Differential Diagnosis of Dementia: A Case Study Analysis

Christopher Koepppl, MD
Ministry Medical Group
Wisconsin Alzheimer’s Institute
Cognitive Changes with Normal Aging

Some abilities remain stable
- Vocabulary
- Fund of information
Cognitive Changes with Normal Aging

Some abilities decline with normal aging

- Cognitive speed
- Rapid novel problem solving
Cognitive Changes with Normal Aging

![Graph showing Z-Score changes with age.](image-url)
Normal Aging Versus Dementia

- Minimal memory impairment
- Little or no progression of impairment
- No functional consequences
Dementia

A syndrome characterized by a decline in cognitive functions sufficient to cause impairment in social and occupational performance.
Diagnostic Criteria for Dementia (DSM-IV)

1. **Memory impairment**: impaired ability to learn new information or to recall old information

2. **One or more** of the following:
   - aphasia (language disturbance)
   - apraxia (impaired ability to carry out motor activities despite intact motor function)
   - agnosia (failure to recognize or identify objects despite intact sensory function)
   - disturbance in executive functioning: impaired ability to plan, organize, sequence, abstract

3. The cognitive deficits result in **functional impairment** (social/occupational)

4. The cognitive deficits do not occur exclusively solely during a delirium

5. NOT due to other medical or psychiatric conditions
Causes of Dementia

- Alzheimer's Disease (AD): 65%
- AD & Vascular: 10%
- Lewy body: 7%
- AD and Lewy body: 5%
- Vascular: 5%
- Other: 8%
Mild Cognitive Impairment (MCI)

- Subjective memory complaints
- Objective memory impairments
- MMSE ≥ 24
- No/Minor functional impairment
- No diagnosis of AD
Dementia Evaluation

• History and Observation
• Mental status evaluation
• Physical examination
• Laboratory tests
• Additional tests useful in many cases:
  – Neuroimaging
  – Neuropsychological testing
  – Depression screening
Indications for Neuroimaging in the Diagnosis of Dementia

• Onset before age 65
• Abrupt onset or rapid progression
• Atypical features
• Symptoms suggesting a brain lesion
• Seizures
Indications for Neuropsychological Assessment in the Diagnosis of Dementia

• Onset before age 65
• Mild or atypical pattern of cognitive problems
• Discrepancy between clinical findings and history
• Combined mood and cognitive problems
• Helpful in establishing a baseline for future comparison
• Always required for research-level diagnosis
# Healthy Older Adult

## COGNITIVE STATUS PROFILE

<table>
<thead>
<tr>
<th></th>
<th>LOC</th>
<th>ORI</th>
<th>ATT</th>
<th>LANGUAGE</th>
<th>CONS</th>
<th>ME</th>
<th>CAL</th>
<th>REASONING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>COM P</td>
<td>REP</td>
<td>NAM</td>
<td></td>
<td>SIM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>--6--</td>
<td>--6--</td>
<td></td>
<td></td>
<td>--8--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>--5--</td>
<td>--12--</td>
<td>--8--</td>
<td>--4--</td>
<td>--3--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>--12--</td>
<td>--11--</td>
<td>--7--</td>
<td>--10--</td>
<td>--5--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>--5--</td>
<td>--6--</td>
<td>--5--</td>
<td>--4--</td>
<td>--2--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>--3--</td>
<td>--2--</td>
<td>--0--</td>
<td>--4--</td>
<td>--1--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>--1--</td>
<td>--2--</td>
<td>--0--</td>
<td>--2--</td>
<td>--1--</td>
</tr>
</tbody>
</table>

†AVG. RANGE

- ALERT- --12-- - (S)7-
- --10-- - --6--
- MILD --8-- --5--
- MODERATE --IMP-- --6-- --3--
- SEVERE --4-- --1--

Healthy Older Adult
# Person with Dementia

## Cognitive Status Profile

<table>
<thead>
<tr>
<th></th>
<th>LOC</th>
<th>ORI</th>
<th>ATT</th>
<th>LANGUAGE</th>
<th>CONST</th>
<th>MEM</th>
<th>CALC</th>
<th>REASONING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>COMP</td>
<td>REP</td>
<td>NAM</td>
<td></td>
<td>SIM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALERT</td>
<td>-10</td>
<td>-6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MILD</td>
<td>-5</td>
<td>-5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MODERATE</td>
<td>-6</td>
<td>-3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEVERE</td>
<td>-4</td>
<td>-1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

|       | 8   | 6   | 4   | 10  | 6   | 2   | 4   | 3   | 4   | 4   |

Note: Write in lower scores.
Case #1

- 78 y/o woman, 12 years education, bank teller, married
- 1 ½-year history of progressive short-term memory loss
- No significant functional changes
- Lab – neg.; exam – unremarkable
- Medical hx – hyperlipidemia, CAD (stress test normal 1 yr earlier), hypothyroid - treated
Case #1 continued

- MMSE = 29/30
- Clock – normal (?) equal length of hands
- Animal Naming – 15 items
## Case #1 continued

### Cognitive Status Profile

<table>
<thead>
<tr>
<th>LOC</th>
<th>ORI</th>
<th>ATT</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALERT</td>
<td>12-</td>
<td>-(S)7-</td>
</tr>
<tr>
<td></td>
<td>10-</td>
<td>6-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LANGUAGE</th>
<th>CONST</th>
<th>MEM</th>
<th>CALC</th>
<th>REASONING</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP</td>
<td>REP</td>
<td>NAM</td>
<td>--6--</td>
<td>--8--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AVERAGE RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALERT</td>
</tr>
<tr>
<td>MILD</td>
</tr>
<tr>
<td>MODERATE</td>
</tr>
<tr>
<td>SEVERE</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Write in lower scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 7 6 12 8 5 5 4 7 5</td>
</tr>
</tbody>
</table>
Mild Cognitive Impairment (MCI)

- Subjective memory complaints
- Objective memory impairments
- MMSE $\geq 24$
- No/minor functional impairment
- No diagnosis of AD
Annual Rates of Conversion from MCI to Dementia Over 48 Months

Categories:
- Alzheimer's disease
- MCI
Case #2

- 72 y/o woman, married, BS degree, school secretary (retired)
- 9-mo h/o of word-finding difficulty and short-term memory loss
- Pt and husband say non-progressive and not affecting function
- Lab, MRI, exam – unremarkable
- Medical history - negative
Case #2 continued

• MMSE = 26/30
• Animal Naming = 10
• Clock – abnormal
**Case #2 continued**

**COGNITIVE STATUS PROFILE**

<table>
<thead>
<tr>
<th>LOC</th>
<th>ORI</th>
<th>ATT</th>
<th>LANGUAGE</th>
<th>CONS T</th>
<th>ME M</th>
<th>CAL C</th>
<th>REASONING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>COM P</td>
<td>REP</td>
<td>NAM</td>
<td></td>
<td>SIM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(-S)6-</td>
<td>--(S)-</td>
<td>--(S)-</td>
<td>--(S)-</td>
<td>--12-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>--8--</td>
<td>--9--</td>
<td>--5--</td>
<td>--3--</td>
<td>--8--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>--8--</td>
<td>--7--</td>
<td>--3--</td>
<td>--2--</td>
<td>--6--</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>--4--</td>
<td>--2--</td>
<td>--0--</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**†AVG. RANGE**

- ALERT- --12- --(S)7-
- MILD --8-- --5--
- MODERATE --IMP-- --6-- --3--
- SEVERE lower 6 6

**Write in lower scores**

6 6
Diagnosis of AD

1. Dementia by DSM-IV criteria 1-4

   and

2. Insidious onset with progressive deteriorating course

   and

3. Exclusion of other causes of dementia
Diagnostic Criteria (DSM-IV) for Vascular Dementia

- Dementia criteria 1-4
- Focal neurological signs and symptoms OR
- Evidence of cerebrovascular disease judged to be etiologically related to the dementia
Case # 3

- 82 year old female, widowed x 22 yrs
- h/o htn, ASHD, s/p AVR, PMR
- Meds: ASA, Lovastatin, ca ++
- 3-4 mo hx anorexia, weight loss, decreased attn to grooming and ADLs
- Decreased interest in usual activities, intermittent confusion, mild paranoia
- Nursing home placement
Case #3 continued

• MMSE 26/30, AF 16, O x 2, mood sluggish, min verbal, poor hygiene, psychomotor retardation (almost catatonic)
• Labs normal, MRI neg, GDS 15/16
### Case # 3
**COGNITIVE STATUS PROFILE**

<table>
<thead>
<tr>
<th></th>
<th>LOC</th>
<th>ORI</th>
<th>ATT</th>
<th>LANGUAGE</th>
<th>CONS</th>
<th>MEM</th>
<th>CAL</th>
<th>REASONING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>COMP</strong></td>
<td><strong>REP</strong></td>
<td><strong>NAM</strong></td>
<td><strong>-6--</strong></td>
<td><strong>-8--</strong></td>
</tr>
<tr>
<td><strong>†AVG. RANGE</strong></td>
<td>ALERT-</td>
<td>-</td>
<td>-</td>
<td>(S)7-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MILD</td>
<td></td>
<td>--8-</td>
<td>--3-</td>
<td>--4-</td>
<td>--9-</td>
<td>--5-</td>
<td>--3-</td>
<td>--8-</td>
</tr>
<tr>
<td>MODERATE</td>
<td>--IMP--</td>
<td>--6-</td>
<td>--3-</td>
<td>--3-</td>
<td>--7-</td>
<td>--3-</td>
<td>--2-</td>
<td>--6-</td>
</tr>
<tr>
<td>SEVERE</td>
<td></td>
<td>--4-</td>
<td>--1-</td>
<td>--2-</td>
<td>--5-</td>
<td>--2-</td>
<td>--0-</td>
<td>--4-</td>
</tr>
</tbody>
</table>

Write in lower scores:

<p>| | | | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>11</td>
<td>5</td>
<td>5</td>
<td>11</td>
<td>7</td>
<td>4</td>
<td>8</td>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>
Case #3 continued

- Depression
- Pseudodementia
- ECT
- Follow-up revealed alert, pleasant, well-groomed, happy, more verbal, and AF 20
Case # 4

• 79 year old man, 12 years education
• 2 yr hx memory complaints, reduced completion of complex tasks, good/bad days, visual hallucinations
• 1 yr hx intermittent falls, occasional syncopal episodes, difficulty getting in and out of chairs
• Reduced alertness, mildly depressed mood
• Neurological Exam – mild Parkinsonism (rigidity, balance changes, mild cogwheeling, no tremor)
Case #4 continued

- MMSE = 26/30

- Animal Naming – 11 items
Case #4 continued
## Case #4 continued

### Cognitive Status Profile

<table>
<thead>
<tr>
<th></th>
<th>LOC</th>
<th>ORI</th>
<th>ATT</th>
<th>LANGUAGE</th>
<th>CONST</th>
<th>MEM</th>
<th>CALC</th>
<th>REASONING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>COMP</td>
<td>REP</td>
<td>NAM</td>
<td></td>
<td>SIM</td>
</tr>
<tr>
<td>AVG. RANGE</td>
<td>ALERT</td>
<td>12-</td>
<td>(S)7-</td>
<td>(S)6-</td>
<td>(S)5-</td>
<td>12-</td>
<td>(S)4-</td>
<td>(S)6-</td>
</tr>
<tr>
<td></td>
<td>10-</td>
<td>6-</td>
<td></td>
<td>5-</td>
<td>8-</td>
<td>11-</td>
<td>7-</td>
<td>4-</td>
</tr>
<tr>
<td>MILD</td>
<td></td>
<td></td>
<td></td>
<td>4-</td>
<td>9-</td>
<td>5-</td>
<td>3-</td>
<td>8-</td>
</tr>
<tr>
<td>MODERATE</td>
<td>IMP</td>
<td>-6-</td>
<td>-3-</td>
<td>-3-</td>
<td>-7-</td>
<td>-3-</td>
<td>-2-</td>
<td>-6-</td>
</tr>
<tr>
<td>SEVERE</td>
<td></td>
<td></td>
<td></td>
<td>-4-</td>
<td>-1-</td>
<td>-2-</td>
<td>-5-</td>
<td>-2-</td>
</tr>
</tbody>
</table>

Write in lower scores: 8 5 4 8 7 1 6 2 4 5
Dementia with Lewy Bodies – Core Features

Two of the following for Dx of probable DLB, one for Dx of possible:

- Fluctuating cognitive deficits
- Visual hallucinations
- Motor feature of parkinsonism – gait
Dementia with Lewy Bodies – Central Features

- Progressive cognitive impairment leading to functional impairment
- Prominent memory impairment may not occur until later stages
Dementia with Lewy Bodies – Supportive Features

- Repeated falls
- Syncope
- Transient loss of consciousness
- Neuroleptic sensitivity
- Systematized delusions
Case #5

- 63 y/o man, married; 13 yrs education; farmer
- 4+ year h/o short-term memory loss, weight gain (60+ lbs in preceding year)
- Personality changes: argumentative, anxious, paranoid, rude, repetitious
- Poor judgment in use of farm machinery; gets lost
Case #5 continued

- Lab, exam – unremarkable except gait broad-based and slow
- Medical history- remote hx of head injury, Lyme disease; life-long heavy drinker; depression-treated; hypertension
- Neuropsych testing 4 yrs earlier-generally wnl, difficulties attributed to anxiety and adjustment issues, question of apnea
- Family hx of dementia (mother)
Case #5 continued

- MMSE = 27/30
- Animal naming = 15 with 2 perseverations
- Clock draw – abnormal (could not set time)
### Case #5 continued

**COGNITIVE STATUS PROFILE**

<table>
<thead>
<tr>
<th></th>
<th>LOC</th>
<th>ORI</th>
<th>ATT</th>
<th>LANGUAGE</th>
<th>CONST</th>
<th>MEM</th>
<th>CALC</th>
<th>REASONING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>COMP</td>
<td>REP</td>
<td>NAM</td>
<td>SIM</td>
<td>JUD</td>
</tr>
<tr>
<td><strong>†AVG. RANGE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- ALERT -</td>
<td></td>
<td></td>
<td></td>
<td>-6--</td>
<td>-8--</td>
<td>-6--</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 10--</td>
<td></td>
<td></td>
<td></td>
<td>-11--</td>
<td>-7--</td>
<td>4--</td>
<td>-10--</td>
<td>-2--</td>
</tr>
<tr>
<td>- 8--</td>
<td></td>
<td></td>
<td></td>
<td>-5--</td>
<td>-4--</td>
<td>5--</td>
<td>-5--</td>
<td>4--</td>
</tr>
<tr>
<td>MILD</td>
<td></td>
<td></td>
<td></td>
<td>-8--</td>
<td>-5--</td>
<td>-4--</td>
<td>-9--</td>
<td>-5-- -3--</td>
</tr>
<tr>
<td>MODERATE</td>
<td>-IMP</td>
<td>-6--</td>
<td>-3--</td>
<td>-3--</td>
<td>-7--</td>
<td>-3--</td>
<td>-2--</td>
<td>-6-- -1--</td>
</tr>
<tr>
<td>SEVERE</td>
<td>-4--</td>
<td>-1--</td>
<td>-2--</td>
<td>-5--</td>
<td>-2--</td>
<td>0--</td>
<td>-4--</td>
<td>-0-- -2--</td>
</tr>
</tbody>
</table>

Write in lower scores:

11 6 5 12 7 4 5 3 5 4
Frontal Lobe Dementia – Core Features

• Insidious onset and gradual progression
• Early decline in social/interpersonal conduct
• Early impairment in personal conduct
• Early loss of insight
• Early emotional blunting
Frontal Lobe Dementia – Supportive Features

• Behavior disorder – hygiene, grooming, mental rigidity, dietary changes, perseverative behavior

• Speech and language – perseveration, mutism, economy of speech

• Physical signs – akinesia, rigidity, tremor, labile BP
## MMSE – Diagnostic Accuracy

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Abnormal (&lt; 24) (%)</th>
<th>Normal (≥ 24) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>AD</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>Vascular</td>
<td>52</td>
<td>48</td>
</tr>
<tr>
<td>Mixed</td>
<td>71</td>
<td>29</td>
</tr>
<tr>
<td>Lewy Body</td>
<td>71</td>
<td>29</td>
</tr>
<tr>
<td>Frontal Lobe</td>
<td>31</td>
<td>69</td>
</tr>
</tbody>
</table>

**Sensitivity – 47**

**Specificity - 100**
# Clock Draw – Diagnostic Accuracy

<table>
<thead>
<tr>
<th></th>
<th>Abnormal(≤8)</th>
<th>Normal(&gt; 8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>26%</td>
<td>74%</td>
</tr>
<tr>
<td>AD</td>
<td>87%</td>
<td>13%</td>
</tr>
<tr>
<td>Vascular</td>
<td>82%</td>
<td>18%</td>
</tr>
<tr>
<td>Mixed</td>
<td>86%</td>
<td>14%</td>
</tr>
<tr>
<td>Lewy Body</td>
<td>95%</td>
<td>5%</td>
</tr>
<tr>
<td>Frontal Lobe</td>
<td>71%</td>
<td>29%</td>
</tr>
</tbody>
</table>

Sensitivity – 77  
Specificity - 74
Animal Naming

Name: ___________________________  ID #: _________________  Date: ____________

Introduction:  “I’d like to ask a question to check your memory.”

Instruction:  “Tell me the names of as many animals as you can think of, as quickly as possible.”

Procedure:  Time for 60 seconds and record all responses.

If the person stops before 60 seconds, say “Any more animals?”

If the person says nothing for 15 seconds, say “A dog is an animal. Can you tell me more animals?”

1. dog
2. cat
3. cow
4. pig
5. sheep
6. horse
7. lion
8. tiger
9. cat
10. mouse
11. ant
12. spray
13. dandelion
14. bird
15. _______________________
16. _______________________
17. _______________________
18. _______________________
19. _______________________
20. _______________________
21. _______________________
22. _______________________

Scoring:  Count the total number of animals (NOT including repetitions or non-animal words): _______________________

Next step:  If the score is less than 14, do the Cognistat exam
## Animal Fluency – Diagnostic Accuracy

<table>
<thead>
<tr>
<th>Condition</th>
<th>Abnormal (&lt; 17) (%)</th>
<th>Normal (&gt; 17) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>24</td>
<td>76</td>
</tr>
<tr>
<td>AD</td>
<td>91</td>
<td>9</td>
</tr>
<tr>
<td>Vascular</td>
<td>90</td>
<td>10</td>
</tr>
<tr>
<td>Mixed</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Lewy Body</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Frontal Lobe</td>
<td>100</td>
<td>0</td>
</tr>
</tbody>
</table>

Sensitivity – 90
Specificity - 76
WAI-Affiliated Dementia Diagnostic Clinic Network

3000 new evaluations annually

33 clinics total as of 5/09

36 clinics as of 5/10