th>Reported Rate of Progression</th>
<th>Actual Progression Rate, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solfrizzi et al, 2004</td>
<td>Italy</td>
<td>1524</td>
<td>≥ 65</td>
<td>3.8/100 person-years</td>
<td>3.8</td>
<td>3.8</td>
</tr>
<tr>
<td>Busse et al, 2006</td>
<td>Leipzig, Germany</td>
<td>863</td>
<td>≥ 75</td>
<td>44% per 4.3 y</td>
<td>10.2</td>
<td>10.2</td>
</tr>
<tr>
<td>Tschanz et al, 2006</td>
<td>Cache County, Utah</td>
<td>3266</td>
<td>≥ 65</td>
<td>46% per 3 y</td>
<td>15.3</td>
<td>15.3</td>
</tr>
<tr>
<td>Fischer et al, 2007</td>
<td>Austria</td>
<td>476</td>
<td>75–76</td>
<td>33.9% per 30 mo</td>
<td>13.6</td>
<td>13.6</td>
</tr>
<tr>
<td>Ravaglia et al, 2008</td>
<td>Italy</td>
<td>937</td>
<td>≥ 65</td>
<td>14%</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>Farias et al, 2009</td>
<td>California</td>
<td>111</td>
<td>&gt; 60</td>
<td>3% * per 1 y</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Petersen et al, unpublished</td>
<td>Rochester, MN</td>
<td>1969</td>
<td>70–89</td>
<td>7.5% per 1 y</td>
<td>7.5</td>
<td>7.5</td>
</tr>
</tbody>
</table>
Fluorodeoxyglucose Positron Emission Tomography (FDG-PET)
For conversion from MCI to AD:
Sensitivity 92%
Specificity 89%
Decreased uptake in temporal and parietal regions

Relationship of White Matter Hyperintensities to Cognition

Regional white matter burden, independent of cognitive decline, correlates with balance/gait disturbance and predicts falls in elderly with aMCI and AD
Risk Factors for MCI

- Male
- Lower Education
- APOEe4 genotype
- Lack of physical exercise
- Smoking
- Processed foods
- Multiple diseases

Reversible Causes of MCI

- Drugs (digoxin, theophylline, cimetidine, anticholinergic)
- Emotional (depression)
- Metabolic (hypothyroidism, B12)
- Eyes and ears (sensory isolation)
- Normal Pressure Hydrocephalus (ataxia, incontinence, and dementia)
- Tumor or other space-occupying lesion
- Infection (syphilis, chronic infections)
- Arrhythmia (normal B12 deficiency, Alcoholism)
- Sleep Apnea

Obstructive Lung Disease and MCI

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>OLD</th>
<th>MCI</th>
<th>MCI-OLD</th>
<th>p value</th>
<th>Standardized Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
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<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoking</td>
<td></td>
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<tr>
<td>Hypertension</td>
<td></td>
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<tr>
<td>Diabetes</td>
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</tbody>
</table>

Prospective memory test (persons with correct recall on first attempt), n (%)

- OLD: 4235 (73.5%), MCI: 2938 (78.8%), p < .005
- Adjusted β: -0.15 (95% CI: -0.22 to -0.09), p < .005

Fluid intelligence test (number of correct answers), mean (SD)

- OLD: 5.9 (2.1), MCI: 6.1 (2.1), p < .005
- Adjusted β: -0.05 (95% CI: -0.11 to 0.003), p = .065

Pairs matching test round 1 (number of mistakes), median (IQR)

- OLD: 0.0 (0.0 ‒ 1.0), MCI: 0.0 (0.0 ‒ 1.0), p < .005
- Adjusted β: 0.06 (95% CI: 0.03 ‒ 0.10), p < .005

Pairs matching test round 2 (number of mistakes), median (IQR)

- OLD: 4.0 (2.0 ‒ 6.0), MCI: 3.0 (2.0 ‒ 5.0), p < .005
- Adjusted β: 0.09 (95% CI: 0.00 ‒ 0.18), p = .047

Numeric memory test (longest number correctly recalled), median (IQR)

- OLD: 7.0 (6.0 ‒ 8.0), MCI: 7.0 (6.0 ‒ 8.0), p < .005
- Adjusted β: -0.05 (95% CI: -0.10 to 0.00), p = .047

Reaction time test (time in milliseconds), median (IQR)

- OLD: 555.0 (493.0 ‒ 637.0), MCI: 539.0 (481.0 ‒ 615.0), p < .005
- Adjusted β: 4.62 (95% CI: 1.25 ‒ 8.01), p = .007
Cognitive Function and Diabetes

- Diabetes for 6 years 2-fold increase in cognitive impairment. 68 2 females age 72 years (Gregg et al, 2000)

Management of MCI
**Drug Trials for MCI Progression**

<table>
<thead>
<tr>
<th>Source</th>
<th>Study Sponsor</th>
<th>Duration</th>
<th>End Point</th>
<th>Medication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petersen et al. 2005</td>
<td>Alzheimer's Disease Cooperative Study</td>
<td>3 yr</td>
<td>AD</td>
<td>Vitamin E</td>
</tr>
<tr>
<td>Thal et al. 2005</td>
<td>Merck</td>
<td>3–4 yr</td>
<td>AD</td>
<td>Rofecoxib</td>
</tr>
<tr>
<td>Feldman et al. 2007</td>
<td>Novartis</td>
<td>4 yr</td>
<td>AD</td>
<td>Rivastigmine</td>
</tr>
<tr>
<td>Winblad et al. 2008</td>
<td>Johnson &amp; Johnson</td>
<td>2 yr</td>
<td>CDR 1</td>
<td>Galantamine</td>
</tr>
<tr>
<td>Doody et al. 2009</td>
<td>Pfizer</td>
<td>46 wk</td>
<td>AD</td>
<td>Donepezil</td>
</tr>
</tbody>
</table>

**Positive effects of exercise**

- Increased cognition and decreased brain atrophy
- Decreased dysphoria
- Enhanced VO2 max
- Decreased sarcopenia and frailty
- Increased bone mineral density

![Exercise Program](image)

**Exercise Program**
- Balance, Strength, and Aerobic Exercises
  - 15 min walking outside
  - 5 min of weight lifting
  - 5 min of sit and stand
  - 5 min of throwing a beach ball
  - 30 min of exercise, 3 days per week for 3 weeks

![Exercise and incident dementia in persons 65 years and older](image)

**Exercise and incident dementia in persons 65 years and older**

- 1740 older persons who scored above 25th percentile cognitively
- Follow-up 6.2 years
- Exercise 3 times/week: 13.0 per 1000
- Exercise less: 19.7 per 1000
- OR 0.62 (0.44 – 0.86, p = 0.004)
EDEN ALTERNATIVE
(Founded 1991)

- Cultural Change
- De-institutionalizing culture and environment of nursing homes
- Ownership,...enhancing locus of control
- Enlivened environment
  - pets
  - gardens

Meaningful Activities

Enjoyable activities that improve:

- Emotional wellbeing
- Cognitive status
- Physical function
- Reduce problematic behaviors
Meaningful Activities

- Less than 13% of time
- Less than 2 minutes a day (Meaningful social interaction)

Leisure Activities and Dementia

- Reading
- Playing board games
- Playing a musical instrument
- Dancing

Verghese et al, NEJM 2003 348:2500

Meaningful Activities

- Reminiscence and Cognitive Stimulation Therapy
- Family and social
- Musical
- Individual
- Exercise (mind and body)
- Spiritual

Meaningful Events

- 1931 - Empire State Building opens in New York City.
- 1932 - Ford introduces the Model B, the first low-priced car to have a V-8 engine.
- 1933 - President Roosevelt establishes the New Deal, a response to the Great Depression, and focusing on what historians call the "3 Rs": relief, recovery and reform.
- 1934 - John Dillinger killed.
- 1938 - Life magazine publishes first issue.
- 1937 - Golden Gate Bridge completed in San Francisco.
- 1938 - Orson Welles' The War of the Worlds broadcast.
- 1939 - President Roosevelt, appearing at the opening of the 1939 New York World's Fair, first present gives speech on TV.
- 1940 - Oldsmobile becomes the first car maker to offer a fully automatic transmission.
- 1940 - Bugs Bunny, Tom and Jerry make their cartoon debuts.

Activities and Dementia

- Mild dementia: activities they relate to
- Late dementia: sensory-motor

Cooking Together!
Is it time for geriatricians to teach about Robo Sapiens?

The GOD Card: Spirituality
Cognitive Training: Five Year Functional Outcomes

Willis et al, JAMA 296:2805, 2006

N = 2832;        Age 73.6 years

CST Key Principles

- Orientating people sensitively / when appropriate
- Information processing and opinion rather than factual knowledge -> implicit learning
- Multi-sensory stimulation
- Flexible activities to cater for group’s needs and abilities
- Using reminiscence (as an aid to here-and-now)
- Building / strengthening relationships

Cochrane Review 2012

- 15 trials, 407 treatment and 311 controls participants
- Length of intervention varied: 1 to 24 months
- MMSE difference at follow up = 1.74 points (Z = 5.57, p < 0.00001)
- Holden Communication Scale SMD = 0.47 (Z = 3.22, p = 0.001)
- Wellbeing/QoL SMD = 0.38 (Z = 2.76, p = 0.006)
- Depression (GDS) SMD = 0.34 (Z = 1.88, p = 0.06)
- No benefits to ADL, behaviour, or carers measures

Number needed to treat = 6
Cost Effective
Mediterranean Diet associated with reduced risk of Alzheimer’s Disease

Table 1: Studies investigating the association between adherence to Mediterranean diet and Alzheimer’s disease

<table>
<thead>
<tr>
<th>Study</th>
<th>Type</th>
<th>Population</th>
<th>Intervention</th>
<th>Follow-up</th>
<th>Outcome</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunnesen et al. 2009</td>
<td>Prospective cohort</td>
<td>Older women</td>
<td>Mediterranean diet</td>
<td>10 years</td>
<td>Mini-Mental Status Examination (MMSE)</td>
<td>MMSE p=0.03</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td>CDT p=0.02</td>
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<td></td>
<td></td>
<td>MCI OR 0.34 (0.12-0.97)</td>
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</tr>
</tbody>
</table>

PREDIMED-NAVARRA
6.5 years

Extra Virgin Olive Oil Extracts

Cardinals Reminiscence League
A 2 year multidomain intervention (diet, exercise, cognitive training, vascular risk monitoring), or a control group (general health advice).
1260 to the intervention group (n=631) or control group (n=629).

FINGER STUDY
Aged 60-77 years recruited from previous national surveys.
A 2 year multidomain intervention (diet, exercise, cognitive training, vascular risk monitoring), or a control group (general health advice).

Mild Cognitive Impairment
- Prevalence 14-18% over 70 years
- Can be reliably identified with simple clinical tests
- Often has reversible causes
- Those progressing to dementia can be identified in many cases
- Exercise, Nutrition and CST can improve outcomes