Cognitive Decline 2018: Evaluation and Treatment of Memory Loss, Alzheimer's, & Dementia
2018 update

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Learning objectives:
1. Understand the Alzheimer's disease pathophysiologic process.
2. Use the new diagnostic criteria to diagnose Alzheimer's disease dementia and mild cognitive impairment (MCI) due to the Alzheimer's disease pathophysiologic process.
3. Distinguish Alzheimer's disease from other common causes of cognitive impairment and dementia.
4. Treat Alzheimer's disease and other common causes of cognitive impairment and dementia.

I. Dementia Prevalence
    A. Increases geometrically with age
        1. 5-10% of individuals > age 65
        2. 50% of those > age 85
    B. Alzheimer's disease is by far the most common form of dementia, affecting about 7 out of every 10 patients.
    C. Distribution of pathology in Alzheimer's disease:

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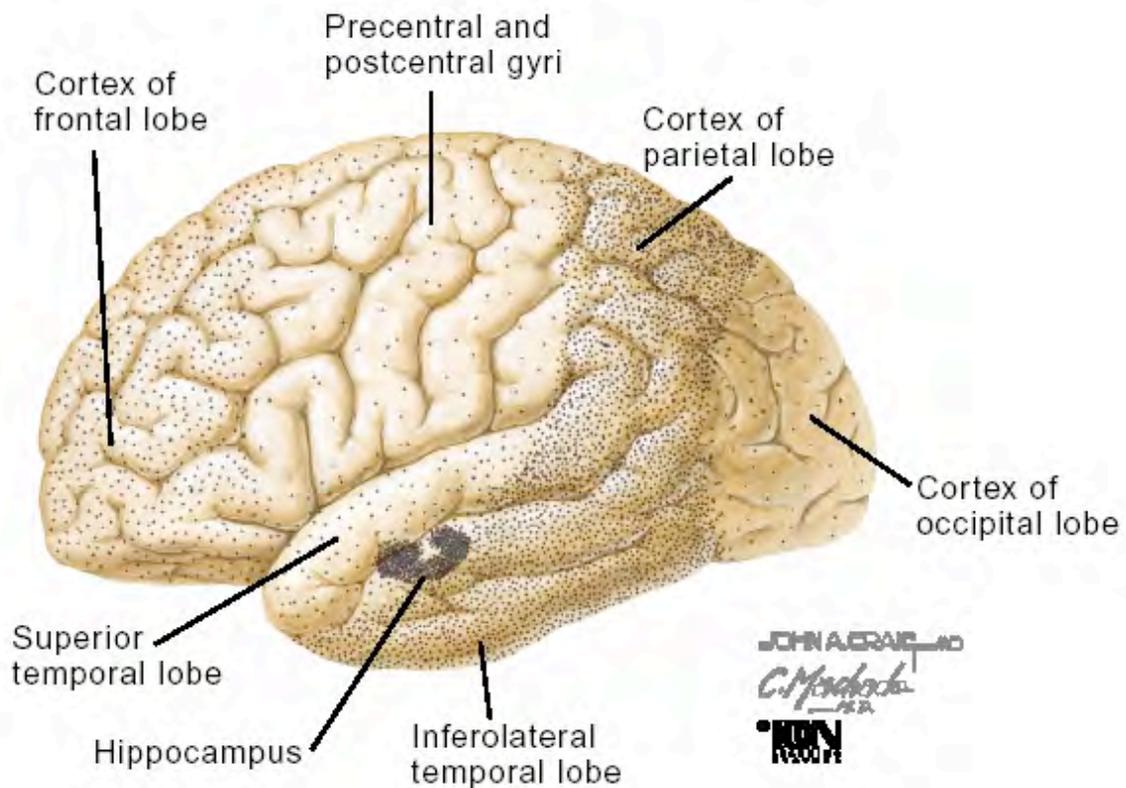
II. <u>Evaluation</u> (to diagnose Alzheimer's disease vs. other dementia). For additional information see Sections I & II of Budson & Solomon, *Memory Loss, Alzheimer's Disease, and Dementia: A Practical Guide for Clinicians*, Philadelphia: Elsevier Inc., 2016.

    A. Structure of appointment:

- *With both patient & caregiver*: brief hx per patient's perspective, PMH, All, Meds, SHx including education & occupation, FHx (25-40% of AD patients have at least one other afflicted relative) (10 min)
- *Caregiver alone*: History per caregiver's perspective. Key questions: (1) What was the **first symptom** suggesting impairment, and (2) **when** did it occur? (3) What was the **pace** of the decline? Was it gradual or stepwise? (4) What cognitive areas are **currently** impaired & (5) which are the **most prominent**? (15 min)
- *Patient alone*: Physical, Neurological & Cognitive exam. (20 min)
- *Both patient & caregiver*: Assessment, further work-up and/or treatment plan. (15 min)
- Do in two visits if necessary. (An extra 10 minutes each on the history and cognitive exam is worth at least as much diagnostically as a PET or SPECT scan, neuropsychological testing, expert referral, etc., and is much more cost effective.)

    B. History: (Although classically in neurology exam tells where, and history tells what, history often tells where as well as what in dementia.)
****Need to talk with caregiver/child/spouse alone****

        <u>General</u>: Gradual and insidious onset over months to years, not stepwise (ask about when retired and why; keep checkbook; do taxes; continue community participation; etc.)

        <u>Hippocampal</u>: Inability to learn new information, with striking preservation of older memories initially (repeats self; needs to be told information multiple times; misses appointments).

        <u>Temporal</u>: Word finding difficulties. Disruption in the semantic storage and retrieval of linguistic information (anomia, not just for names of people; empty speech).

        <u>Parietal</u>: Visuo-spatial deficits (difficulty planning routes; gets lost; cannot draw intersecting pentagons).

        <u>Frontal</u>: (late) Dysexecutive syndrome (disinhibition; aggression; agitation; also much worse memory, attention and other cognitive functions).

    C. General Exam: Check for cervical bruits; look for signs of systemic disease (COPD, liver failure, etc.)

    D. Neuro exam:

        Inconsistent: focal signs suggesting strokes, subdural fluid collections, tumors, etc.; signs suggesting Parkinson's (rigidity, tremor, etc.), PSP (no downgaze) or other neurodegenerative disease. (Note: some patients have both PD and AD.)

        Supportive (early): none

        Supportive (mid to late): Brisk reflexes, extensor plantars, snout, grasp, palmomental reflexes. (These are, however, not sensitive or specific.)

    E. Cognitive exam:
Use one simple global cognitive exam to evaluate cognitive function.
Use the MMSE—but copyrights held by Psychological Assessments Resources.

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> *Use the Montreal Cognitive Assessment (MoCA)—my new favorite—test & instructions below.*

Useful for:

- Establishing the pattern of deficits
- Evaluation of drug effects (typical increases of 2-3 points are seen on both MoCA & MMSE)
- Annual comparisons (typical yearly decline of 2-3 points/year are seen on both MoCA & MMSE).

Pattern of deficits on the MoCA:

<u>Delayed Recall</u> tests new learning which is always impaired in early AD and MCI due to AD.

<u>Orientation</u> tests recent memory, which is generally impaired in early AD, particularly the date.

Other tests, including <u>Visuospatial/Executive</u>, <u>Naming</u>, <u>Attention</u>, <u>Language</u>, & <u>Abstraction</u> typically become more impaired as patients progress from early to moderate AD. These tests should be more or less intact in patients with MCI due to AD.

Other tests. Useful if the pattern from the MoCA is unclear:

<u>Word Fluency</u>: Intact individuals generate more words to categories (animals, vegetables, fruits; 12-15 or > for each), than letters (F, A, S; 10-12 or > for each); early AD patients show opposite pattern, i.e. can generate more words to letters than categories. (This is the only test that uses the patient as their own control.)

> Instructions: "Tell me all the words that you can think of in 1 minute that begin with a certain letter. You cannot use names or different forms of the same words. For example, if the letter was 'R' you could not say Richard or Roger or Rochester, because those are names. You could say 'run' but then you could not say 'runs,' 'running,' or 'ran' because those are different forms of the same word. The first letter is F…." Prompt patients if they do not give any words for any 15 second block. For efficiency, only do as many letters as needed to establish pattern or normality. For categories: "Now we're going to do the same thing only different. I want you to tell me all the words you can think of that are all in the same category (which I will give you). The words can begin with any letters. You can say both big subcategories, as well as small individual items. For example, if the category was 'furniture,' you could not only say 'tables,' 'desks,' and 'chairs,' but also 'armchair,' 'high chair,' 'rocker,' 'recliner,' etc. The first category is 'animals'…." Again, prompt patients after no response for 15 seconds, and only do as many categories as necessary to either establish a pattern or normality.

<u>Attention</u>: *Simple* (always intact in early AD): Digit span forwards, 1 to 20, months forwards, registration (remembering words etc. w/o distraction for 30-60 seconds).

<u>Attention</u>: *Complex* (may be impaired in early AD): Digit span backwards, 20 to 1, months backwards, calculations.

<u>Memory</u> (always impaired in early AD): (note: registration must be intact) drilled word span (= to 1 less than digit span forwards), story "Bill and Tom went fishing…", others. If they don't get the words on free recall, check cued recall and recognition.

<u>Remote Memory</u> (often intact in early AD): Presidents, personal information.

Language (usually intact early, except for naming): naming high and low frequency objects (watch & band, pencil & point), writing sentence, comprehension, repetition, (empty speech late).

Visuospatial (may be impaired in early AD): copy figure

F. Laboratory tests: TSH, B12, Vit D. Also screen for encephalopathy / delirium: CBC, lytes, BUN, Cr, glucose, LFTs, Ca, alb. If clinically indicated: RPR, Lyme titre.

G. Imaging: MR is better for judging atrophy (esp. hippocampal), better for small vessel disease, better for evaluating for unusual conditions. CT is adequate, and better for agitated patients. (Everyone deserves at least one image in the course of their disease. E.g. a subdural on top of AD may explain the patient's current presentation—AD patients don't remember their falls!)

H. Additional w/u:

Behavioral Neurology Evaluation: (1.5-2 hrs over 1-2 visits with neurologist who has additional training in dementias.) Review history, imaging, interviews with patient & caregiver, general and neurological examinations, 20-30 minute cognitive exam. Especially important for complicated patients or those seeking second opinion of specialist. (Will follow patient if you desire.)

Neuropsychological Evaluation: (1-1.5 hrs with neuropsychologist (Ph.D.) + 3-6 hrs with technician for cognitive testing, over 1-3 visits.) Helpful if after your own thorough w/u including 15-20 min cognitive exam it is necessary to better characterize the existing deficit to make a diagnosis. E.g. to help determine the contributions of depression to a memory disorder, or to help evaluate someone who has an above average IQ and educational background such that although they perform normally on your office tests, you still suspect they are impaired. [Caution: all neuropsychologists are NOT equal when it comes to diagnosing dementia; only refer your patients to ones with experience in dementias.]

Brain FDG PET or ^{99}Tc SPECT: Nuclear medicine tests. Useful for confirming diagnosis of atypical dementia, or AD in a young patient (< age 65). In AD Expect temporal and parietal hypoperfusion. Moderate sensitivity and specificity. In correct clinical setting, areas of medial temporal, temporal, or parietal hypoperfusion suggests AD *regardless of the official interpretation*. PET and SPECT scans (unlike MRI) will often show significant changes from one year to the next, making them a useful follow-up test in the setting of previous negative work-up. In frontotemporal dementia, PET and SPECT shows abnormalities in frontal lobes; in corticobasal degeneration there are abnormalities in parietal lobes; in Lewy body disease there are abnormalities similar to AD but also in occipital lobes; in primary progressive aphasia abnormalities are in left perisylvian areas. Some pathologies yield multifocal patterns: e.g., Lyme disease, cerebral vasculitis.

Florbetapir (Amyvid), flutemetamol (Vizamyl), or florbetaben (Neuraceq) PET: Nuclear medicine tests. Useful for confirming diagnosis of AD in a young patient (< age 70) or at any age when being sure that the patient has AD would significantly alter prognosis or treatment. Above 95% sensitivity and specificity.

CSF Aβ & tau: laboratory study. Useful for confirming diagnosis of AD in a young patient (< age 70) or at any age when being sure that the patient has AD

would significantly alter prognosis or treatment. About 85% sensitivity and specificity.

I. Apply new criteria for AD and MCI due to AD (in slides)

III. <u>Treatment</u> For additional information see Section III of Budson & Solomon, *Memory Loss, Alzheimer's Disease, and Dementia: A Practical Guide for Clinicians*, Philadelphia: Elsevier Inc., 2016.

   A. D/c or change anticholinergic agents, sedatives, etc.

   B. To enhance cognition:

   1. <u>donepezil (generic & as Aricept)</u>. Cholinesterase inhibitor. Main side effects are: anorexia, nausea, & diarrhea (occur infrequently, <1 out of 10), also vivid dreams. (Additionally, need to use non-cholinergic paralytic agent for anesthesia; i.e. no succinyl choline) Start with 5mg QD, increase to 10 mg after 4-6 weeks if tolerated. 23 mg tablet available for moderate to severe AD; data suggests it may improve cognition but side-effects (anorexia, nausea, vomiting, diarrhea) also more common. Low income assistance program available. Produces a noticeable improvement in most patients. FDA approved for mild, moderate, and severe AD.

   2. <u>rivastigmine (Exelon)</u>. Cholinesterase inhibitor. Side-effects are more than donepezil in capsule form, but rivastigmine is now available in a QD patch which has comparable efficacy and fewer side-effects than any drug in this class. Start 4.6 mg/24 hr patch; can increase to 9.5 mg/24 hr patch after one month, and 13.3 mg/24 hr patch after that. Note: 13.3 mg/24 hr patch has more side-effects than 9.5 mg/24 hr patch; most patients do best with the 9.5 mg/24 hr patch. The rivastigmine patch is FDA approved for mild to moderate AD and mild to moderate dementia associated with Parkinson's disease (Lewy Body Dementia).

   3. <u>galantamine (now generic, formerly Razadyne, formerly Reminyl)</u>. Cholinesterase inhibitor. Similar to Donepezil. Immediate release (IR) and extended release (ER) formulations available; ER is both easier to use and has fewer side-effects (due to lower serum peak levels). ER: Start with 8 mg QD and increase after 4 weeks to 16 mg QD. Can also go to 24 mg QD. IR: 4 mg bid and increase after 4 weeks to 8 mg bid. Can also go to 12 mg bid.

   <u>References for cholinesterase inhibitors:</u>
   - Improves cognition, participation in activities of daily living, & global function in mild to moderate patients with AD:
     - Donepezil: Neurology 1998;50:136
     - Rivastigmine: BMJ 1999;318:633
     - Rivastigmine patch: Int J Geriatr Psychiatry 2007;22:456
     - Galantamine: Neurology 2000;54:2261
   - Improves cognition & behavior in mild to moderate and moderate to severe patients with AD
     - Donepezil: Neurology 2001;57:613 & Lancet 2006;367:1057
     - Donepezil 23 mg: Clin Ther. 2010 Jul;32(7):1234-51.
     - Galantamine: Neurology 2000;54:2269
   - Delay to nursing home placement by up to 2 years:

- Donepezil: J Am Ger Soc 2003;51:937
- Reduces healthcare expenditures because treatment costs are offset by reductions in other healthcare expenditures.
  - Galantamine: Neurology 2000;57:972
  - Donepezil: Dementia and Geriatric Cognitive Disorders 2003;15:44
- Reduces caregiver time by over 1 hour per day
  - Galantamine: Int J Geriatr Psychiatry 2003;18:942
- Mild Cognitive Impairment
  - Donepezil: Neurology 2004;63:651 & NEJM 2005;352:23
- Vascular Dementia
  - Galantamine: Lancet 2002;359:1283
  - Donepezil: Neurology 2003;61:479
- Lewy Body Dementia
  - Rivastigmine: Lancet 2000;356:2031
- Neuropsychiatric inventory meta-analysis
  - JAMA 2003;289:210
- Responders and non-responders
  - 25-30% show an improvement equivalent to a 1 year reversal of symptoms
  - 50-60% show an improvement equivalent to a 6-month reversal of symptoms
  - 10-15% show either less than a 6-month reversal of symptoms or no significant improvement
  - NEJM 2004;351:56.
- How long to use them?
  - Studies suggest at least 4 to 5 years (CNS Drugs 2004;18:757)
  - Recommend: continue as long as there is quality of life to preserve.
  - In patients with moderate or severe Alzheimer's disease, continued treatment with donepezil was associated with cognitive benefits that exceeded the minimum clinically important difference and with significant functional benefits over the course of 12 months. (NEJM 2012; 366: 893-903)

See Figure below for Treatment outcomes curves.

Treatment expectations for cholinesterase inhibitors:
•Small but noticeable improvements:
–Less time spent looking for keys, glasses, etc.
–Repeats self less often
–Dwells in past less
–Easier time keeping track of conversation
–More engaged, outgoing
•Will decline over time even if the cholinesterase is working.

Treatment Outcomes

Function

Disease arrest

**Slowed
progression**

**Symptomatic
benefit**

No effect

Time
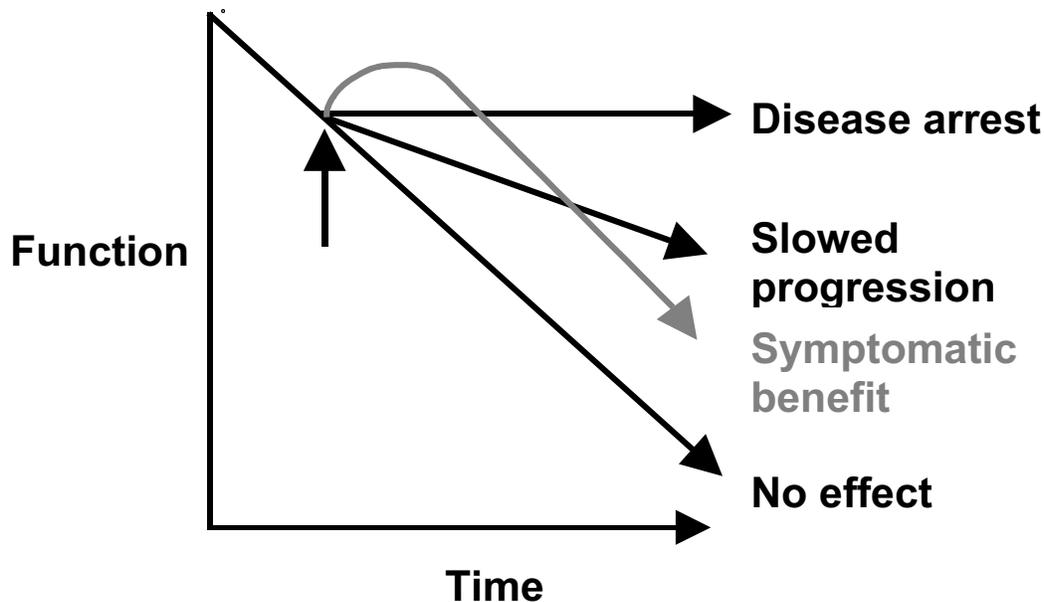
Treatment side effects:
- Gastrointestinal effects
– anorexia
– nausea/vomiting
– diarrhea
- Vivid dreams
– take in AM or earlier PM dose
- Other cholinergic symptoms
– rarely slows heart rate
- muscle cramps
- increased salivation
- rhinorrhea
- can exacerbate existing ulcers (but not known to cause them)

4. huperzine A (Cerebra). Available w/o prescription as a nutritional product. Cholinesterase inhibitor. Similar (perhaps fewer) side effects. 100 mcg of huperzine A BID is equivalent to 5 mg donepezil QHS. Effects are somewhat less impressive. (Obviously, this drug should not be used with other cholinesterase inhibitors.) http://www.nutrapharm.com/

5. Memantine (Namenda). Two mechanisms: 1. Uncompetitive antagonist at the NMDA glutamate receptor. 2. Dopamine agonist. Approved for use in moderate to severe patients (MMSE 15/Blessed 15 or worse). Works well with cholinesterase inhibitors—both are better than either one alone. Improves both cognition and behavior—particularly agitation. Side-effects uncommon, < 1

out of 10. Main side-effect is drowsiness, confusion, and dizziness which is dose related, often transient, and worse in milder patients. A few patients have experienced changes in blood pressure. Old pills are 10 mg. Start at half a pill, then increase weekly by half a pill: ½ qd, then ½ bid, then ½ in AM and 1 in PM, then 1 bid. Can prescribe memantine "titration pack" disp #1 sig. Use as directed, followed by memantine 10 mg BID disp #60. New pills are 7 mg extended release. Start 7 mg QAM, then increase by 7 mg QAM weekly until 28 mg QAM. Latest retrospective data analysis suggest that combination therapy, memantine plus a cholinesterase inhibitor, is superior to either medication alone.

- References for memantine:
    - N Engl J Med 2003; 348:1333
    - Int J Geriatr Psychiatry 1999;14:135
    - JAMA 2004; 291:317
    - Alzheimer Dis Assoc Disord. 2008 Jul-Sep;22(3):209-21

6. Gingko Biloba. Doesn't work: JAMA 2002;288:835.
7. Ritalin. A useful stimulant when attention or encoding deficits are prominent, or when fatigue, somnolence, and poor energy are issues. Also great when there is a problem with napping during the day and consequent wandering at night—much better to use a stimulant in the morning than a sleeper at night. I use the 20 mg of the sustained release formulation. Can also use Concerta 18 mg or modafinil 100 mg.
8. On-going clinical trials.

C. To slow down disease progression:
1. Lower homocysteine: Folate, B6, B12 (NEJM 2002;346:476) Can use Folgard (Folate 0.8 mg, B6 10 mg, B12 115 mcg)
2. Statins
3. Clinical trials.

D. Managing Agitaion. For additional information see Section IV of Budson & Solomon, *Memory Loss, Alzheimer's Disease, and Dementia: A Practical Guide for Clinicians*, Philadelphia: Elsevier Inc., 2016. Try to determine the underlying cause of agitation:
1. Use non-pharmacologic approaches first!!!
    i. Educate Caregiver.
    ii. Teach 3Rs: Reassure, Reconsider, Redirect
2. Agitation is often due to anxiety
    i. Start with sertraline (Zoloft) 50 to 100 mg or citalopram (Celexa) 10 to 20 mg [but watch for increased QTc] (others not as good.)
3. Manage sleep cycle disturbances
    i. Limit naps
    ii. Methylphenidate (Ritalin) SR 20 mg or modafanil (Provigil) in AM if needed.
4. Daytime agitation
    i. Risperidone (Risperdal) start 0.25 mg QD
5. Nighttime agitation
    i. Trazodone start 50 mg QHS

        ii. Quetiapine (Seroquel) start 25 mg QHS
6. Studies underway to evaluate prazosin & carbamazepine. (Corbett A, Smith J, Creese B, Ballard C. Treatment of behavioral and psychological symptoms of Alzheimer's disease. Curr Treat Options Neurol. 2012 Apr;14(2):113-25.)
7. Consider 20 mg Dextromethorphan HBr / 10 mg Quinidine sulfate (Nuedexta)
        i. Cummings et al., JAMA. 2015;314:1242-54
        ii. Dosage: Weeks 1: 20/10 QD, 2-3: 20/10 BID, 4+: 30/10 BID
        iii. Need more dextromethorphan? Add 10 mg/5 ml BID to Nuedexta BID
        iv. Common adverse reactions: falls, diarrhea, UTI, dizziness, cough, vomiting, asthenia, peripheral edema, influenza, ⇧GGT, & flatulence
8. Consider pimavanserin (Nuplazid) 40 mg QD. FDA approved to treat hallucinations and delusions associated with psychosis of Parkinson's disease. Clinical trials of AD on-going now. (Cummings et al., Lancet. 2014 383(9916):533-40)
9. Inform families of cardiovascular risk of neuroleptics along with side-effects of drowsiness and Parkinsonism.
10. Refer to psychiatry if needed.

E. Pseudobulbar Affect
1. What it is: Crying, laughing, or showing other strong emotions for little or no reason. Crying out of proportion to mood is particularly common in AD and vascular dementia.
2. New Medication FDA approved to treat pseudobulbar affect:
        i. 20 mg Dextromethorphan HBr / 10 mg Quinidine sulfate (Nuedexta)
        ii. 1 capsule daily x 7 days, then 1 capsule Q12H
        iii. Common adverse reactions: diarrhea, dizziness, cough, vomiting, asthenia, peripheral edema, UTI, influenza, ⇧GGT, & flatulence
        iv. Serious side-effects & contraindications mainly related to quinidine

F. Social Work referral often helpful for helping patients and families deal with diagnosis, day programs, nursing home and other long term care placement.

G. Early on, Cognitive Occupational Therapy can be especially helpful for those with a bit of insight, to provide alternative strategies.

H. Driving. For additional information see Section V of Budson & Solomon, *Memory Loss, Alzheimer's Disease, and Dementia: A Practical Guide for Clinicians*, Philadelphia: Elsevier Inc., 2016.
1. Patients with very mild AD have accident rates similar to 16 to 19 year old drivers (Neurology 2000;54:2205)
2. Have family members ride as passengers; when they feel uncomfortable patient is not safe to drive. Adult children are best. (Am J OT 2015;69: 6903270030)
3. Rehabilitation hospitals have driving evaluations ($250 to $500), much less expensive than a single accident. Some state registry of motor vehicles do as well.

I. Non-pharmacologic approaches
1. Aerobic exercise has been proven to improve memory in healthy older adults and patients with mild Alzheimer's disease likely related to increased

> production of growth factors in the brain which stimulates hippocampal stem cells. (PNAS 2011;108(7) 3017-3022)
>
> 2. Mediterranean diet is beneficial (JAMA Intern Med. 2015;175(7):1094-1103. doi:10.1001/jamainternmed.2015.1668)
> 3. Social activities have also been shown to improve cognition in healthy older adults and patients with mild Alzheimer's disease
> 4. Use of habit can be helpful. Habit learning (procedural memory, learning by doing) is intact in mild Alzheimer's disease and therefore these patients can learn new routines and improve their lives.

J. Alzheimer's Association: www.alz.org, is a great resource for patients and families.

K. Chronic Traumatic Encephalopathy For additional information see Chapter 13 of Budson & Solomon, *Memory Loss, Alzheimer's Disease, and Dementia: A Practical Guide for Clinicians*, Philadelphia: Elsevier Inc., 2016. (summary below.)

L. Resource for patients and families: Budson & O'Connor, *Seven Steps to Managing Your Memory: What's Normal, What's Not, and What to Do About It*, New York: Oxford University Press, 2017.

Definition & etiology	• Chronic traumatic encephalopathy is a progressive neurodegenerative disease associated with repetitive brain trauma.
Cognitive and behavioral symptoms, in order of prevalence at presentation	• Memory impairment • Executive dysfunction • Attention & concentration difficulties • Sadness/depression • Hopelessness • Explosivity • Language impairment • Visuospatial difficulties • "Out of control" • Physically violent • Verbally violent • Impulse control problems • Suicidal ideation/attempts
Summary of diagnostic criteria	**General Criteria for Traumatic Encephalopathy Syndrome:** *All five criteria must be met* 1) History of multiple impacts to the head. 2) No other neurological disorder present that likely accounts for all clinical features 3) Clinical features must be present for a minimum of 12 months 4) At least 1 Core Clinical Features must be present and considered a change from baseline 5) At least 2 Supportive Features must be present **Core Clinical Features of Traumatic Encephalopathy Syndrome:** *At least 1 must be met:* 1) *Cognitive.* Difficulties in cognition substantiated by impairment on

	standardized tests 2) *Behavioral*. Emotionally explosive, physically and/or verbally violent 3) *Mood*. Feeling overly sad, depressed, and/or hopeless **Supportive Features of Traumatic Encephalopathy Syndrome**: *At least 2 must be present:* (1) *Impulsivity*, (2) *Anxiety*, (3) *Apathy,* (4) *Paranoia*, (5) *Suicidality*, (6) *Headache*, (7) *Motor Signs,* including dysarthria & features of parkinsonism, (8) *Documented Decline*, for a minimum of one year, (9) *Delayed Onset*, at least 2 years **Traumatic encephalopathy syndrome diagnostic subtypes:** (1) Behavioral/Mood Variant, (2) Cognitive Variant, (3) Mixed Variant, (4) Dementia.
Imaging findings	• Cavum septum pellucidum is commonly seen on MRI or CT. Atrophy and hypofunction is typically observed in medial temporal and in frontal lobes.
Treatment	• Treatment is supportive. Cholinesterase inhibitors, memantine, and SSRIs can be tried.
Top differential diagnoses	• Alzheimer's disease, dementia with Lewy bodies, frontotemporal dementia, vascular dementia, progressive supranuclear palsy, corticobasal degeneration, and normal pressure hydrocephalus.

MONTREAL COGNITIVE ASSESSMENT (MOCA)

NAME :
Education :   Date of birth :
Sex :   DATE :
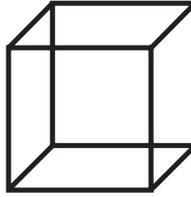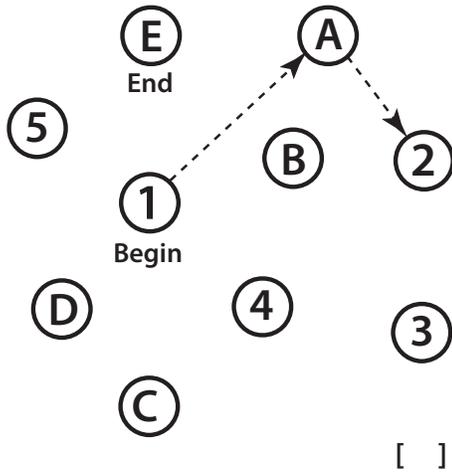
VISUOSPATIAL / EXECUTIVE	Copy cube	Draw CLOCK (Ten past eleven) (3 points)	POINTS

E — End
A
5
B   2
1 — Begin
D   4   3
C

[ ]   [ ]

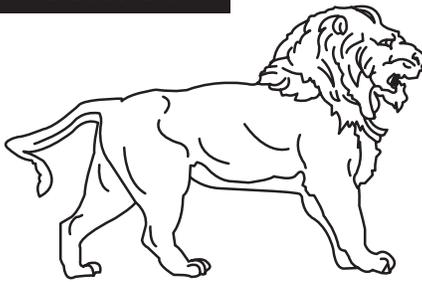[ ] Contour   [ ] Numbers   [ ] Hands

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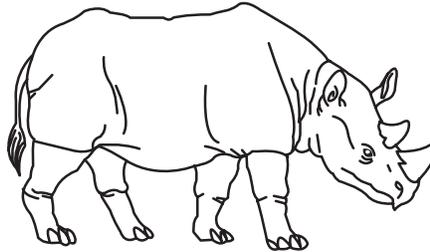## NAMING

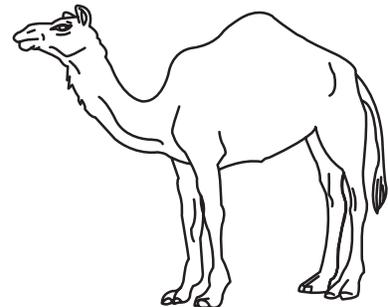[ ]   [ ]   [ ]   ___/3

MEMORY

Read list of words, subject must repeat them. Do 2 trials, even if 1st trial is successful. Do a recall after 5 minutes.

	FACE	VELVET	CHURCH	DAISY	RED	No points
1st trial						
2nd trial						

ATTENTION

Read list of digits (1 digit/ sec.).

Subject has to repeat them in the forward order   [ ] 2 1 8 5 4

Subject has to repeat them in the backward order   [ ] 7 4 2   ___/2

Read list of letters. The subject must tap with his hand at each letter A. No points if ≥ 2 errors

[ ] F B A C M N A A J K L B A F A K D E A A A J A M O F A A B   ___/1

Serial 7 subtraction starting at 100   [ ] 93   [ ] 86   [ ] 79   [ ] 72   [ ] 65

4 or 5 correct subtractions: **3 pts**, 2 or 3 correct: **2 pts**, 1 correct: **1 pt**, 0 correct: **0 pt**   ___/3

LANGUAGE

Repeat : I only know that John is the one to help today. [ ]

The cat always hid under the couch when dogs were in the room. [ ]   ___/2

Fluency / Name maximum number of words in one minute that begin with the letter F   [ ] _____ (N ≥ 11 words)   ___/1

ABSTRACTION

Similarity between e.g. banana - orange = fruit   [ ] train – bicycle   [ ] watch - ruler   ___/2

DELAYED RECALL

Has to recall words **WITH NO CUE**	FACE [ ]	VELVET [ ]	CHURCH [ ]	DAISY [ ]	RED [ ]	Points for UNCUED recall only	___/5
Optional Category cue							
Multiple choice cue							

ORIENTATION

[ ] Date   [ ] Month   [ ] Year   [ ] Day   [ ] Place   [ ] City   ___/6

© Z.Nasreddine MD   Version 7.1   **www.mocatest.org**   Normal ≥ 26 / 30

TOTAL   ___/30

Add 1 point if ≤ 12 yr edu

Administered by: _____

Montreal Cognitive Assessment
(MoCA)

Administration and Scoring Instructions

The Montreal Cognitive Assessment (MoCA) was designed as a rapid screening instrument for mild cognitive dysfunction. It assesses different cognitive domains: attention and concentration, executive functions, memory, language, visuoconstructional skills, conceptual thinking, calculations, and orientation. Time to administer the MoCA is approximately 10 minutes. The total possible score is 30 points; a score of 26 or above is considered normal.

1. **Alternating Trail Making:**
Administration: The examiner instructs the subject: *"Please draw a line, going from a number to a letter in ascending order. Begin here* [point to (1)] *and draw a line from 1 then to A then to 2 and so on. End here* [point to (E)]."

Scoring: Allocate one point if the subject successfully draws the following pattern:
1 −A- 2- B- 3- C- 4- D- 5- E, without drawing any lines that cross. Any error that is not immediately self-corrected earns a score of 0.

2. **Visuoconstructional Skills (Cube):**
Administration: The examiner gives the following instructions, pointing to the **cube**: *"Copy this drawing as accurately as you can, in the space below"*.

Scoring: One point is allocated for a correctly executed drawing.
- Drawing must be three-dimensional
- All lines are drawn
- No line is added
- Lines are relatively parallel and their length is similar (rectangular prisms are accepted)

A point is not assigned if any of the above-criteria are not met.

3. **Visuoconstructional Skills (Clock):**
Administration: Indicate the right third of the space and give the following instructions:
*"Draw a **clock**. Put in all the numbers and set the time to 10 after 11"*.

Scoring: One point is allocated for each of the following three criteria:
- Contour (1 pt.): the clock face must be a circle with only minor distortion acceptable (e.g., slight imperfection on closing the circle);
- Numbers (1 pt.): all clock numbers must be present with no additional numbers; numbers must be in the correct order and placed in the approximate quadrants on the clock face; Roman numerals are acceptable; numbers can be placed outside the circle contour;
- Hands (1 pt.): there must be two hands jointly indicating the correct time; the hour hand must be clearly shorter than the minute hand; hands must be centred within the clock face with their junction close to the clock centre.

A point is not assigned for a given element if any of the above-criteria are not met.

4.   **Naming:**

        Administration: Beginning on the left, point to each figure and say: *"Tell me the name of this animal"*.

        Scoring: One point each is given for the following responses: (1) camel or dromedary, (2) lion, (3) rhinoceros or rhino.

5.   **Memory:**

        Administration: The examiner reads a list of 5 words at a rate of one per second, giving the following instructions: *"This is a memory test. I am going to read a list of words that you will have to remember now and later on. Listen carefully.   When I am through, tell me as many words as you can remember. It doesn't matter in what order you say them"*.   Mark a check in the allocated space for each word the subject produces on this first trial. When the subject indicates that (s)he has finished (has recalled all words), or can recall no more words, read the list a second time with the following instructions: *"I am going to read the same list for a second time. Try to remember and tell me as many words as you can, including words you said the first time."* Put a check in the allocated space for each word the subject recalls after the second trial.
        At the end of the second trial, inform the subject that (s)he will be asked to recall these words again by saying, *"I will ask you to recall those words again at the end of the test."*

        Scoring: No points are given for Trials One and Two.

6.   **Attention:**

        Forward Digit Span: Administration: Give the following instruction: *"I am going to say some numbers and when I am through, repeat them to me exactly as I said them"*. Read the five number sequence at a rate of one digit per second.
        Backward Digit Span: Administration: Give the following instruction: *"Now I am going to say some more numbers, but when I am through you must repeat them to me in the <u>backwards</u> order."* Read the three number sequence at a rate of one digit per second.

        Scoring: Allocate one point for each sequence correctly repeated, (*N.B.:* the correct response for the backwards trial is 2-4-7).

        Vigilance: Administration: The examiner reads the list of letters at a rate of one per second, after giving the following instruction: *"I am going to read a sequence of letters. Every time I say the letter A, tap your hand once. If I say a different letter, do not tap your hand"*.

        Scoring: Give one point if there is zero to one errors (an error is a tap on a wrong letter or a failure to tap on letter A).

Serial 7s: Administration: The examiner gives the following instruction: *"Now, I will ask you to count by subtracting seven from 100, and then, keep subtracting seven from your answer until I tell you to stop."* Give this instruction twice if necessary.

Scoring: This item is scored out of 3 points. Give no (0) points for no correct subtractions, 1 point for one correction subtraction, 2 points for two-to-three correct subtractions, and 3 points if the participant successfully makes four or five correct subtractions. Count each correct subtraction of 7 beginning at 100. Each subtraction is evaluated independently; that is, if the participant responds with an incorrect number but continues to correctly subtract 7 from it, give a point for each correct subtraction. For example, a participant may respond "92 – 85 – 78 – 71 – 64" where the "92" is incorrect, but all subsequent numbers are subtracted correctly. This is one error and the item would be given a score of 3.

7.   Sentence repetition:
Administration: The examiner gives the following instructions: *"I am going to read you a sentence. Repeat it after me, exactly as I say it* [pause]*: **I only know that John is the one to help today."*** Following the response, say: *"Now I am going to read you another sentence. Repeat it after me, exactly as I say it* [pause]*: **The cat always hid under the couch when dogs were in the room.**"*

Scoring: Allocate 1 point for each sentence correctly repeated. Repetition must be exact. Be alert for errors that are omissions (e.g., omitting "only", "always") and substitutions/additions (e.g., "John is the one who helped today;" substituting "hides" for "hid", altering plurals, etc.).

8.   Verbal fluency:
Administration: The examiner gives the following instruction: *"Tell me as many words as you can think of that begin with a certain letter of the alphabet that I will tell you in a moment. You can say any kind of word you want, except for proper nouns (like Bob or Boston), numbers, or words that begin with the same sound but have a different suffix, for example, love, lover, loving. I will tell you to stop after one minute. Are you ready?* [Pause] *Now, tell me as many words as you can think of that begin with the letter F.* [time for 60 sec]. *Stop."*

Scoring: Allocate one point if the subject generates 11 words or more in 60 sec. Record the subject's response in the bottom or side margins.

9.   Abstraction:
Administration: The examiner asks the subject to explain what each pair of words has in common, starting with the example: *"Tell me how an orange and a banana are alike"*. If the subject answers in a concrete manner, then say only one additional time: *"Tell me another way in which those items are alike"*. If the subject does not give the appropriate response (*fruit*), say, *"Yes, and they are also both fruit."* Do not give any additional instructions or clarification.
After the practice trial, say: *"Now, tell me how a train and a bicycle are alike"*. Following the response, administer the second trial, saying: *"Now tell me how a ruler and a watch are alike"*. Do not give any additional instructions or prompts.

Scoring: Only the last two item pairs are scored. Give 1 point to each item pair correctly answered. The following responses are acceptable:

> Train-bicycle = means of transportation, means of travelling, you take trips in both;
> Ruler-watch = measuring instruments, used to measure.

The following responses are **not** acceptable: Train-bicycle = they have wheels; Ruler-watch = they have numbers.

10. **Delayed recall:**

> Administration: The examiner gives the following instruction: "*I read some words to you earlier, which I asked you to remember. Tell me as many of those words as you can remember.* Make a check mark (✓) for each of the words correctly recalled spontaneously without any cues, in the allocated space.

> Scoring: **Allocate 1 point for each word recalled freely <u>without any cues</u>.**

> **Optional:**
> Following the delayed free recall trial, prompt the subject with the semantic category cue provided below for any word not recalled. Make a check mark (✓) in the allocated space if the subject remembered the word with the help of a category or multiple-choice cue. Prompt all non-recalled words in this manner. If the subject does not recall the word after the category cue, give him/her a multiple choice trial, using the following example instruction, "*Which of the following words do you think it was, NOSE, FACE, or HAND?*"
> Use the following category and/or multiple-choice cues for each word, when appropriate:
> FACE: category cue: part of the body   multiple choice: nose, face, hand
> VELVET: category cue: type of fabric   multiple choice: denim, cotton, velvet
> CHURCH: category cue: type of building   multiple choice: church, school, hospital
> DAISY: category cue: type of flower   multiple choice: rose, daisy, tulip
> RED: category cue: a colour   multiple choice: red, blue, green
> Scoring: **No points are allocated for words recalled with a cue.** A cue is used for clinical information purposes only and can give the test interpreter additional information about the type of memory disorder. For memory deficits due to retrieval failures, performance can be improved with a cue. For memory deficits due to encoding failures, performance does not improve with a cue.

11. **Orientation:**

> Administration: The examiner gives the following instructions: "*Tell me the date today*". If the subject does not give a complete answer, then prompt accordingly by saying: "*Tell me the [year, month, exact date, and day of the week]."* Then say: "*Now, tell me the name of this place, and which city it is in.*"

> Scoring: Give one point for each item correctly answered. The subject must tell the exact date and the exact place (name of hospital, clinic, office). No points are allocated if subject makes an error of one day for the day and date.

> **TOTAL SCORE:** Sum all subscores listed on the right-hand side. Add one point for an individual who has 12 years or fewer of formal education, for a possible maximum of 30 points. A final total score of 26 and above is considered normal.

AD8 Dementia Screening Interview

Remember, "Yes, a change" indicates that there has been a change in the last several years caused by cognitive (thinking and memory) problems.	YES, A change	NO, No change	N/A, Don't know
1. Problems with judgment (e.g., problems making decisions, bad financial decisions, problems with thinking)			
2. Less interest in hobbies/activities			
3. Repeats the same things over and over (questions, stories, or statements)			
4. Trouble learning how to use a tool, appliance, or gadget (e.g., VCR, computer, microwave, remote control)			
5. Forgets correct month or year			
6. Trouble handling complicated financial affairs (e.g., balancing checkbook, income taxes, paying bills)			
7. Trouble remembering appointments			
8. **Daily** problems with thinking and/or memory			
TOTAL AD8 SCORE			

The AD8 Administration and Scoring Guidelines

A spontaneous self-correction is allowed for all responses without counting as an error.

The questions are given to the respondent on a clipboard for self–administration or can be read aloud to the respondent either in person or over the phone. It is preferable to administer the AD8 to an informant, if available. If an informant is not available, the AD8 may be administered to the patient.

When administered to an informant, specifically ask the respondent to rate change in the patient.

When administered to the patient, specifically ask the patient to rate changes in his/her ability for each of the items, **without** attributing causality.

If read aloud to the respondent, it is important for the clinician to carefully read the phrase as worded and give emphasis to note changes due to cognitive problems (not physical problems). There should be a one second delay between individual items.

No timeframe for change is required.

The final score is a sum of the number items marked "Yes, A change".

Interpretation of the AD8 (Adapted from Galvin JE et al, The AD8, a brief informant interview to detect dementia, Neurology 2005:65:559-564)

A screening test in itself is insufficient to diagnose a dementing disorder. The AD8 is, however, quite sensitive to detecting early cognitive changes associated many common dementing illness including Alzheimer disease, vascular dementia, Lewy body dementia and frontotemporal dementia.

Scores in the impaired range (see below) indicate a need for further assessment. Scores in the "normal" range suggest that a dementing disorder is unlikely, but a very early disease process cannot be ruled out. More advanced assessment may be warranted in cases where other objective evidence of impairment exists.

Based on clinical research findings from 995 individuals included in the development and validation samples, the following cut points are provided:
- 0 – 1: Normal cognition
- 2 or greater: Cognitive impairment is likely to be present

Administered to either the informant (preferable) or the patient, the AD8 has the following properties:
- Sensitiv   ity >84%
- Specific   ity >80%
- Positive Predictive Value > 85%
- Negative Predictive Value > 70%
- Area under the Curve: 0.908; 95%CI: 0.888-0.925

Reciever Operator Characteristics (ROC) curve for AD8