Cognitive Testing Tools
Compare and Contrast

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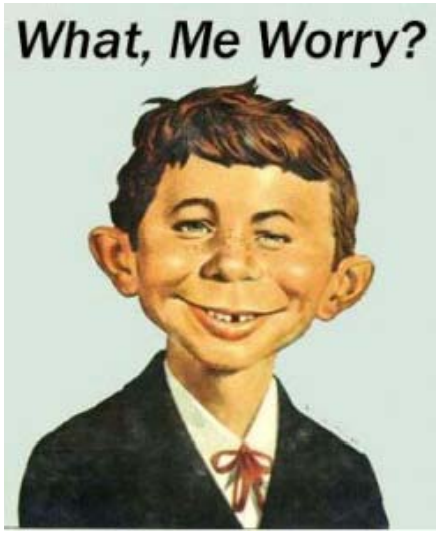
ILTCI

Dementia: Why Worry?



LTC Claims

- Dementia is the #1 claimed LTC event
- Average expenditure more than $103K
- Not all cog claims are dementia (only 68%)
- More than 50% reside in memory units
- 9% of recoveries approved for cog impairment

Underwriting

- Anti-selection – it happens
- No effective therapy, less medical record documentation
- Less than perfect tool for early detection
- What we know: proper cognitive screening can be protective

“I just had a senior moment”

- Have you ever left something on the stove? Where are my keys? What was that actor’s name?
- Cognitive function of normal aging
  - Peak cognitive function occurs throughout lifespan
  - Mild loss of short term memory with age.
    - Mini-mental status exam (MMSE) 50th percentile:
      - Age 64 years: 28
      - Age 74 years: 27
      - Age 84 years: 25
    - Delayed Word Recall and MCAS do not decay with age
    - Level of education may also play an important role as does health status

Aging and Cognition

So why are we not as sharp as we used to be?

- As we age there are decrements in
  - Processing speed
  - Attention process
  - Learning and memory
  - Visual perception
  - Visual construction
  - Complex cognitive function

Memory and Aging

- Overall stable memory functions
  - Remote history is well preserved
  - "Crystallized" abilities (e.g., world knowledge, vocabulary)
  - Remembering the gist of information
- Aging-sensitive memory
  - New learning is slower. Requires encoding
  - Depth of processing information is at a more superficial level
  - Nonverbal learning declines (e.g., misplacing things)

Case Study #1 – TQ Comprehensive Plan

Mrs. Wilson is a 63 year old woman, recently retired

- Applying for a 6 year plan at $300/day and a 30 day EP
- Lives alone, Rx: HTCZ, Prevagen supplement, describes herself as active and independent, drives, volunteers, took early retirement 6 months ago

- **Phone interview**
  - Hesitant at times, otherwise completely normal
- **Medical Record**
  - Hypertension and metabolic syndrome, BMI of 32
  - Two complaints of memory issues in past 12 months, discounted by her physician, a MMSE of 25/30 (college education) was obtained and her affect was described as flat
  - Daughters have accompanied their mom during her last two office visit and both described their mom as absent minded and "not quite right in the head".

What are your next underwriting steps?

Case Study #1 – TQ Comprehensive Plan

Mrs. Wilson is a 63 year old woman, recently retired

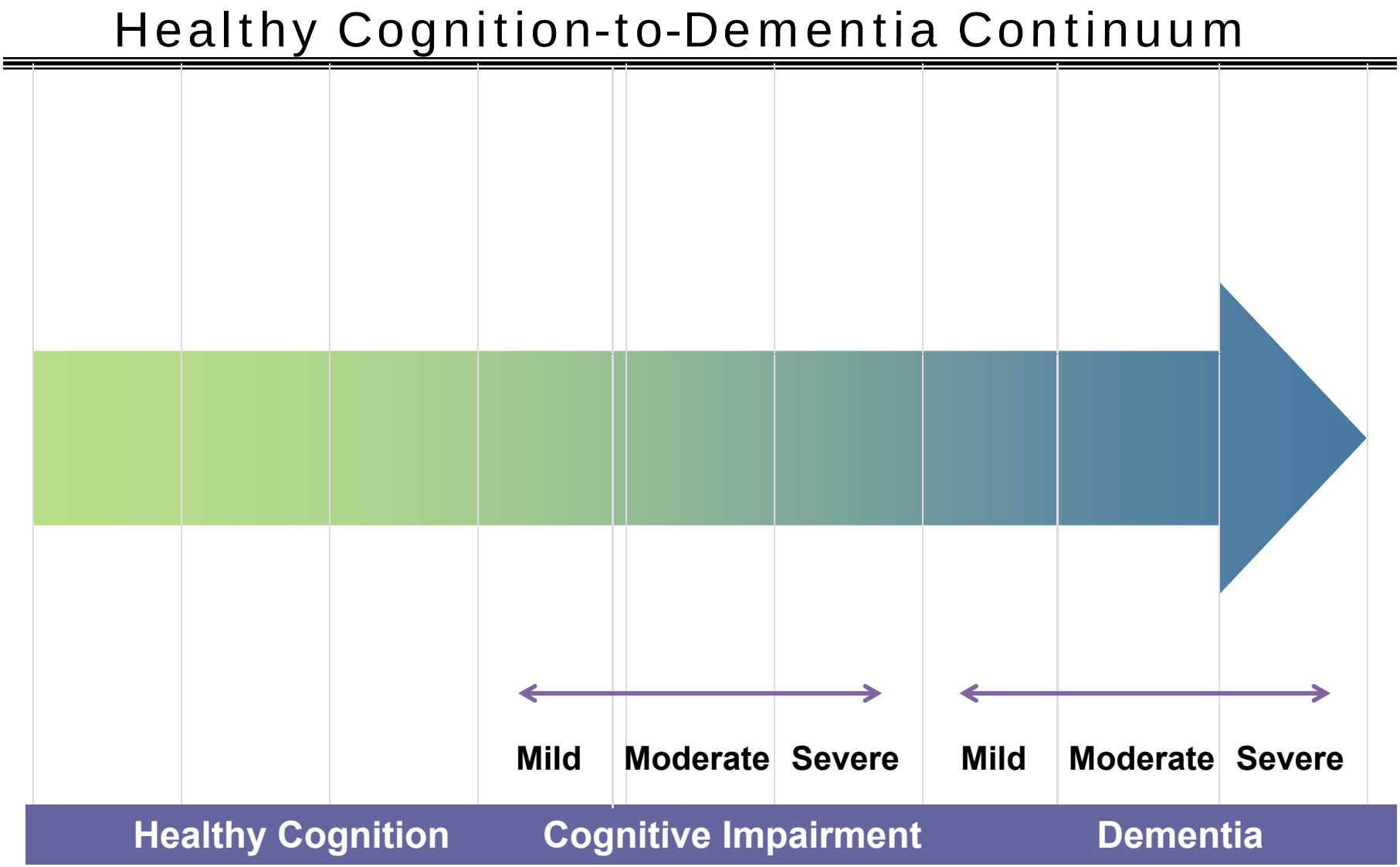
A. She sounds fine, accept her application

B. Continue your work-up by obtaining a cognitive screening test by phone

C. I'm concerned, I'll order an in-person cognitive screening test

D. I'm very concerned, I would likely decline this application based upon multiple memory complaints over the past 24 months

A Cognition Continuum



Mild Cognitive Impairment

"A syndrome defined as cognitive decline greater than that expected for an individual's age and education level but that does not interfere notably with activities of daily living."

MCI Criteria (ADCS)

- Memory complaints (self or informant)
- Memory deficit on paragraph recall (age and education adjusted)
- Clinical Dementia Rating (CDR) = 0.5 (questionable dementia)
- General cognition preserved (MMSE $\geq$ 24)
- "Not sufficiently impaired" in daily function for diagnosis of dementia

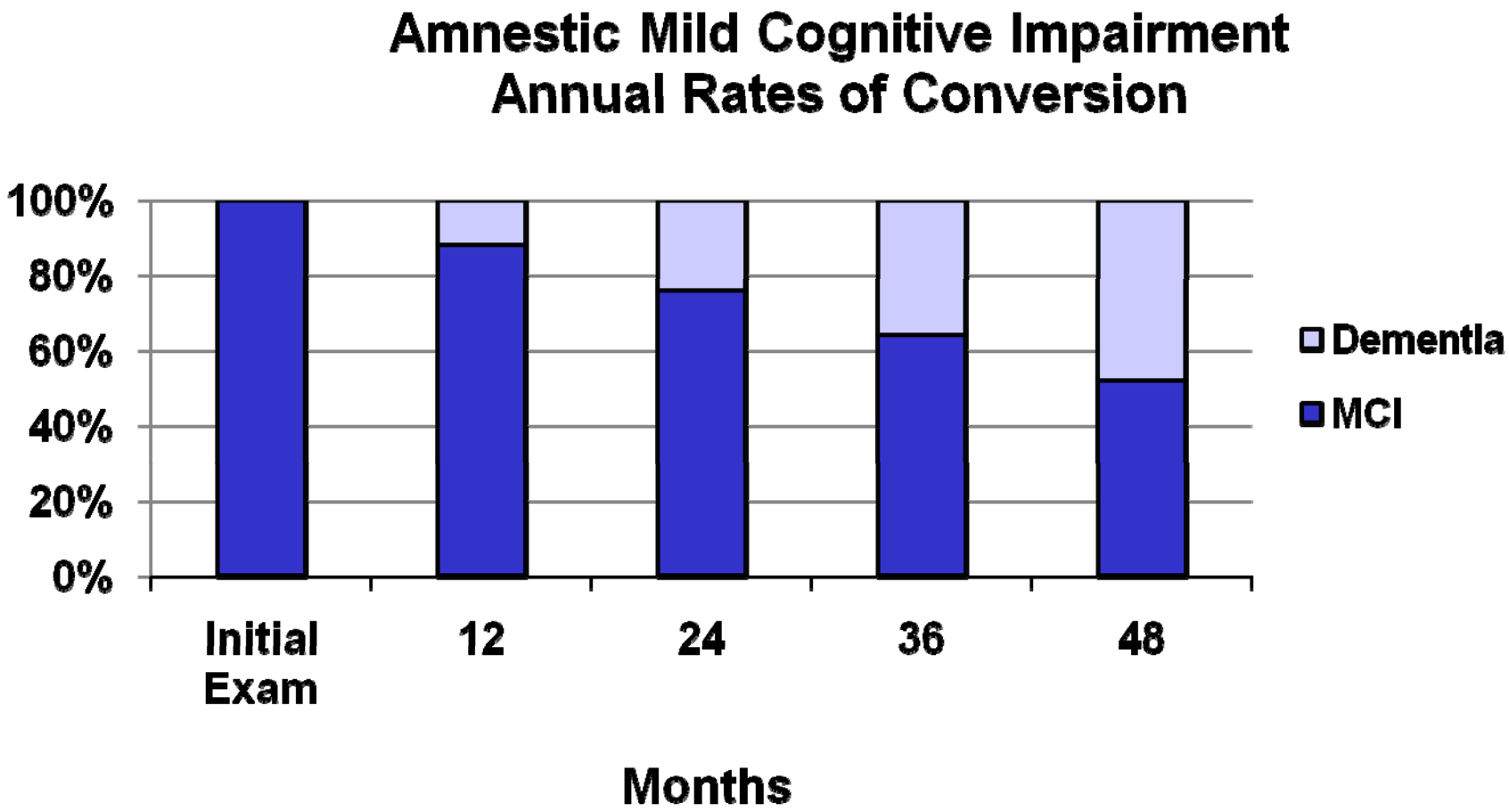
Gauthier, S. et. al., The Lancet 2006; 367:1262.

Mild Cognitive Impairment

- Transitional stage between normal aging and dementia
- Heterogeneous condition; not all individuals develop dementia
- Mild Cognitive Impairment prevalence varies from 1 to 15% of the population depending on the MCI subset diagnostic criteria employed (13-16% of those 70-89 years of age)
- MCI progresses to dementia at divergent rates of between 10% to 55%, over 2.6 years, depending on the diagnostic subset criteria employed
- MCI may begin 10-15 years prior to convergence to dementia

Petersen RC, Smith GE, Waring SC, et al. (1999). "Mild Cognitive Impairment". Archives of Neurology 56: 303–308.
Grundman M, Petersen RC, Ferris SH, et al. (2004). "Mild Cognitive Impairment Can Be Distinguished From Alzheimer's disease and Normal Aging for Clinical Trials". Archives of Neurology 61: 59–66.
Tabert MH, Manly JJ, Liu X, et al. (2006). "Neuropsychological Prediction of Conversion to Alzheimer's Disease in Patients With Mild Cognitive Impairment". Archives of General Psychiatry 63: 916–924

Conversion of MCI to Dementia



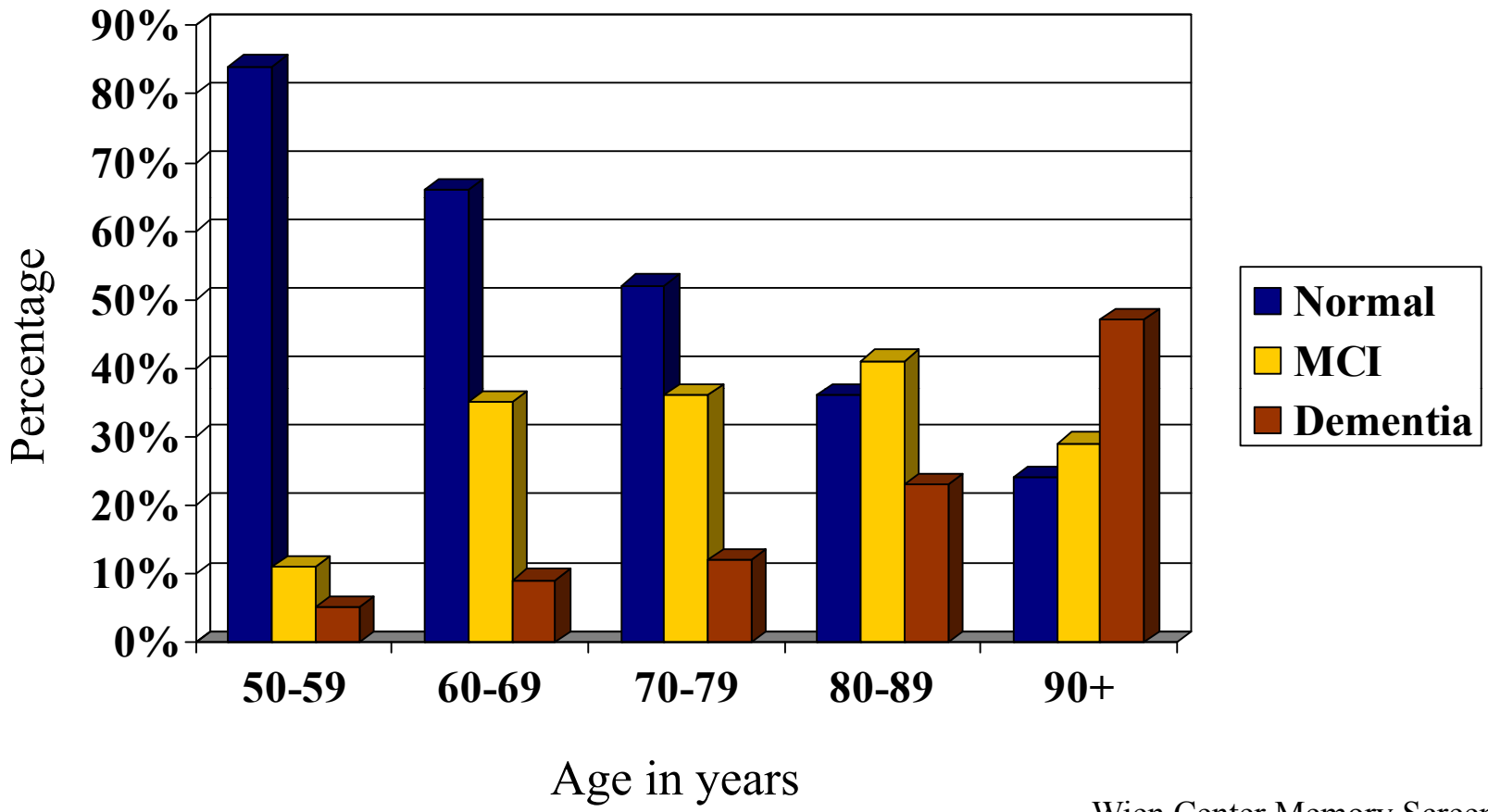
From Petersen RC, et al. *Arch Neurol* 1999;56:303

Mild Cognitive Impairment

- Pedersen: MCI subjects develop AD at rate of 10-12% per year (controls develop MCI/AD at 1-2% per year)
- Tremont: 47% of MCI identified by MCAS converted to AD over a 2.5-3 year period
- MCI subjects can be differentiated from control and very mild AD subjects
  - From memory perspective, MCI resembles Alzheimer's disease
  - MCI resembles controls on non-memory cognitive measures
  - MCI has slower rate of cognitive decline than AD
  - Although many MCI individuals develop AD, not all do
- Many clinicians are uncomfortable classifying MCI as AD

Petersen RC et al., Arch Neurol 1999;56:303-308
Tremont, et. al., J Am Geriatric Soc 2016;64(3): 608-613

MCI and Dementia Rates



Wien Center Memory Screening
Community-based, self referred participants, 2001.

Transient Cognitive Impairment: Delirium

A Special Case of Cognitive Impairment: Delirium

- Definition: An acute confusional state
  - Often fluctuating during the day
  - Impacting attention and cognition
  - Presenting in a disorganized and incoherent manner
  - Often time-limited with full or partial recovery

- Many etiologies:
  - Acute disorientation of being sick and hospitalized
  - Post-op: Impact of anesthesia, surgery and hospitalization
  - Infections and sepsis: urosepsis, pneumonia, viral encephalitis, etc.
  - Metabolic: low sodium, hypercalcemia, hypoglycemia, liver failure, renal failure, alcohol or opiate withdrawal
  - Hypoxemia: congestive heart failure, COPD, shock
  - Traumatic brain injury

10 Early warning signs of AD

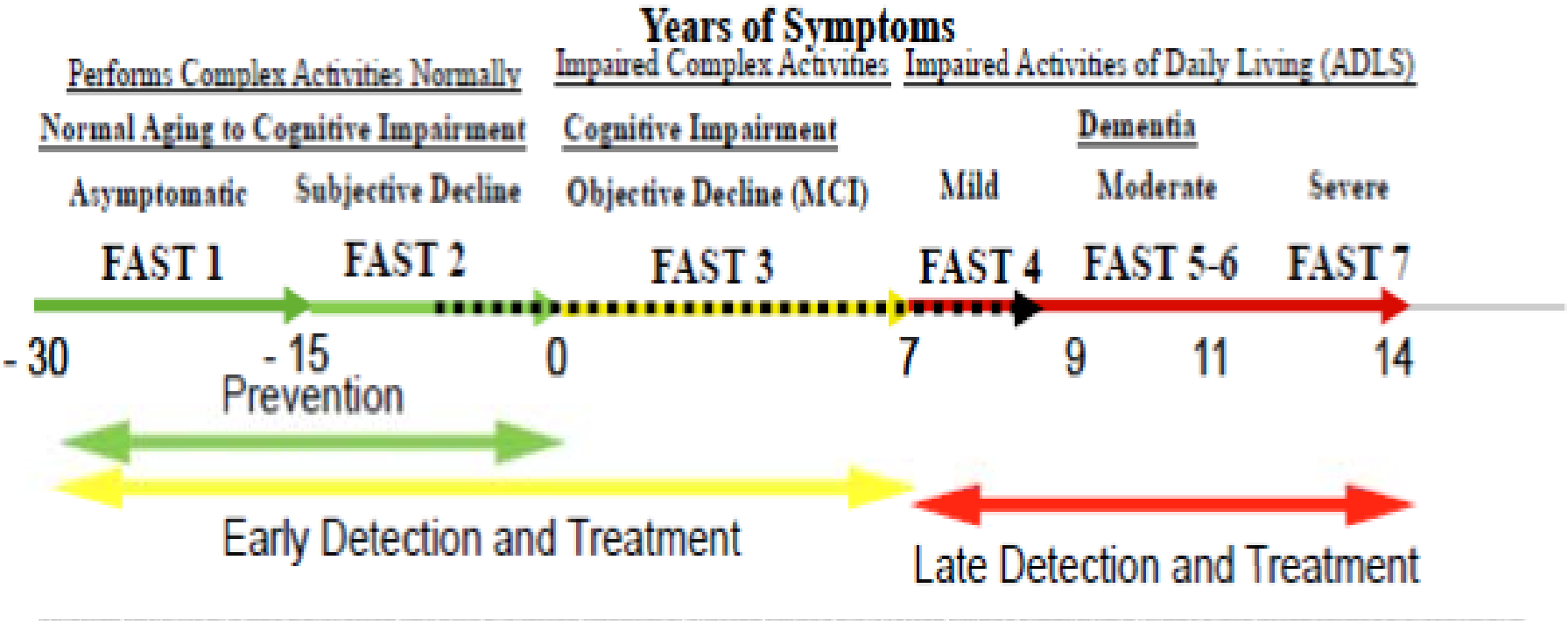
- Memory loss affecting job performance
- Difficulty performing familiar tasks
- Language difficulties
- Disorientation to time and place
- Poor judgement
- Problems with abstract thinking
- Misplacing things
- Mood or behavior changes
- Personality changes
- Loss of initiative and apathy

Alzheimer's Association. *Ten Warning Signs of Alzheimer's Disease. At* http://www.alz.org/AboutAD/10Signs.htm

"Prodrome" can extend for years

The Spectrum of Cognitive Impairment [CI] & Dementia due to Alzheimer's Disease

Functional Assessment Staging Test (FAST)[1]



[1] Reisberg B Functional Assessment Staging (FAST) Psychopharmacology Bulletin 1988: 24: 653-659

Prodromal dementia: amnestic mild cognitive impairment

- Mild changes that precede functional impact
  - "Memory problem":
    - 67 % of elderly report problems
    - Only 6% think it is worse than peers
  - Prodromal Alzheimer's or amnestic mild cognitive impairment
    - Amnestic cognitive deficit.
      - Short term memory deficits. Rapid forgetting.
      - Language is first deficit in 20%: word finding, semantic fluency decline and confrontational naming
      - Other presenting features: decline in organization or navigation

Screening for amnestic mild cognitive dysfunction

- Simple test used at the bedside or in the clinic
- Help screen normal from abnormal cognition while not falsely identifying cognitive decline
- Total score based on adding up sub-scores
- Try to cover domains that define dementia per Diagnostic and Statistical Manual-5 (DSM-5)
  - Learning and memory
  - Language
  - Executive Function
  - Complex attention
  - Perceptual-motor function
  - Social cognition

American Psychiatric Association, DSM-5, Amer. Psy. Assoc, Arlington, 2013

"Benchmark": Folstein mini-mental status exam (MMSE)

- Proprietary, in-person screen in clinical practice
- Most widely studied

Cognitive Function	Elements	Other examples
Orientation	10 elements include: date, year, month, day, place (including county and floor)	Season of the year
Immediate recall	Primary memory of repeating 3 words back; gets 6 tries but first is scored	Sequence of numbers
Attention and calculation (Working memory)	Best of Serial 7's: 100-93-86-79-65 or spelling World backwards: D-L-R-O-W	Serial 3's, Months of year backwards, digit span (79256),
Recall	Recall the 3 words	Many different versions including: 5, 7, and 10 word recall

Folstein continued

Cognitive function	Elements	Other examples
Naming	Shown watch and pencil	Telephonically object is described: “What is worn on wrist to tell time?”
Repetition	“No, ifs, ands, or buts.”	
3-Stage Command	Take a paper in [dominant] hand, paper in half and place on floor.	Telephonically can give different commands that include taps on phone.
Reading	Read and perform: “Close you eyes”	
Writing	Write a sentence that should include a subject and verb.	
Copying	Two intersecting pentagons	

Maximum Score	Patient's Score	Questions
5		"What is the year? Season? Date? Day of the week? Month?"
5		"Where are we now: State? County? Town/city? Hospital? Floor?"
3		The examiner names three unrelated objects clearly and slowly, then asks the patient to name all three of them. The patient's response is used for scoring. The examiner repeats them until patient learns all of them, if possible. Number of trials: _____
5		"I would like you to count backward from 100 by sevens." (93, 86, 79, 72, 65, …) Stop after five answers. Alternative: "Spell WORLD backwards." (D-L-R-O-W)
3		"Earlier I told you the names of three things. Can you tell me what those were?"
2		Show the patient two simple objects, such as a wristwatch and a pencil, and ask the patient to name them.
1		"Repeat the phrase: 'No ifs, ands, or buts.'"
3		"Take the paper in your right hand, fold it in half, and put it on the floor." (The examiner gives the patient a piece of blank paper.)
1		"Please read this and do what it says." (Written instruction is "Close your eyes.")
1		"Make up and write a sentence about anything." (This sentence must contain a noun and a verb.)
1		"Please copy this picture." (The examiner gives the patient a blank piece of paper and asks him/her to draw the symbol below. All 10 angles must be present and two must intersect.) 

Source: www.medicine.uiowa.edu/igec/tools/cognitive/MMSE.pdf

Provided by NHCQF, 0106-410

Passing MMSE scores by age and education

- Scored in 30 point scale with 24 passing
- Normal scores sensitive to age and education level

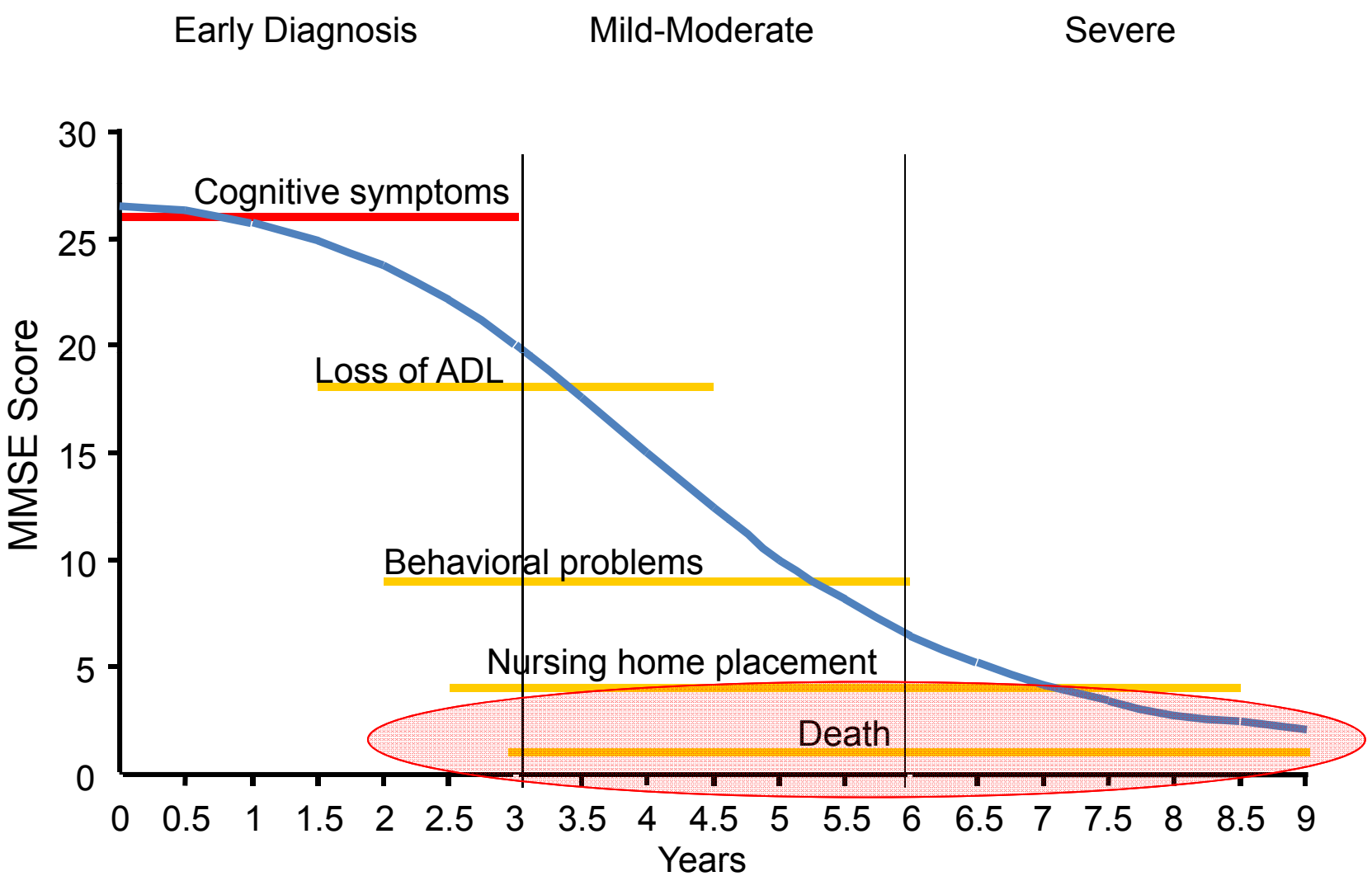
Mean MMSE Score for Level of Education

(General Community Dwelling Population)

Age Range	Level of Education		
	Grades 5-8	High School	College +
55-59	26	28	29
65-69	26	28	29
75-79	25	27	28
85 +	23	26	27

JAMA 1993, (269), 2389

Dementia established: MMSE deteriorates by 4 points annually



Feldman H, et al. Clinical Diagnosis and Management of Alzheimer's Disease. 1996:239-253
Doody RS, et.al. A method for measuring progression rates in Alzheimer Disease *Arch Neurology* 58: 449-454

What is missing from MMSE?

- Good screen but missing elements include:
  - Learning and memory: prompted recall
  - Language: Semantic verbal fluency: timed number of items in a class, e.g. animals in the zoo
  - Executive function: Clock draw, Trails test, verbal fluency (also tests executive function)
  - Complex attention: Selective, sustained, and divided attention testing
  - Perceptual motor function: 3-dimensional perception
  - Social cognition: Insight

Delayed word recall

- 10 words encoded in a sentence x two times.
- Recall ~5 minutes later with interference testing
- Limited to amnestic cognitive dysfunction and prone to anxiety and depression
- Scoring:
  - Original paper had mild dementia group MMSE $\geq$ 18
  - Used 3 as cutscore
    - Sensitivity 89% (25 of 28 below 3)
    - Specificity 98% (54 of 55 were 3 or greater)
    - Overall predictive accuracy 95.2%

Knopman DS, Ryberg S A verbal memory test with high predictive accuracy for dementia of the Alzheimer type *Arch Neurol 1989; 46: 141-145*

Sensitivity and Specificity

- When using a test one wants it to be:
  - able to discriminate or be abnormal when the disease is present. It should be:
    - *Sensitive*
    - Positive when disorder or disease is present
  - able to discriminate or be normal when the disease is <u>not</u> present. It should be:
    - *Specific*
    - Negative when the disorder or disease is not present.

Frequently seen tests

Cognitive test	Mild Cognitive Impairment Sensitivity	Specificity	Dementia Sensitivity	Specificity
MMSE	.62	.87	.81	.89
SPMSQ	Unknown	Unknown	.74	.79
MOCA	.89	.75	.91	.81
Clock Draw	Unknown	Unknown	.76	.85
DWR	Unknown	Unknown	.89-.96	.83-1.00
EMST	.94	.89	(MCI/dementia from Normal) .96	(MCI/dementia from Normal) .91
MCAS (MCI/dementia from Normal)	.86/.95**	.78/.94**	(Dementia from Normal) .975	(Dementia from Normal) .985

Tsoi KK et al. Cognitive Tests to Detect Dementia: A Systematic Review and Meta-analysis, JAMA Internal Med 2015 Sep; 175:1450-8.

Smith M et. al. A Review of Telephone-Administered Screening Tests for Dementia Diagnosis, Am J Alzheimers Dis Other Demen 2009; 24; 58.

** Raw Score/Weighted Score

The Minnesota Cognitive Acuity Screen (MCAS)

- Proprietary test developed for telephonic use
- Validated in prospective, blinded longitudinal studies of both dementia and MCI cohorts
- Passing score 0.0 (adjustable to risk tolerance)
  - Sensitivity
    - Dementia* 97.5%
    - MCI** 86%/95% (raw/weighted score)
  - Specificity
    - Dementia* 98.5%
    - MCI** 78%/94% (raw/weighted score)

* Knopman DS Development and standardization of a new cognitive screening test: The Minnesota Cognitive Acuity Screen *Neuropsychiatry Neuropsychol Behav Neurol* 2000 Oct;13(4):286-96.

** Tremont G et.al. Use of the telephone-administered Minnesota Cognitive Acuity Screen to detect mild cognitive impairment 2011; 26: 555-562. *Am J Alzheimers Dis Other Dementia*. 2011 Nov;26(7):555-62.

MCAS and MMSE

MCAS Test	Domain	MMSE
Orientation questions	Memory, engagement	Orientation
Repeat numbers up to six	Attention	Immediate recall
Delayed word recall (10 words after 5' to 10')	Short term memory	**Recall less sensitive**
Follow directions (Tap 2 times on phone and say "hello")	Comprehension, attention	3-stage command
Repeat short sentences	Comprehension, speech	Repetition
Naming (What do people wear that tells time?)	Speech	Naming
Math problems (27/3=)	Computation	Attention and calculation (Working memory)
Problem solving (What would you do if ..?)	Judgment, working memory, problem solving	**Not on MMSE**
Fruits and vegetables in 30"	Verbal fluency	**Not on MMSE**

Enhanced Mental Skills Test (EMST)

- Proprietary test developed for telephonic use.
- Validated in both cohorts with MCI and mild dementia
- At passing score of 0.0
  - Sensitivity
    - Dementia 97.5%
    - MCI 94%
  - Specificity
    - Dementia 98.5%
    - MCI 89%

Shankle WR et.al Methods to improve the detection of mild cognitive impairment, Proc Nat. Acad Science 2005 March; 102: 4919-4924.

EMST

- Multiple Domains Tested- Attention, comprehension concentration, working memory, abstraction, judgement
- Memory parameters tested by:
  - Use of word lists for immediate recall in three learning trials of 10 words
  - Abstraction interference task followed by delayed free recall
  - Cued recognition by item: recognize whether a word was in recall set
  - Cued recognition by category: from animal comparison sets
- Abstraction
  - triadic comparison of 9 animals in twelve sets of 3 to determine which is most dissimilar in a set of 3.

False Negatives and False Positives

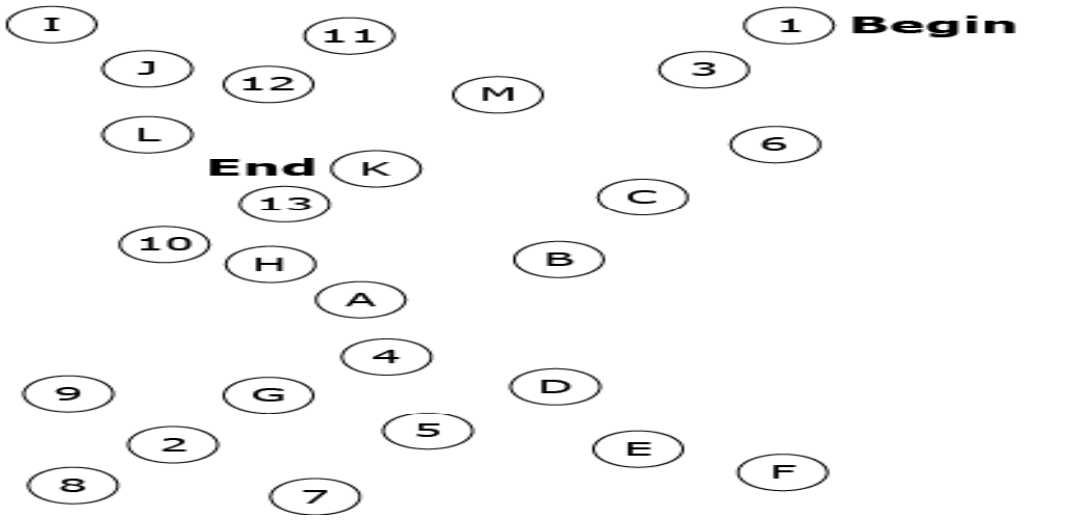
- False Negatives
  - MCI or early dementia
  - Frontal temporal dementia
  - Atypical dementia
- False Positives
  - Effort
  - Nervousness
  - Anxiety and or Depression
  - Distracted state
  - Fatigue, e.g. untreated sleep apnea
  - Medications or illness
  - Time of day?

Effect of time of day does affect older individuals

- Optimal time for best performance is earlier in day
  - *Stroop Interference* greater in evening => decreased ability to suppress interference and maintain attention to a goal.

RED BLUE GREEN RED BLUE RED

    - As an example, the ability to identify the colors in the text above is scored based on speed and accuracy, i.e. "Blue, Green, Blue, Blue, Red, Green."
  - *Trail making test* slower in evening => decreased attention for speed of visual search and mental flexibility in visual-spatial scanning and sequencing.



Not all dementias present the same way

- Over seventy types of dementia
- Neurodegenerative process usually progresses over time
  - Exceptions: embolic stroke, acute injuries, etc.
  - Localized to degeneration of one or more areas of brain (e.g. temporal lobe in Alzheimer's, white matter in vascular dementia, etc.)
  - Multiple injuries over time give varied disease profiles
  - Testing identifies areas of degeneration
- Behavioral impairment can be part of the disease or potentiate impairments

CASE # 2: Police matter of "Svengali woman named Mildred"

- At time of underwriting
  - R.P. 69 yo male non-tobacco
  - Treated prostatism and hyperlipidemia
  - Lives alone. Divorced
  - Admits to 4-6 beers and one bottle of wine per week
  - 9 months PTA normal exam
- Telephonic Minnesota Cognitive Acuity Screen
  - Strong score
  - Orientation excellent
  - Language: naming, verbal fluency excellent
  - Memory: repetition, delayed word recall excellent

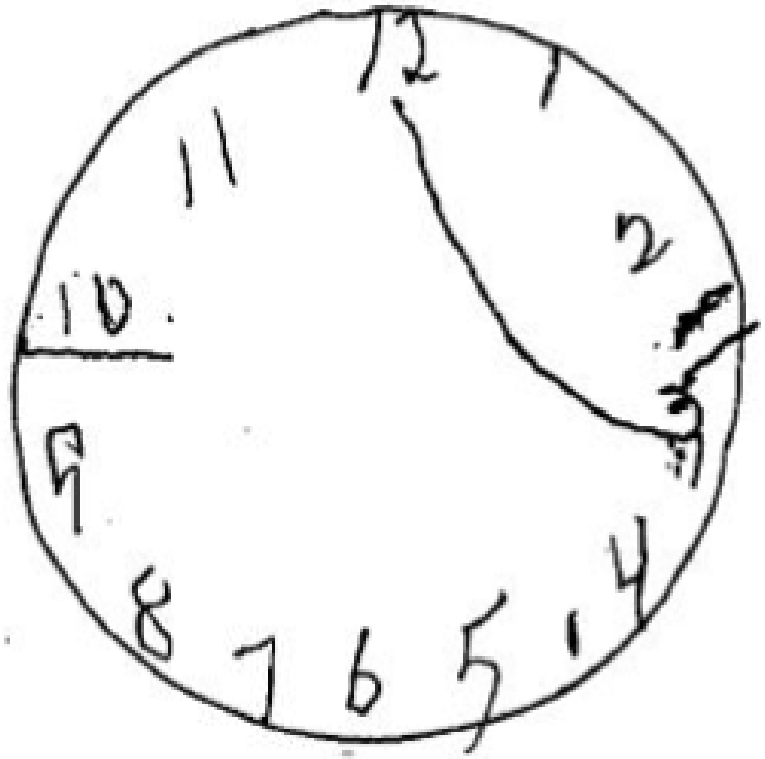
One year later

- Claims file: One year after policy issued
  - Police bring into ED and admitted to psych unit
    - Dx: “delusional disorder, NOS”
    - Threatening neighbor and affect of grandiose, paranoid delusions, with increased mood and easy agitation.
      - Ex-wife is keeping money from him
      - Neighbor Mildred wants to kill him and needs to be stopped
      - Talks over psychiatrist reassuring her that he is alright and this is just a matter for the police.

Hospital course

- Medical prophylaxis for possible Etoh withdrawal.
  - Family disagrees over issue of abuse.
  - Sister notes change in personality about one year prior to admission. (~ time of our underwriting)
    - Lashing out at family members
    - 6 mos prior to admission became verbally abusive over insignificant things
- Neuro workup is unremarkable.
  - MRI and EEG normal
  - Physical Exam non-focal
  - MMSE 29 (of 30)
- Cooperation on ward unpredictable. 4 wk. hospitalization.
- Treatment: forced medication: olanzapine (Zyprexa®)

Clock draw



Discharge

- Leaves after 3 week hospitalization
  - Dx' s: delusional disorder, NOS; possible dementia
- Mental status coherent, compliant, good insight
  - Goes home to live "independently"
  - Emphasized: avoid alcohol, take olanzapine
- Family notifies LTC Benefits for claim
  - The report "bizarre behavior"
  - Wants daily home visit for checking mental status and medication compliance

Your call

- What are your preliminary thoughts on this case?

A. Looks like a psychiatric admission and diagnosis. Check the contract.

B. Family knew something was wrong? They may have been behind application. Check for fraud.

C. Request for benefits appears not to meet the need for LTC services.

D. We got problems. Refer this up to a medical specialist.

The claim follow-up

- As claim is being reviewed: found by family member wedged between toilet and wall.
  - Like this for 3 days?
- Readmitted dehydrated, acute renal failure, completely disoriented
- Neurologist finds pill-rolling tremor
- Diagnosis: possible Lewy body dementia

Short claim

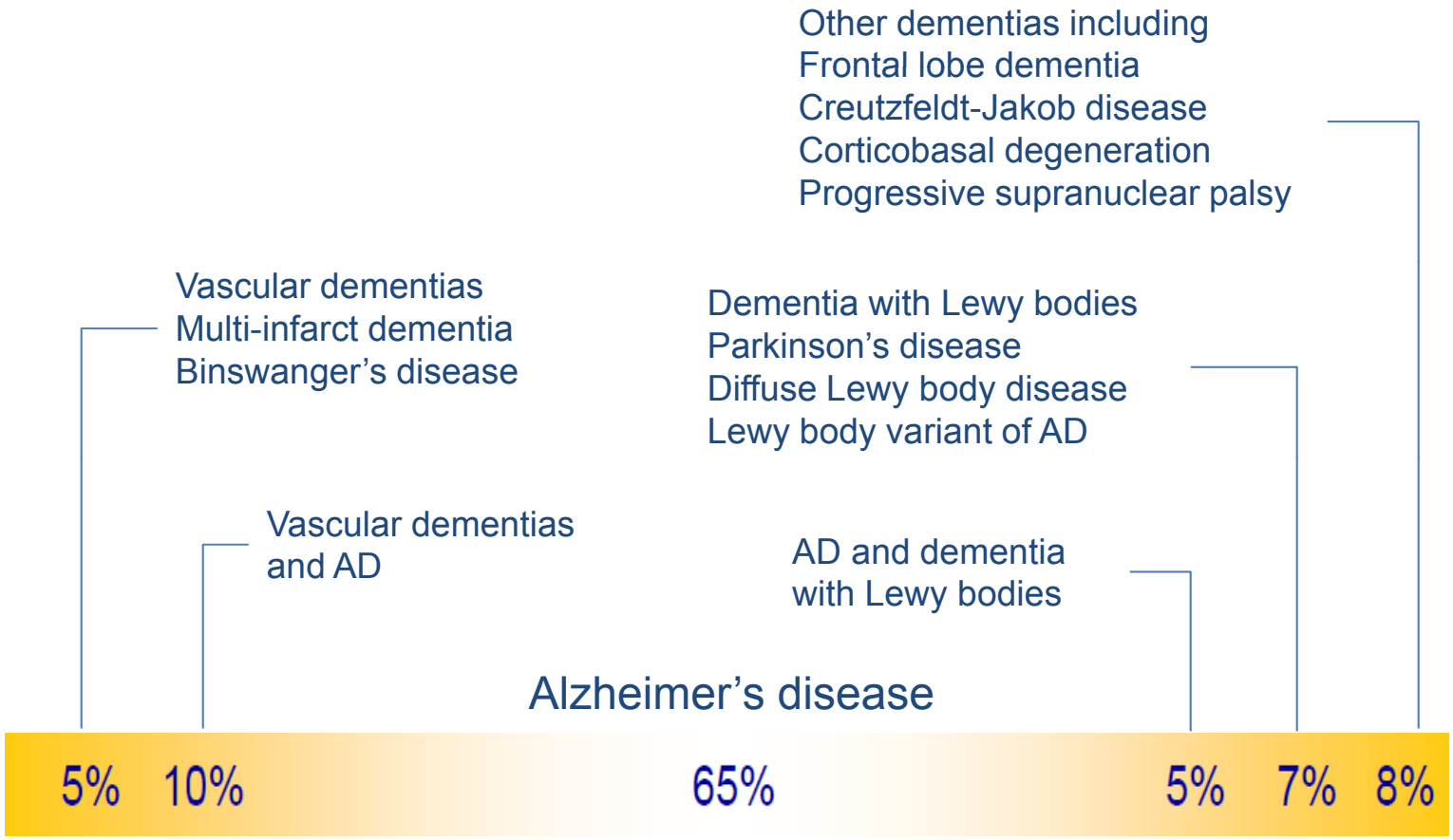
- Discharged to assisted-living facility
- Needs assistance with all ADL's
- Progressive rigidity
- Diagnosed with Lewy body dementia with Parkinsonism
- Death in 9 months

Our Mr. R.P.

- Dementia with Lewy bodies
  - Suspected by neurologist after second hospitalization for two of three criteria
    - *Changes in alertness
    - *Onset of resting tremor
    - Hallucinations in 70% of cases. R.P. had rather strong delusions

Causes of Dementia

Significant Diagnostic Overlap



Small GW, et al. *JAMA.* 1997;278:1363-1371

American Psychiatric Association. *Am J Psychiatry*. 1997;154(suppl):1-39

Morris JC. *Clin Geriatr Med.* 1994;10:257-276

Non-amnestic: Lewy body dementia

- 30% of dementias not Alzheimer's
- Dementias with Lewy bodies. Several disorders represent ~ 10% of dementia.
- Like Alzheimer's, a degenerative disease, with "Lewy body" inclusion in brainstem and cortex.
  - Parkinson's with Dementia includes Lewy bodies
  - *"Dementia with Lewy bodies"* (DLB) is primary => ***followed*** a year or more later by Parkinsonism
    - Progressive dementia, extrapyramidal signs, visual hallucinations and delusions, and severe fluctuations in cognitive function.

Other tests for non-amnestic Cog Impairment

- Non-amnestic cognitive impairment involves: attention, executive function, visuospatial skills and language
- Clock draw
  - One method: asked to draw a clock with all the numbers and the hands pointing to 10 minutes after 11:00 o'clock
  - Tests executive function of planning, visual-constructive ability, and numerical memory
  - Our case with Lewy Body Dementia may or *may not* have had an abnormal clock draw at the time of underwriting

Clock draw

- Multiple ways to score: from 3 point system to 20 point system (at least 10 systems)
- Sometimes circle is provided for face of clock
- Different times: “1:45”, “10 past 11”, etc.,
- Some systems require observation of how it is drawn
- Free form

Weaknesses and strengths of the clock draw

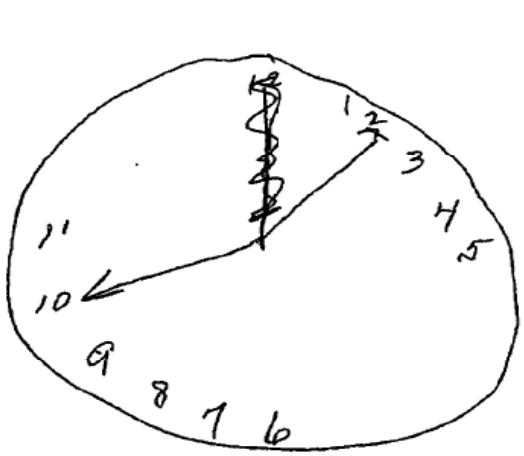
- Only 76% sensitive to mild dementia
- High estimate is 85%/85% Sn/Sp for dementia
- Multiple scoring systems with inter-operator variance
  - MoCA: “10 past 11” 3 pts. (1) contour (2) numbers complete, in order and placed in correct quadrants (3) hands correct time and correct lengths
  - “Standard 5 point system” is simplest: (1) clock circle; (2) all numbers in order; (3) arranged in correct quadrants: (4) two hands of clock; (5) correct time
    - Score of 4 or 5 is “normal”
  - Shulman scale 1-6 points
    - Reproducible
    - Sn/Sp 86%/72%
    - Fair Correlation with MMSE

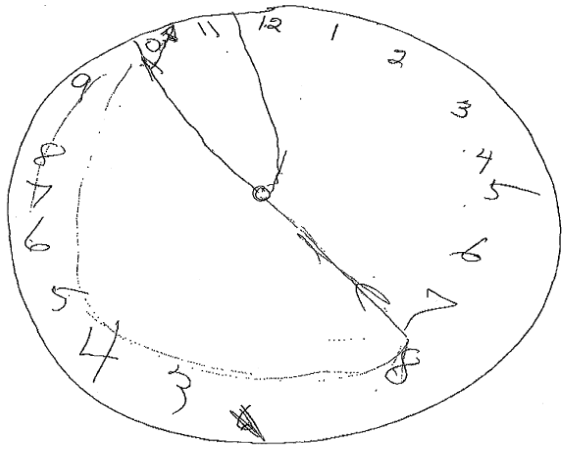
Apahamian I, et.al. The Clock Drawing Test; A Review of its accuracy in screening for dementia *Dementia Neuropsychologia* 2009; 3(2):74-80

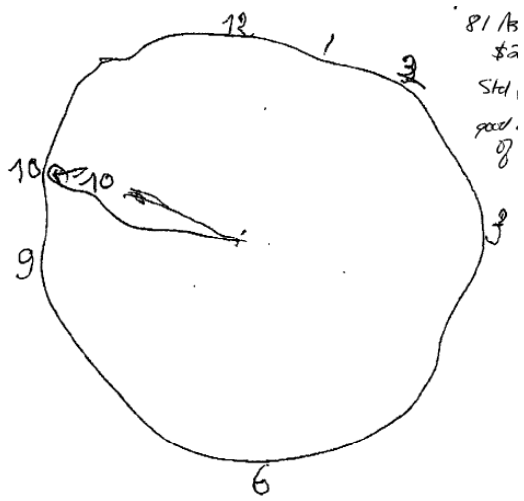
http://alzheimers-review.blogspot.com/2011/07/10-scoring-approaches-for-alzheimers.html

But when it's abnormal….

When clearly abnormal identifies an executive dysfunction of visuospatial construction.







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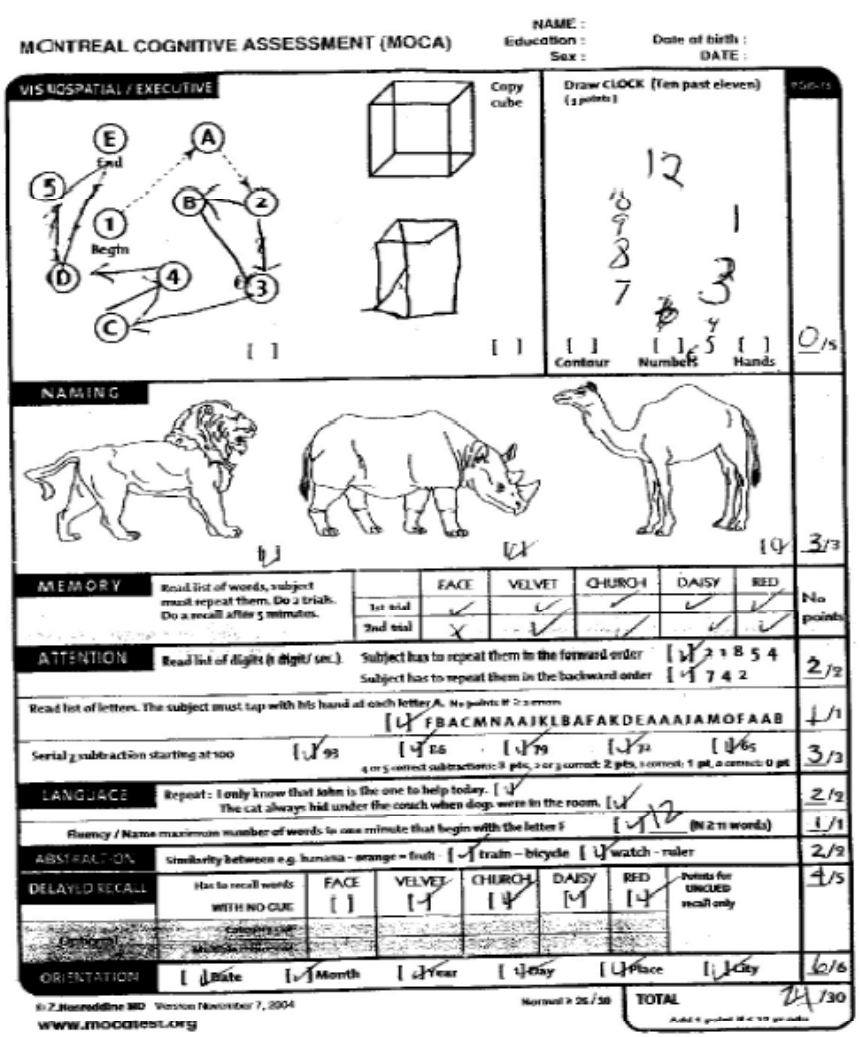
Montreal Cognitive Assessment; the MOCA

- MoCA also tests for executive and visuospatial construction.
- Domains tested beyond MMSE
  - Trails: executive function
  - 3 dimensional box: visuospatial construction
  - Clock draw: executive planning, numerical memory, and visuospatial construction

Example of a MoCA with early DLB



Executive 0/2

Visuospatial 0/3

Naming 3/3

Memory 4/5

Attention 6/6

Language 3/3

Abstraction 2/2

Orientation 6/6

Total = 24/30

Scoring of MoCA

Score Parameters	Normal Controls	Mild Cognitive Impairment	Alzheimer's Disease
MoCA mean score	27.4	22.1	16.2
MoCA standard deviation	2.2	3.1	4.8
Suggested cut-off-score	≥26	<26	<26

The distinction between Alzheimer's disease and mild cognitive impairment is mostly dependent on functional impairment affecting normal daily living activities.

Nareddine et. Al. J Am Geriatr Soc 53:695-699, 2005

Other Common Cognitive Screening Tests

Test	Features	Administration
SLUMS (St. Louis University Mental Status exam)	• Clock draw • Semantic fluency • Short story with 4 questions • Visuospatial 	In person with pen and paper
Cognistat	• Proprietary • Tests Attention, Orientation, Language, Memory, and Constructions (visuospatial) • MCI Index from "no indication" of to "strongly suggests dementia"	In person with pen and paper
BIMS (Brief Interview for Mental Status)	• Used in Nursing Homes • Orientation, Immediate and Delayed Recall • Used to monitor nor "diagnose"	In person interview
TICS (Telephone Interview for Cognitive Status)	• Highly correlated to MMSE • Uses 10 word delayed word recall	Telephonic

Non-amnestic: vascular dementia

- 15-25% of dementia caused by vascular factors
  - stroke can leave with focal defect: e.g. expressive aphasia
  - vascular risks contribute: ASVD, diabetes, afib, age, stroke / multiple strokes, hypertension
  - course earlier than Alzheimer's, in 70's
- Presentation varies depending on sites of ischemic loss
  - abrupt changes in cognition and stepwise deterioration
  - depression, affective lability, focal neurologic signs, gait disturbance, and weakness
  - retrieval based memory problems as poor delayed recall and normal recognition

Non-amnestic: frontotemporal dementia

- 8% of dementia
- prominent atrophy of frontal / temporal lobes
- personality and behavioral changes
- begins insidiously with personality changes:
  - inappropriate social conduct with disinhibition
  - apathy or decreased speech output
  - loss of insight
- followed by impairment of executive functions and /or aphasia
- relative sparing of memory and visuospatial abilities
- One type, Primary Progressive Aphasia starts with language difficulty with expressive speech
- Familial 20-40% of time as autosomal dominant

Primary neurodegenerative dementia

Dementia type	Earliest features	Later features
Alzheimer's (60%)	• Aphasia ("word-finding") • Problems learning new things • Short-term memory loss	• Visual-spatial dysfunction (lost in familiar environment) • Executive dysfunction (solving problems)
Vascular or "multi-infarct" (20%)	• Impairments with attention • Processing speed slowing • Executive dysfunction (solving problems) • Depression	• Gait and urinary difficulties
Dementia with Lewy Bodies (10%)	• Fluctuating cognition (varying level of attention) • Visual hallucinations	• Associated with Parkinsonism with axial rigidity • Postural instability (falls)
Frontotemporal (8%; but average age of onset is 50-60)	• Behavioral changes (apathy, increased emotionality, lack of inhibition) • Impaired decision making • Progressive aphasia	• Memory and visuospatial dysfunction come later

Case # 3: Second Iraq war veteran

- 51 yo female
  - Medical: migraine, irritable bowel
  - Works as health systems analyst
  - Rare alcohol
  - PTSD with 2 concussions without LOC: one a road bomb, the second, head hit on side of helicopter in air under fire.
- Cognitive dysfunction affecting activities of life
  - Progressing and affecting job performance
    - New c/o difficulty with numbers: counting, remembering more than 2 at a time to write down
    - New problem transposing letters: “fro” instead of “for”
  - Old problems
    - Memory: names, placement of objects, recalling intended activities, conversations, directions
    - Word finding
    - Attention

Further workup by neuropsychologist

- Denies sadness or depression
- Admits to being: “dull,” apathetic, poor sleep, anhedonia, poor appetite, feels sluggish and “leaden”
- PTSD symptoms rated at “5 of 10” for intrusive thoughts, nightmares, reactivity, avoidance, and hypervigilance / startle
- Testing
  - California Verbal Learning Test
  - Average or High Average for Short Delay (Free and Cued) and Long Delay (Free and Cued)

Depression and PTSD

- *"Ms. G is evidencing some cognitive difficulties on formal testing; however, these difficulties are not consistent across a domain as would be expected in a head injury…"*
- Diagnosis PTSD with secondary Depression and Panic Attacks
- Depression as a mood disorder affects cognitive function
  - Slow thinking: calculations, following conversations
  - Loss of concentration
  - Loss of decision making

Depression Self Report Scales

- Self report scales used to assess for depression:
  - PDSQ (Psychiatric Diagnostic Screening Questionnaire)
  - Beck's Depression Inventory: self-reported 21 questions
  - PHQ-9 (Patient Health Questionnaire-9 [questions])
  - Hamilton Rating Scale for Depression: few cognitive questions with more questions about somatic symptoms
  - MMPI (Minnesota Multiphasic Personality Index)
  - Geriatric Depression Scale: commonly used 5 question screen with score of 2 indicating depression risk
    - 94% sensitivity and 81% specificity
    - longer forms of GDR with 15 and 30 questions

Pseudodementia

- Because of its acute nature, delirium needs to be identified for acute treatment
  - May leave residual cognitive deficit, e.g. West Nile encephalopathy
- Pseudodementia manifests over a longer period of time
  - Initially the term was used for psychiatric disease presenting as dementia
    - Depressive Pseudodementia
    - Also bipolar disease and schizophrenia
- The term “Pseudodementia” used loosely overlaps with delirium
- Causes with a potential for recovery
  - metabolic and endocrine disorders: hypothyroid
  - drug and medication complications: Lithium toxicity
  - infections: Lyme disease, West Nile,
  - nutritional: folate, B12

Benchmark: neuropsychological testing

- CERAD (Consortium to Establish a Registry for Alzheimer's Disease)
  - Immediate recall and delayed recall (STM): CERAD Wordlist
  - Similarities: WAIS R Similarities
  - Verbal fluency: Animal Fluency
  - Serial Calculations
  - Boston Naming, Ishihara Numbers, Wechsler Visual Reproduction
  - CERAD drawings, Ishihara Trail Tracings, WAIS R Block Design
  - Wechsler Delayed Visual Reproductions
- Calibrated to age and education with standard deviations from medium

Neuropsychological testing

- Exhaustive; can be spread over 2 days
- Everyone has strengths and weaknesses
- Gold standard; can pick up:
  - malingering: effort and inconsistencies
  - establish baseline
  - pick up mild cognitive impairment
  - Help determine safety
- Hundreds of tests

Not always definitive for determining dementia risk

- 76 yo farmer complaining of “memory loss”
  - Walking into a room only to forget the reason why
  - Forgot to pay bills
  - Failed a LTC insurance cognitive screen
- Comprehensive NP testing yields
  - *… “although his score on the recognition trial was mildly impaired, more than one standard deviation below the demographically-calibrated mean, the only other abnormality in the test record was phonemic fluency performance in the mildly impaired range. As relatively isolated findings, these did not appear to be of clinical significance.”*
  - *… “recent MRI brain scan revealed white matter changes consistent with sequelae of small vessel ischemia and whether this has caused some subtle effect on mentation could be difficult to determine.”*
  - *… “empirical trial of cholinesterase inhibitor could be considered”*
  - *“Reevaluation can be scheduled in the future…”*

Time

- Time is the arbiter for cognitive concerns
  - Delirium is acute and associated with medical events
  - Cognitive impairment is a change over time as opposed to
  - Baseline weaknesses (and strengths) in one's cognitive profile
  - Dementia is also a change from baseline over time
  - Pseudodementia is reversible over time if cause treated
- No one cognitive test is completely diagnostic
- The full history always needs to be considered

Cognitive Testing Tools
Compare and Contrast

Questions and Discussion