EVALUATION OF COGNITIVE IMPAIRMENT

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COGNITION

Cognition is the highest level of human function available for evaluation and consists of

- Intellect
- Memory
- Language
- Executive function
- Decision making

Behaviour is the result of cognitive functions.

IMPAIRMENT OF COGNITIVE DOMAIN

Acquired significant impairment in cognitive domains are as follow

1. Memory (Amnesia)
2. Language (Aphasia)
3. Self-control/management (executive function impairment)
4. Execution of purposeful movement (apraxia)
5. Recognition/familiarity (agnosia)
6. Visuospatial function (topographical disorientation)

Types of Memory

Memory is categorized

- Based on **temporal profile** as working memory, short term memory & long term memory.
- Based on **contents** as semantic, episodic, autobiographic.
- Based on **recall pattern** as explicit (declarative) & implicit (demonstrate their knowledge through performance)

Visual memories : it functions in more complex visual recognition, perception, revisualization, visual association and spatial orientation.

EVALUATION OF COGNITIVE IMPAIRMENT **STARTS WITH HISTORY TAKING**

History should be taken accurately and **repeatedly** from patients and bystanders as much as possible.

1. Presenting dominant symptoms

- Their order of occurrence.
- Temporal course of illness (short duration, steadily progressive, step wise progressive, static, regressive).

2. Past illness, treatment details.
3. Family history.
4. Personal (premorbid personality) and compensation related history and social support, cultural background.

1.Careful History of presenting dominant symptoms should include -

Memory problem?

- Word finding difficulty (minor delay in normal aging), retrieval deficit which responds to cues (**normal aging).**
- Recent memory impairment---misplacing things, fail to keep appointment, repeat questions which has been answered, forget food taken and asked again
- Difficulty in learning new tasks,
- Problems in managing money and counting money
- What about other lobe functions? Other parts of Neuraxis? Other systems?

Other cognitive domain other than memory problem?

Behavioral problem?

- Poor judgement & decision making, problem solving,
- Personality changes, mood & emotional changes, behavioral changes.
- Withdrawn behavior, social disinhibition, altered sexuality.
- Sleep-wake alteration, dietary habit changes, perceptual changes

Motor skills problem?

- Problems in driving, workplace & home (Apraxia)
- Action disorder, difficulty in complex actions.

Visuospatial problems?

- Way finding difficulty in new places, getting lost in familiar areas, wandering.
- Dressing difficulty, searching for objects.
- Urination in wrong place.

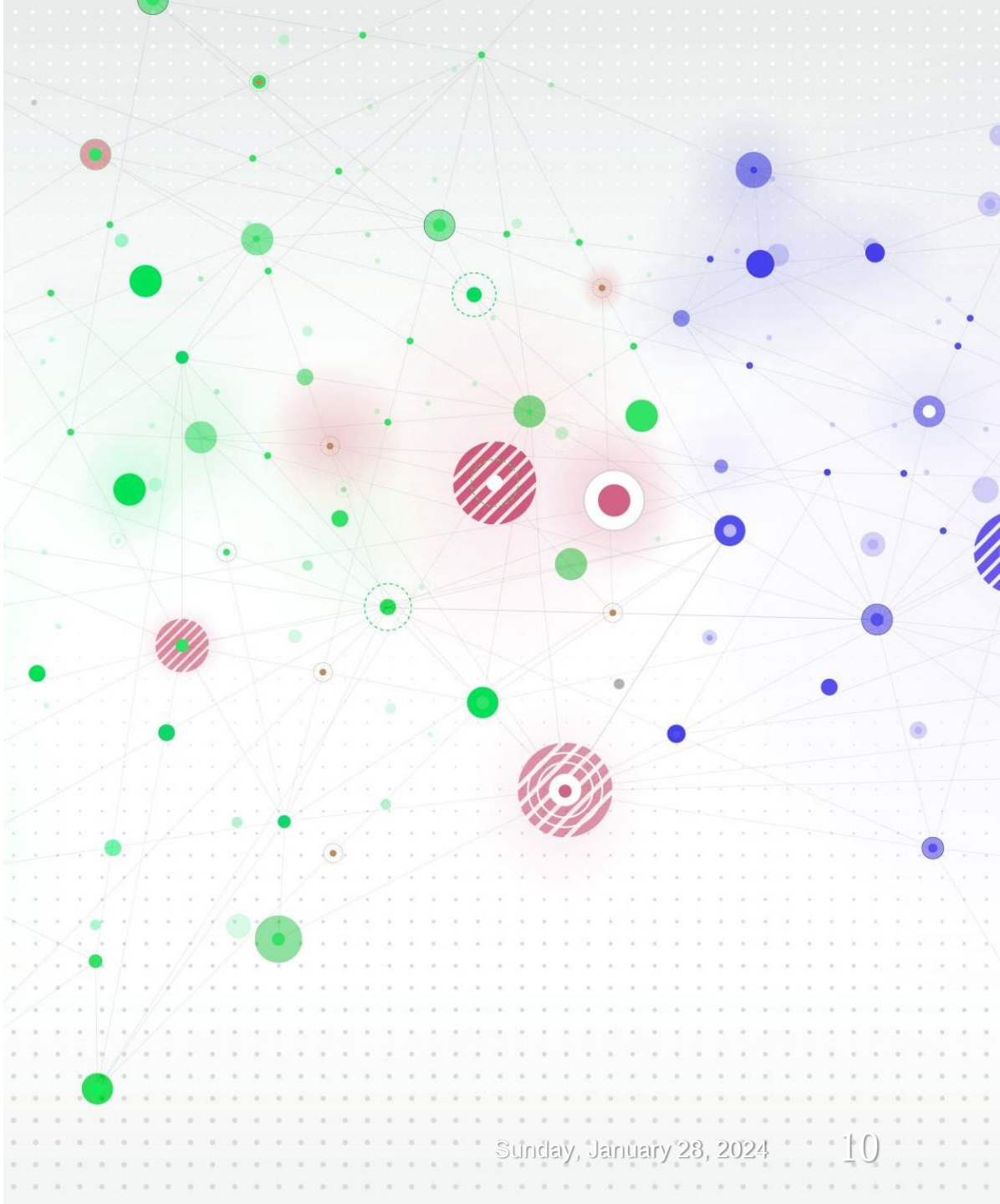
Memory complaint + informant corroboration

Summary of history should include _____

1. Objective memory loss
2. Amnestic/Non-amnestic, single vs multiple cognitive domain
3. Preserved general cognitive functions
4. Intact activities of daily living

NEUROPSYCHOMETRY/MENTAL STATUS EXAMINATION

Mental status examination is very valuable in characterizing the cognitive problem in more detail and identification of subclinical deficits that might not be explored in the history.



THE MENTAL STATUS EXAMINATION (MSE)

The MSE is used to help determine if a patient has

- Neurologic disease as opposed to psychiatric disease.
- To identify psychiatric symptoms possibly related to primary neurologic disease.
- To distinguish focal neurologic deficits from diffuse processes.

- **The psychiatric MSE** is longer and more involved than **the neurologic MSE**.

THE MENTAL STATUS EXAMINATION (MSE)

- The MSE begins with **careful observation** of the patient during taking history; emotional status, intelligence, memory, observation, character and personality.
- Observe the general appearance, attitude and behavior, manner, speech, posture and facial expression, interest in the interview, be in touch with the surroundings, distracted, preoccupied, indifferent or inattentive.
- Then a more formal MSE should be carried out.

The formal MSE is a more structured process that expands on the information from the history.

THE MENTAL STATUS EXAMINATION

- Many neuropsychometric tests provide quantitative and normative data.

- Documentation of performance in **particular cognitive domains** allows the likely origin of the cognitive problem to be **specified**, because particular patterns of deficit have **localizing value.**

- **The timing of test administration should be considered carefully, should be interpreted in the context of the specific clinical scenario.**

- A number of short screening mental status evaluation tests have been developed for **bedside use.**

- The most widely used of these are –
  - MMSE (Mini-Mental State Examination)
  - Mini Cog
  - Short Orientation Memory Concentration (SOMC)

- To detect Mild cognitive impairment (MCI) –
  - MoCA (Montreal Cognitive Assessment) are widely used.

- To expend assessment of behavior/global executive function –
  - Frontal Assessment Battery (FAB).

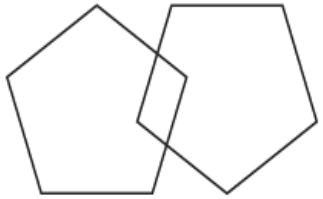
Mini-Mental state Exam (MMSE)

- Takes about 5-10 minutes
- Maximum score 30
- Dementia-23 (sensitivity 86%, specificity 91%)
- Limitation in both sensitivity and specificity.
- Affected not only by age and education, but also by gender and cultural background.

MINI-MENTAL STATE EXAM

Patient_____ Examiner _____ Date_____

Maximum	Score	
		Orientation
5	( )	What is the (year) (season) (date) (day) (month)?
5	( )	Where are we (state) (country) (town) (hospital) (floor)?
		Registration
3	( )	Name 3 objects: 1 second to say each. Then ask the patient all 3 after you have said them. Give 1 point for each correct answer. Then repeat them until he/she learns all 3. Count trials and record. Trials _____
		Attention and Calculation
5	( )	Serial 7's. 1 point for each correct answer. Stop after 5 answers. Alternatively spell "world" backward.
		Recall
3	( )	Ask for the 3 objects repeated above. Give 1 point for each correct answer.
		Language
2	( )	Name a pencil and watch.
1	( )	Repeat the following "No ifs, ands, or buts"
3	( )	Follow a 3-stage command: "Take a paper in your hand, fold it in half, and put it on the floor."
1	( )	Read and obey the following: CLOSE YOUR EYES
1	( )	Write a sentence.
1	( )	Copy the design shown.

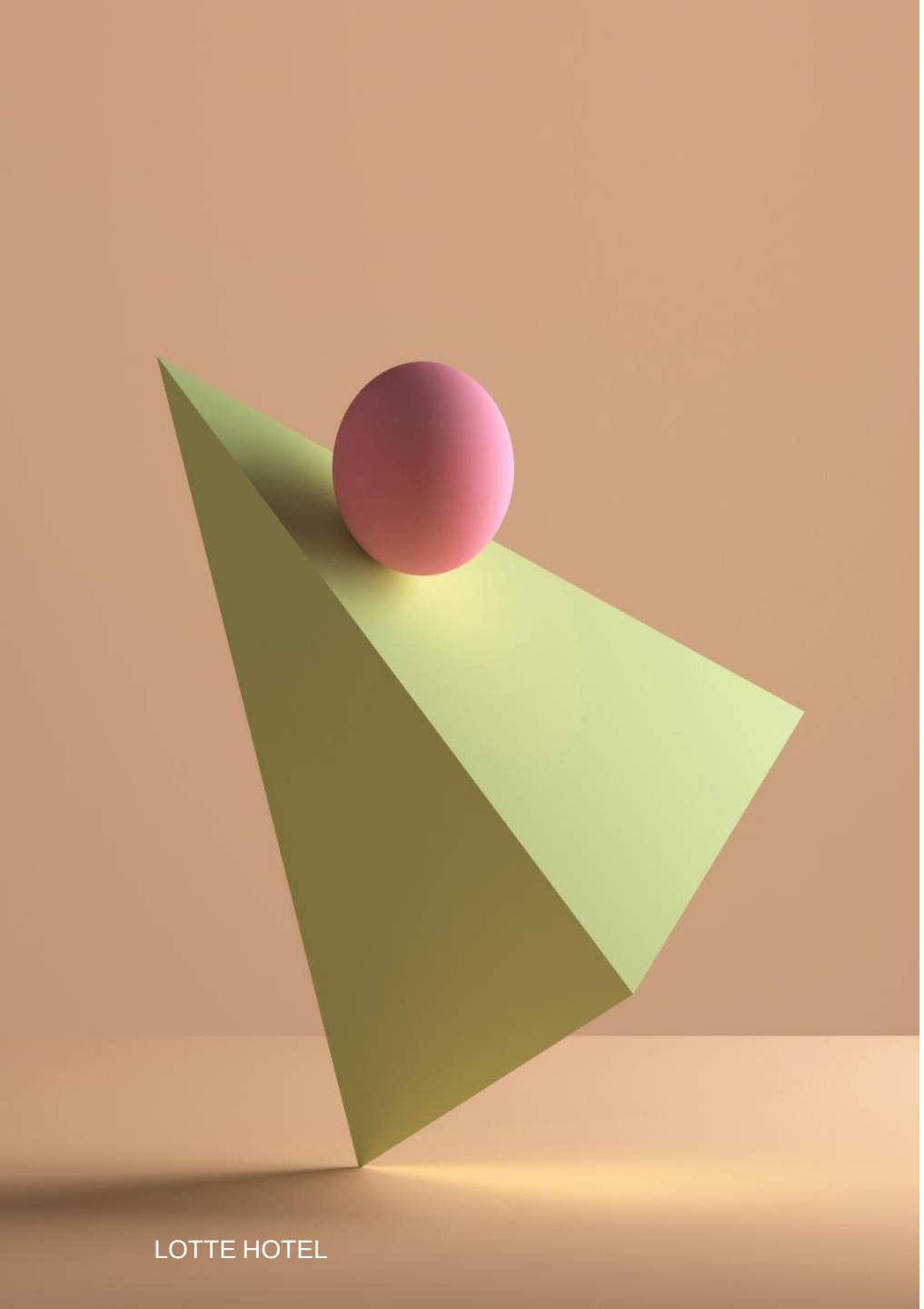


_____ Total Score

ASSESS level of consciousness along a continuum _____

Alert Drowsy Stupor Coma

"MINI-MENTAL STATE." A PRACTICAL METHOD FOR GRADING THE COGNITIVE STATE OF PATIENTS FOR THE CLINICIAN. *Journal of Psychiatric Research*, 12(3): 189-198, 1975. Used by permission.



Mini-Cog©

Instructions for Administration & Scoring

ID:_____ Date: _____

Step 1: Three Word Registration

Look directly at person and say, "Please listen carefully. I am going to say three words that I want you to repeat back to me now and try to remember. The words are [select a list of words from the versions below]. Please say them for me now." If the person is unable to repeat the words after three attempts, move on to Step 2 (clock drawing).

The following and other word lists have been used in one or more clinical studies.[1-3] For repeated administrations, use of an alternative word list is recommended.

Version 1	Version 2	Version 3	Version 4	Version 5	Version 6
Banana	Leader	Village	River	Captain	Daughter
Sunrise	Season	Kitchen	Nation	Garden	Heaven
Chair	Table	Baby	Finger	Picture	Mountain

Step 2: Clock Drawing

Say: "Next, I want you to draw a clock for me. First, put in all of the numbers where they go." When that is completed, say: "Now, set the hands to 10 past 11."

Use preprinted circle (see next page) for this exercise. Repeat instructions as needed as this is not a memory test. Move to Step 3 if the clock is not complete within three minutes.

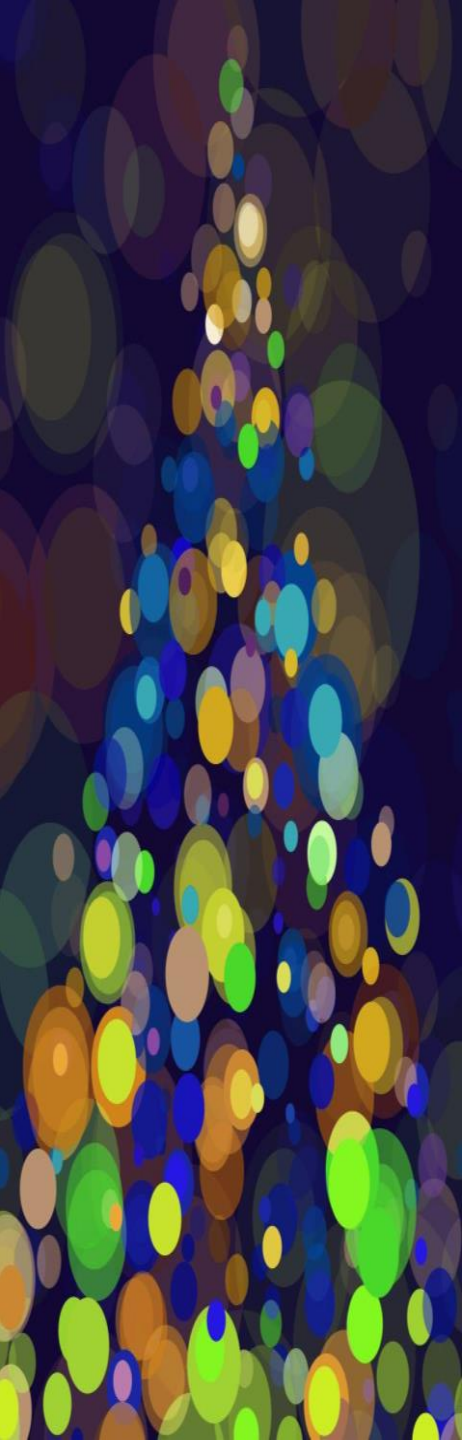
Step 3: Three Word Recall

Ask the person to recall the three words you stated in Step 1. Say: "What were the three words I asked you to remember?" Record the word list version number and the person's answers below.

Word List Version: _____ Person's Answers: _____ _____ _____

Scoring

Word Recall: _____ (0-3 points)	1 point for each word spontaneously recalled without cueing.
Clock Draw: _____ (0 or 2 points)	Normal clock = 2 points. A normal clock has all numbers placed in the correct sequence and approximately correct position (e.g., 12, 3, 6 and 9 are in anchor positions) with no missing or duplicate numbers. Hands are pointing to the 11 and 2 (11:10). Hand length is not scored. Inability or refusal to draw a clock (abnormal) = 0 points.
Total Score: _____ (0-5 points)	Total score = Word Recall score + Clock Draw score. A cut point of <3 on the Mini-Cog™ has been validated for dementia screening, but many individuals with clinically meaningful cognitive impairment will score higher. When greater sensitivity is desired, a cut point of <4 is recommended as it may indicate a need for further evaluation of cognitive status.



SMOC(Short orientation-Memory-Concentration Test

Ask patient to:

1.Name the month

2.Name the year

3.State the time of day

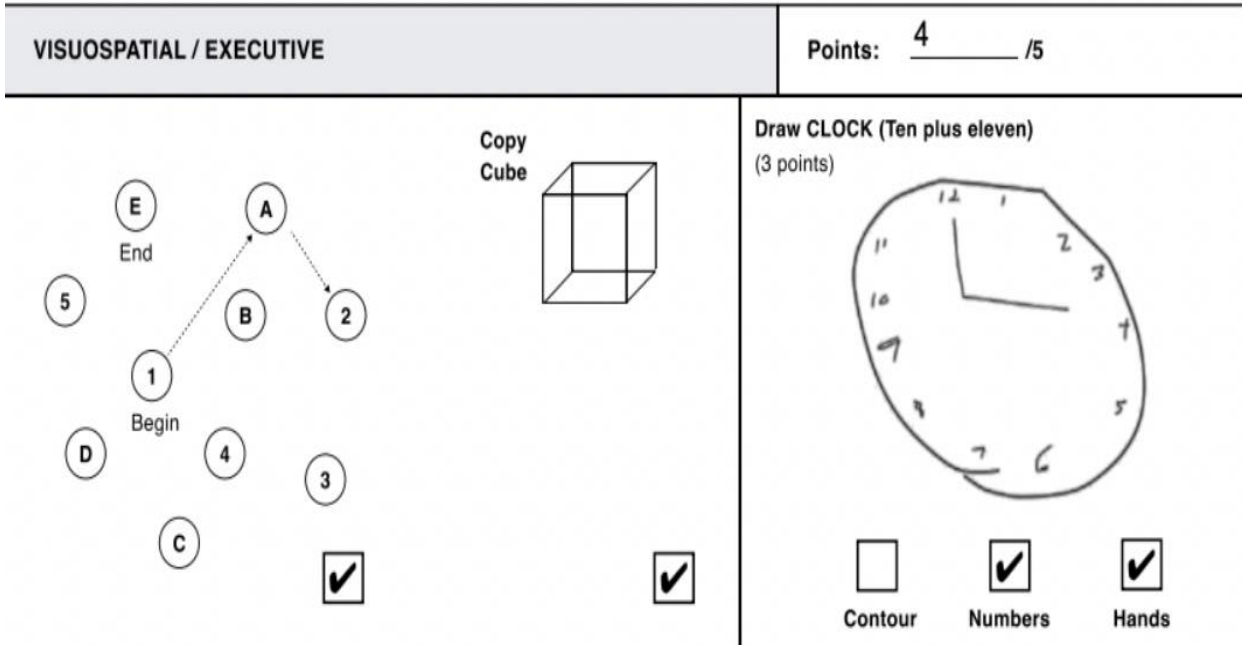
4. Repeat the phrase “John Brown,42 Market Street, Chicago”

5.Count backward from 20 to 1

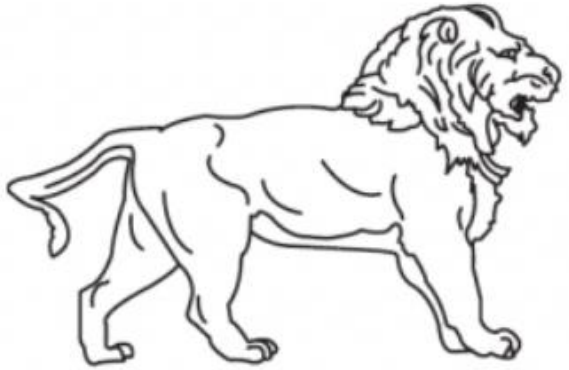
6.Name the month of the year in reverse

7.Recall the phrase mentioned in No.4

MoCA TEST (MONTREAL COGNITIVE ASSESSMENT)



NAMING | **Points:** 2 /3



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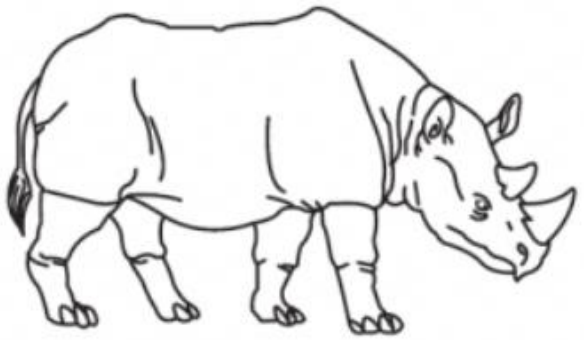

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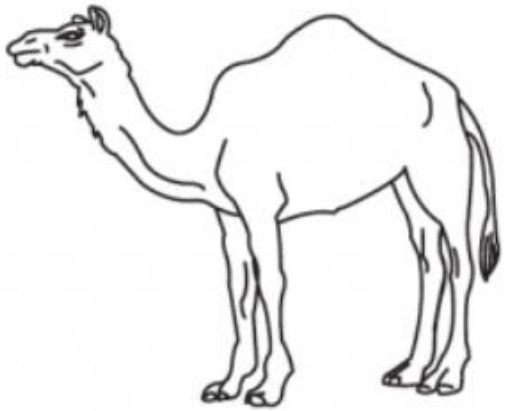

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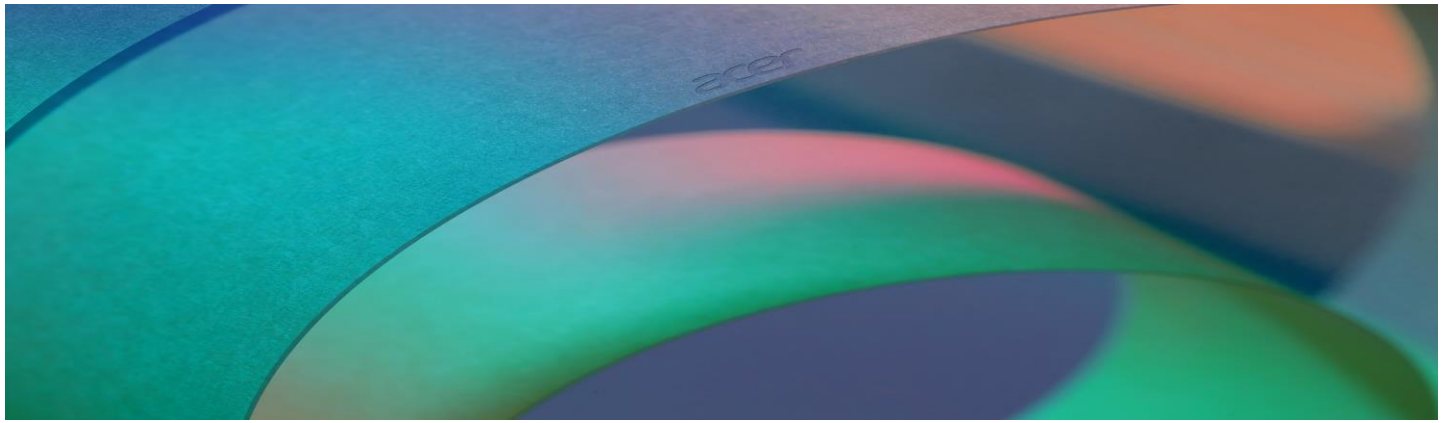
MEMORY | **No Points**

Read list of words, subject must repeat them. Do 2 trials. Do a recall after 5 minutes

	FACE	VELVET	CHURCH	DAISY	RED
First trial	yes	yes	no	no	no
Second Trial	yes	yes	yes	no	no

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**	**Points:** 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**		**Points:** 0 /1



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

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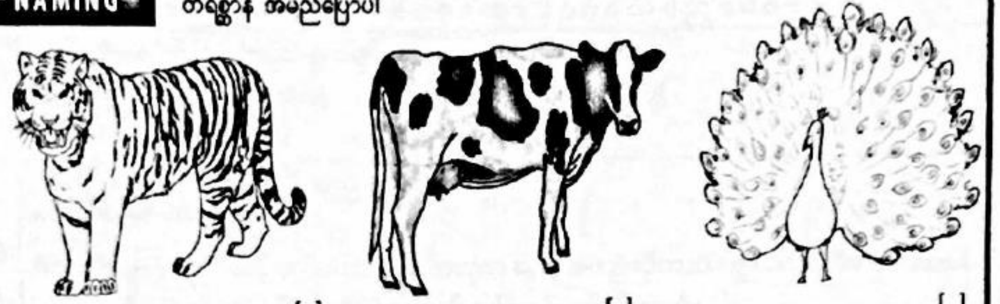
Normal ≥ 26 / 30

TOTAL ___/30

Add 1 point if ≤ 12 yr edu

NAMING

တိရိစ္ဆာန် အမည်ပြောပါ



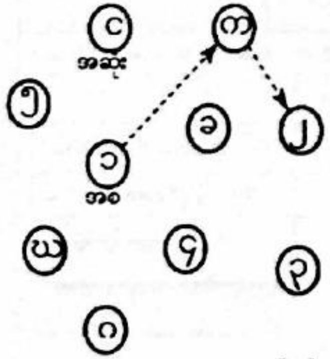
[ ] [ ] [ ] __/3

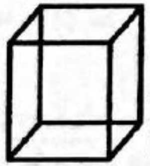
MEMORY

အောက်ပါ စကားလုံးများကို ရွတ်ဖတ်ပြရန်။ စစ်ဆေးခံသူအနေဖြင့် ပြန်လည်ရွတ်ဆိုပြရပါမည်။
၂ ကြိမ်မြောက် ပြန်လည်ရွတ်ဆိုပြ၊ ရွတ်ဆိုနိုင်းရပါမည်။ ၅ မိနစ် ကြာလျှင် ပြန်လည် မေးမြန်းရန်။

	မျက်နှာ	တရွဲ	ဘုရားကျောင်း	စံပယ်ပန်း	အနီရောင်	အမှတ်မပေးပါ
ပ - အကြိမ်						
ဒု - အကြိမ်						

VISUOSPATIAL / EXECUTIVE





ကုဗပုံကို ပုံတူ ကူးဆွဲ ပြပါ။

နာရီပုံ ဆွဲပြပါ (ဆယ့်တစ်နာရီ ဆယ်မိနစ်) (၃ မှတ်)

POINTS

[ ] [ ] [ ] ပုံစံ [ ] နံပါတ် [ ] လက်တံ __/5

ATTENTION

ကိန်းဂဏန်းများကို ရွတ်ဖတ်ပြရန် (တစ်စက္ကန့် တစ်လုံးနှုန်း)

စစ်ဆေးခံသူ အနေဖြင့် ဂဏန်းများကို အစဉ်လိုက်ပြန်လည် ရွတ်ဆိုပြရန်။

[ ] ၂ ၁ ၈ ၅ ၄

စစ်ဆေးခံသူ အနေဖြင့် ဂဏန်းများကို ပြောင်းပြန် အစဉ်လိုက်ပြန်လည် ရွတ်ဆိုပြရန်။

[ ] ၇ ၄ ၂ __/2

အောက်ပါအက္ခရာများကို ရွတ်ဖတ်ပြရန်။ (တစ်စက္ကန့်လျှင် တစ်လုံးနှုန်း)
စစ်ဆေးခံသူ အနေဖြင့် ' ဂ ' အက္ခရာတိုင်းတွင် လက်ဖြင့် ပုတ်ပြရန်။
အက္ခရာ ၂ ကြိမ်နှင့်အထက် မှားယွင်းလျှင် အမှတ်မပေးရ။
( ) စ စ ဂ တ ည စ ဂ ဂ ဆ တ ထ စ ဂ စ ဂ ဆ စ င ဂ ဂ ဂ ဆ ဂ ည ဒ စ ဂ ဂ စ __/1

၁၀၀ ထဲမှ ၇ ကို အစဉ်တိုင်း နုတ်ရန်
[၄ (သို့) ၅ ကြိမ်မှန် - ၃ မှတ်] [၂ (သို့) ၃ ကြိမ်မှန် - ၂ မှတ်]
[၁ ကြိမ်မှန် - ၁ မှတ်] [၀ ကြိမ်မှန် ၀ မှတ်] __/3

LANGUAGE

ပြန်လည် ရွတ်ဆိုနိုင်ရန်

ဒီနေ့အတွက် ကူညီမယ့် တစ်ယောက်သောသူက ဂျော်ဂျော်ဆိုတာပဲ ကျွန်တော်သိတယ်။ အခန်းထဲမှာ ခွေးတွေ ရှိနေခဲ့ရင် ကြောင်က ထိုင်ခုံအောက် အမြဲတမ်း ဝင်ပုန်းတယ်။ __/2

စကားလုံးကြွယ်ဝမှု
က နှင့်စသော စကားလုံးများကို တစ်မိနစ်အတွင်း သင်သိသမျှ ပြောပါ (၁၁ လုံး အထက်)
(ဂဏန်း၊ နံပါတ် ၊ အက္ခရာ အစဉ်လိုက် (ဥပမာ - က၊ ကာ၊ ကား)၊ မြို့အမည်၊ လူအမည် မပြောရပါ။) __/1

ABSTRACTION

တူညီမှု (အမျိုးအစားပြောရန်) ဥပမာ (၁) ငှက်ပျောသီး - လိမ္မော်သီး = သစ်သီး
(၂) ရထား – စက်ဘီး (၃) ကျောက်စိမ်း - ပတ္တမြား
(ပထမမေးခွန်း မှန်အောင်ဖြေနိုင်လျှင် နောက်ထပ်မေးခွန်း (၁) ခုသာထပ်မေးရန် လိုသည်။ အကယ်၍ ပထမမေးခွန်းကို မဖြေနိုင်လျှင် အဖြေကို ပြောပြပြီး နောက်ထပ်မေးခွန်း (၂)ခုကို ဆက်မေးပါ။) __/2

DELAYED RECALL

သဲလွန်စမပေးဘဲ မှတ်မိသော အဖြေများသာ အမှတ်ပေးရန်

	မျက်နှာ	တရွဲ	ဘုရားကျောင်း	စံပယ်ပန်း	အနီရောင်
သဲလွန်စမပေးဘဲ မှတ်မိ					
အမျိုးအစားသဲလွန်စပေး					
မှန်ရာကို ရွေးချယ်ရန်					

__/5

ORIENTATION

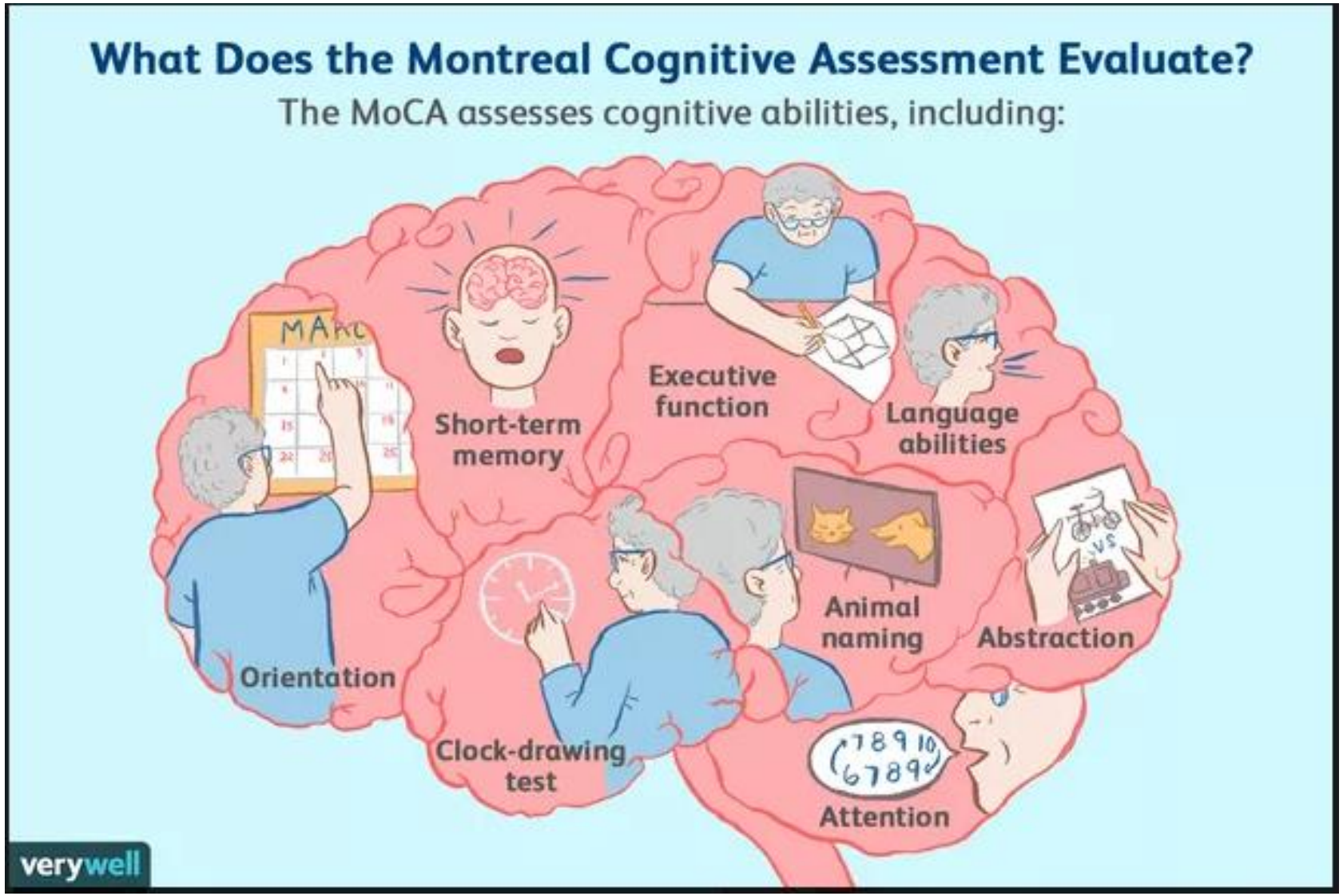
[ ] ရက် [ ] လ [ ] နှစ် [ ] နေ့ [ ] နေရာ [ ] မြို့ __/6

စုစုပေါင်း __/30

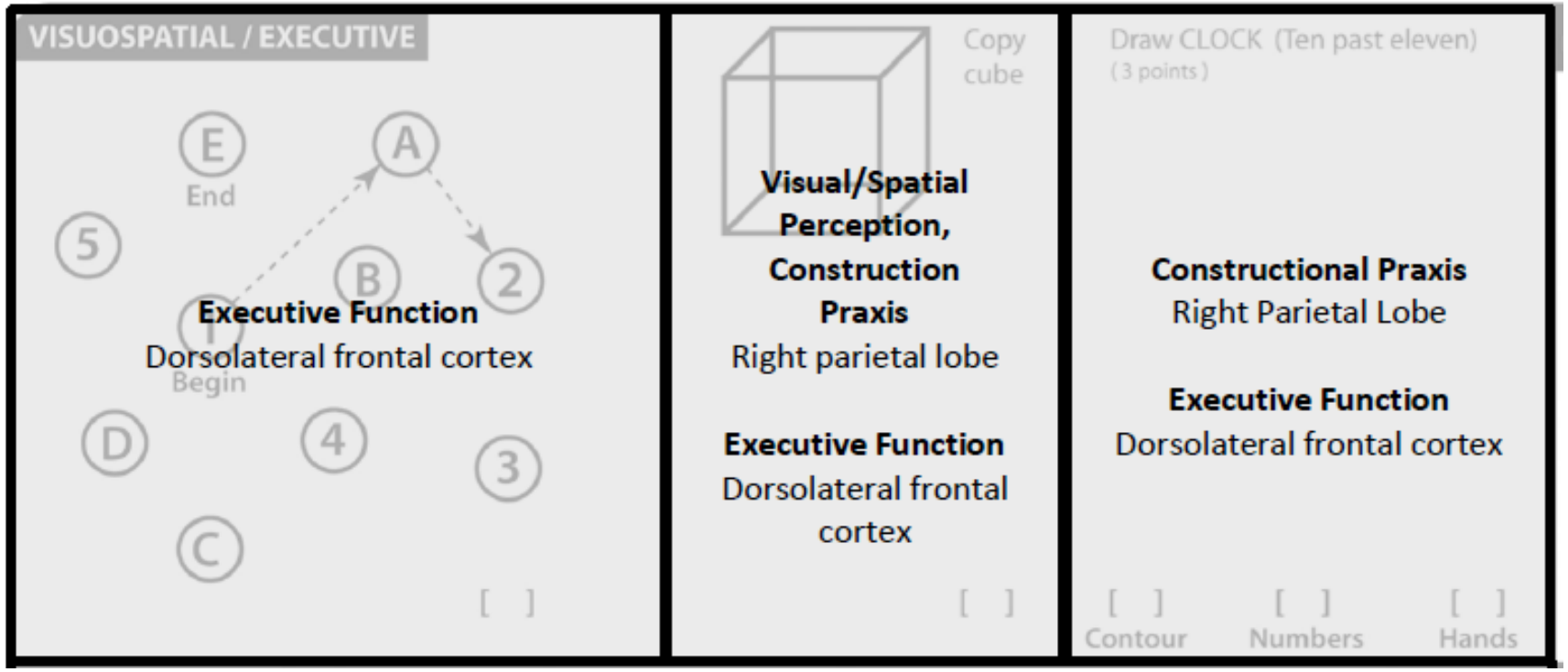
Normal ≥26/30 တက္ကသိုလ် ပထမနှစ်နှင့်အောက်ဆိုလျှင် ၁ မှတ်ထည့်ပေါင်းရန်

- MoCA test better discriminate mild cognitive impairment from normal.
- Maximum score – 30 , a score of 26 & higher is normal.
- MCI –average of 22.1
- Alzheimer’s disease-average score of 16.2
- Has a more challenging memory tasks.
- Greater emphasis on attention and executive function.

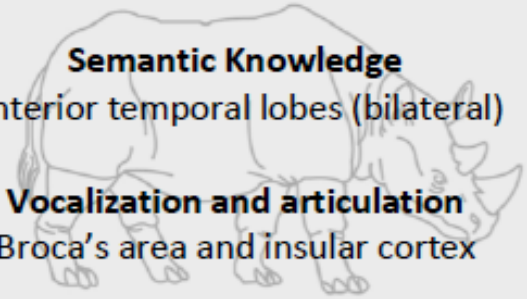
The scoring breakdown is as follows:	
Visuospatial & executive function	5 points
Animal naming	3 points
Attention	6 points
Language	3 points
Abstraction	2 points
Delayed recall (short term memory)	5 points
Orientation	6 points
Education level (If patient is <12 years or less of formal education)	1 point

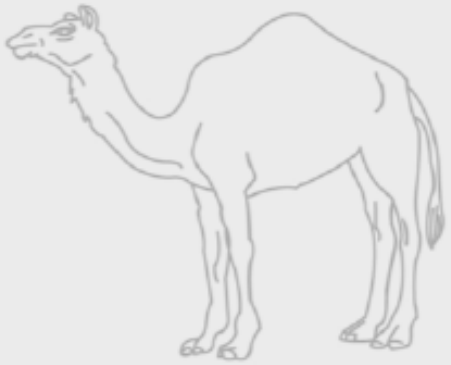

What Does the Montreal Cognitive Assessment Evaluate?
The MoCA assesses cognitive abilities, including:
Short-term memory
Executive function
Language abilities
Orientation
Clock-drawing test
Animal naming
Abstraction
Attention
verywell

Montreal cognitive assessment lesion localization



NAMING





Semantic Knowledge
Anterior temporal lobes (bilateral)

Vocalization and articulation
Broca's area and insular cortex

[ ] [ ] [ ]

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
Working Memory	Anterior temporal lobes (bilateral)					
	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

ATTENTION	**Attention/Vigilance**	Dorsolateral frontal lobes
TAPPING	**Response Inhibition**	Orbitofrontal cortex
SERIAL 7s	**Working memory/Attention**	Dorsolateral frontal lobes
	Calculation	Left parietal lobe

Read list of letters. The subject ... with his hand ... 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 E A A B

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

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

LANGUAGE	**REPEATING**	**Working memory/Executive Function**	Dorsolateral frontal
	FLUENCY	**Working memory/Executive Function**	Dorsolateral frontal
ABSTRACTION	**Abstraction**	Dorsolateral prefrontal cortex	
DELAYED RECALL	**Memory**	Hippocampus	
	If able to recall words with multiple choice or category cues, then memories were stored in the hippocampus, but unable to be retrieved. This would mean a frontal lobe deficit, more commonly seen in vascular dementia or Parkinson's dementia.		
ORIENTATION	**Memory**	Hippocampus	

FRONTAL ASSESSMENT BATTERY(FAB)

1. Similarities(conceptualization)
2. Lexical Fluency(mental flexibility)
3. Motor Series “Lurica” test (programming) series of “fist-edge-palm”
4. Conflicting Instructions (sensitivity to interference)
5. Go-No-Go (Inhibitory control)
6. Prehension behavior (Environmental autonomy) - Do not take my hands

Total score -18

A cut off score of 12 – sensitivity 77% & specificity 87% in differentiating between frontotemporal dementia and Alzheimer disease.

INVESTIGATIONS (PRIORITY TO EXCLUDE REVERSIBLE CONDITION)

Blood Tests

Recommended blood tests are

Complete blood count, coagulation screen

Glucose, electrolytes,calcium,

Vitamin B12, folic acid, renal & hepatic function

Thyroid function test

VDRL, HIV, ESR/CRP, urineRE

Imaging

- MRI Brain (T1 T2 ,DWI) non contrast or NECT head
- EEG,ECG,CXR
- CSF if indicated
- Functional Imaging (PET/SPECT)
- Molecular Imaging (Amyloid, Dopamine, Tau)

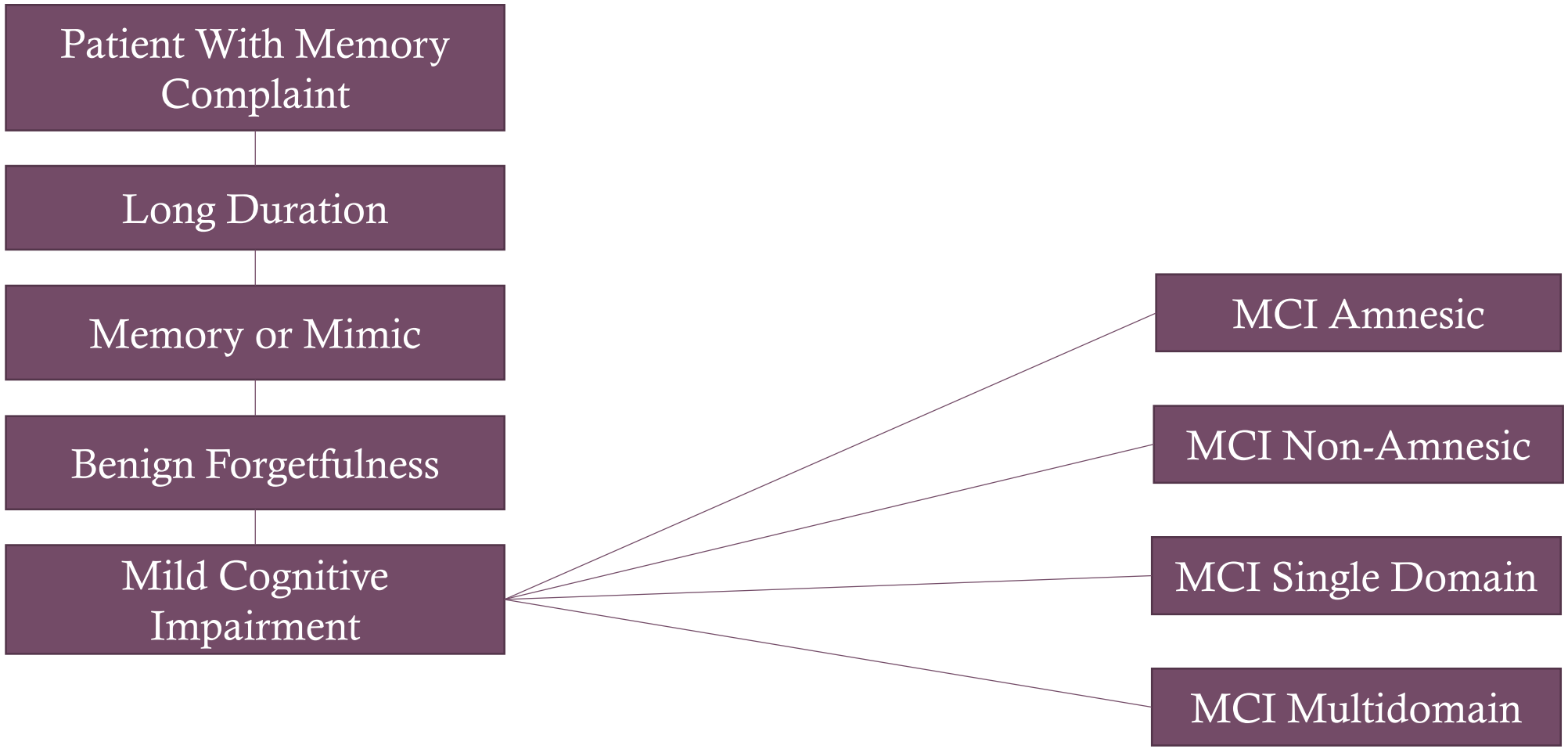
INVESTIGATION OF THE PATIENT WITH DEMENTIA

Associated Features	Investigations
Young onset,non-cognitive neurological symptoms, family history	HIV serology,copper studies, slit lamp exam,specialized metabolic & genetic screens,muscle/axillary skin, marrow,liver biopsy
Rapid course,headache, menigism, fever Atypical for degenerations(<65yr,systemic features, neurological signs)	Vasculitis, auto-Ab screens(ANCA,APL,NMDA R Ab VGKCAb coeliac screens) ,antineuronal Ab, neoplasia screen(including whole boby PET,CT)
	CSF examination (REME,cytology,C&S, syphilis, TB screen,cryptococcal Ag, measles Ab Whipple PCR, oligoclonal bands,14-3-3, S100, JC/otherviral PCR)
	MRI FLAIR sequences, tonsillarbiopsy if suspect vCJD,prion genotyping if suspect prion disease
Seizure prominent fluctuation	Prolong EEG(if routine EEG not diagnostic) autoimmune, Echocardiogram, vascular &thrombotic screen, urinary porphyrin

INVESTIGATION OF PATIENTS WITH DEMENTIA

Associated features	Investigations
Poor Nutrition/suspicion of deficiency	Nutritional Screens
Drug use/ possible toxic exposure	Rationalise medications/toxicological screens
Major affective disorder,psychosis, fugue state,factitious disorder	Psychiatric evaluation
Sleep disorder	Sleep study
Suspicion of treatable(inflammatory) process when diagnosis is not established by non-invasive means	Brain biopsy

APPROACH TO CATEGORIZATION OF COGNITIVE IMPAIRMENT/DEMENTIA



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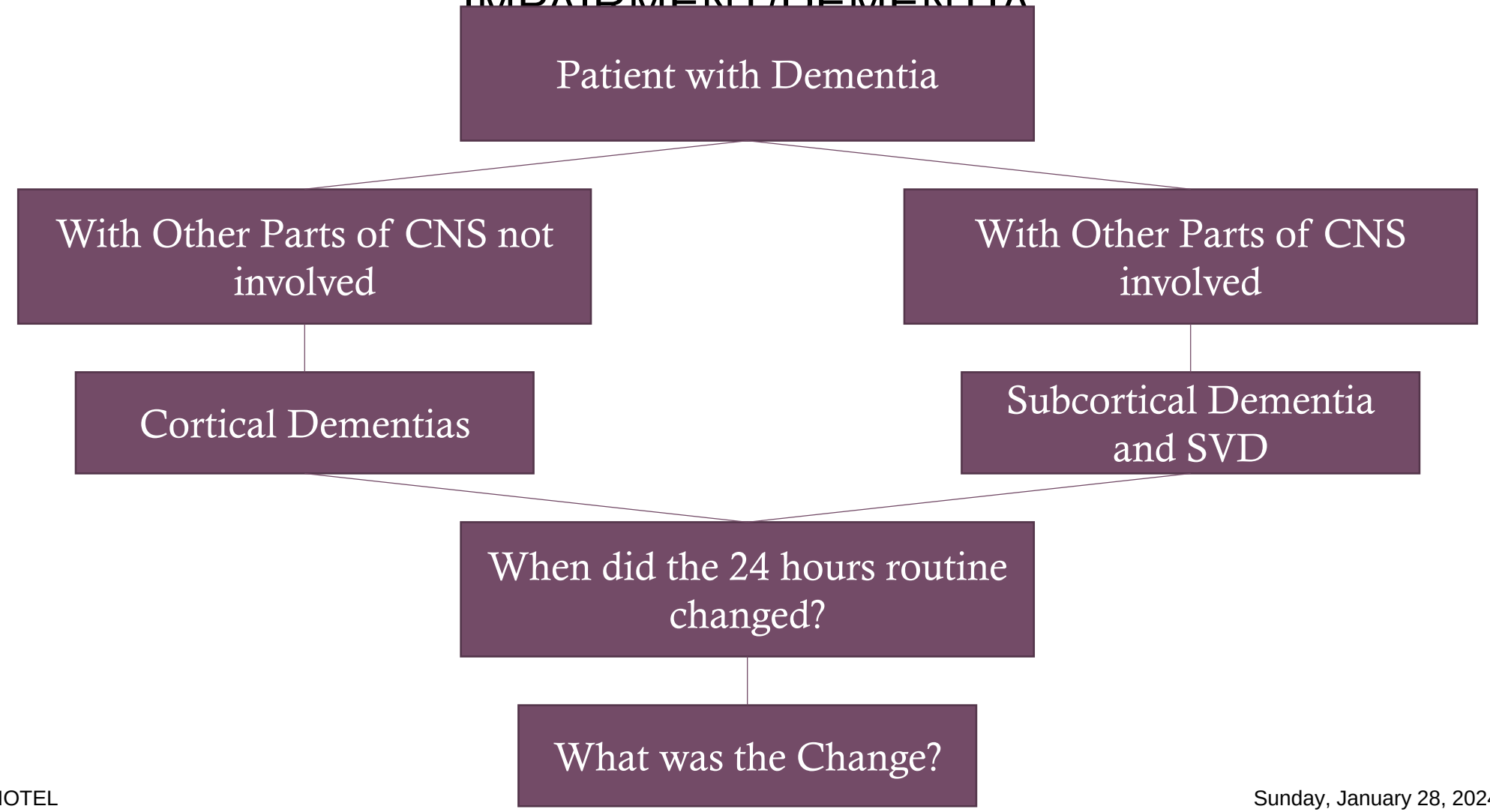

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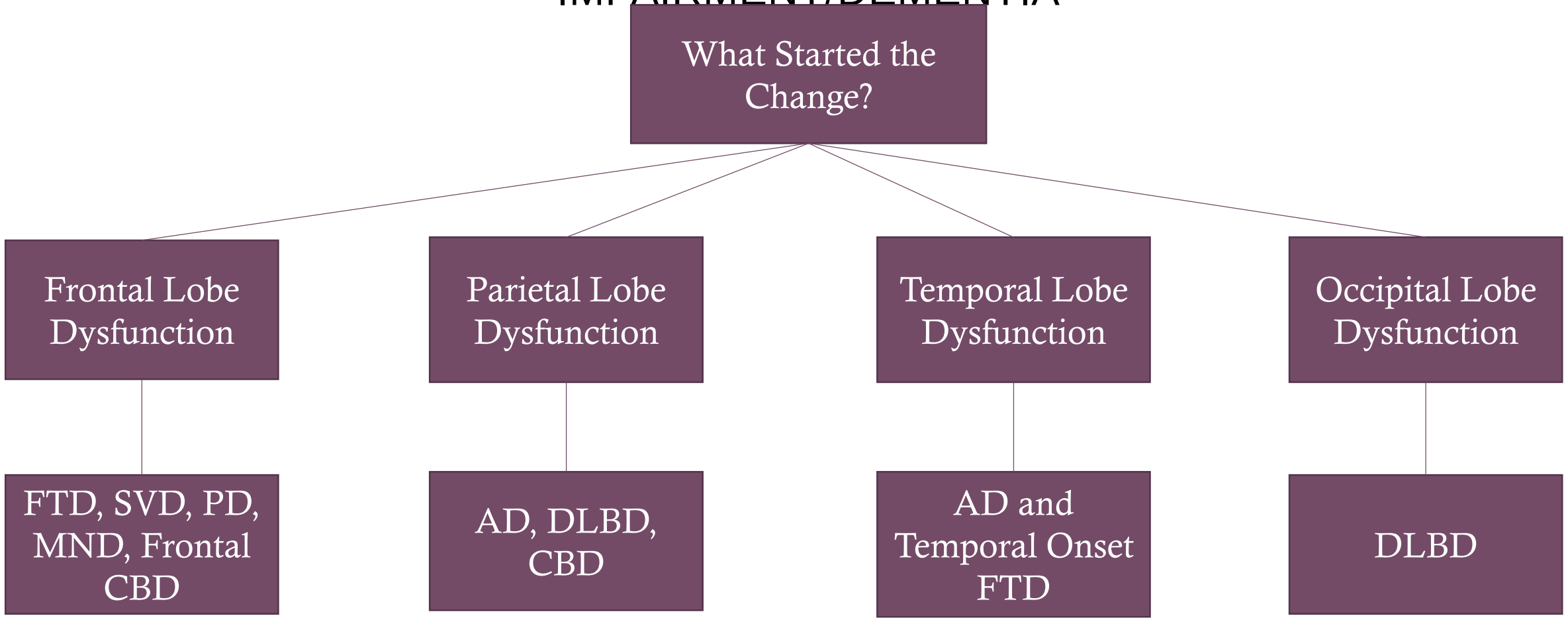

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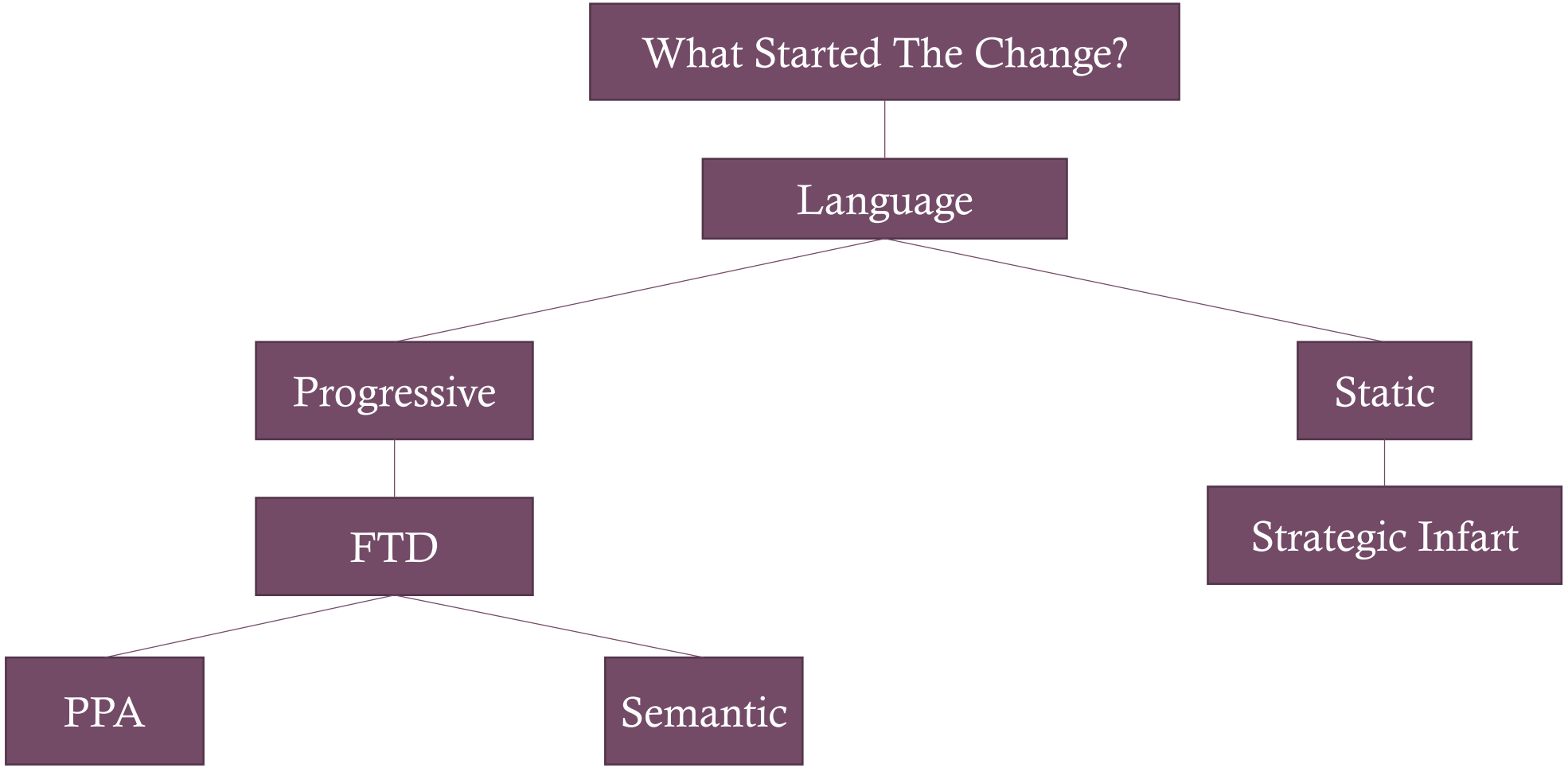

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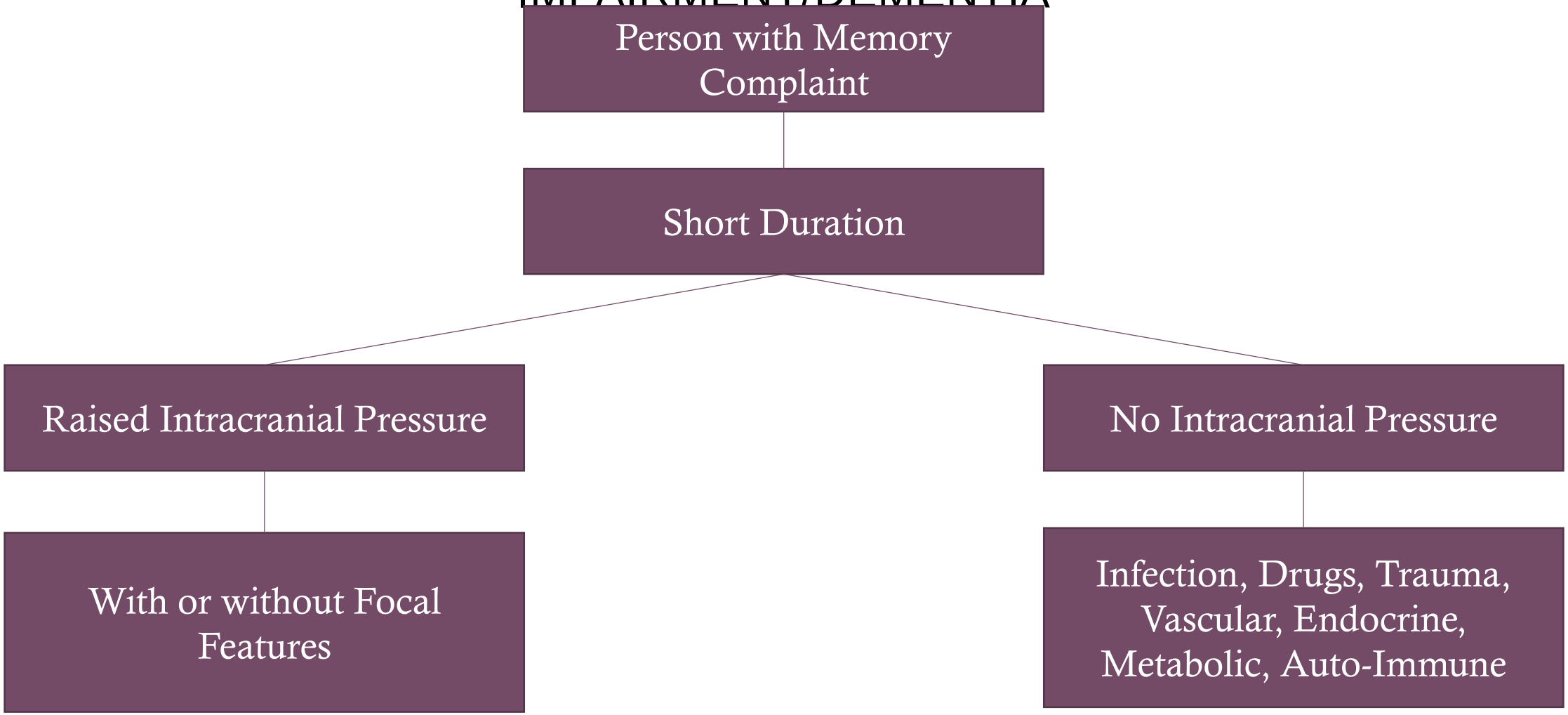
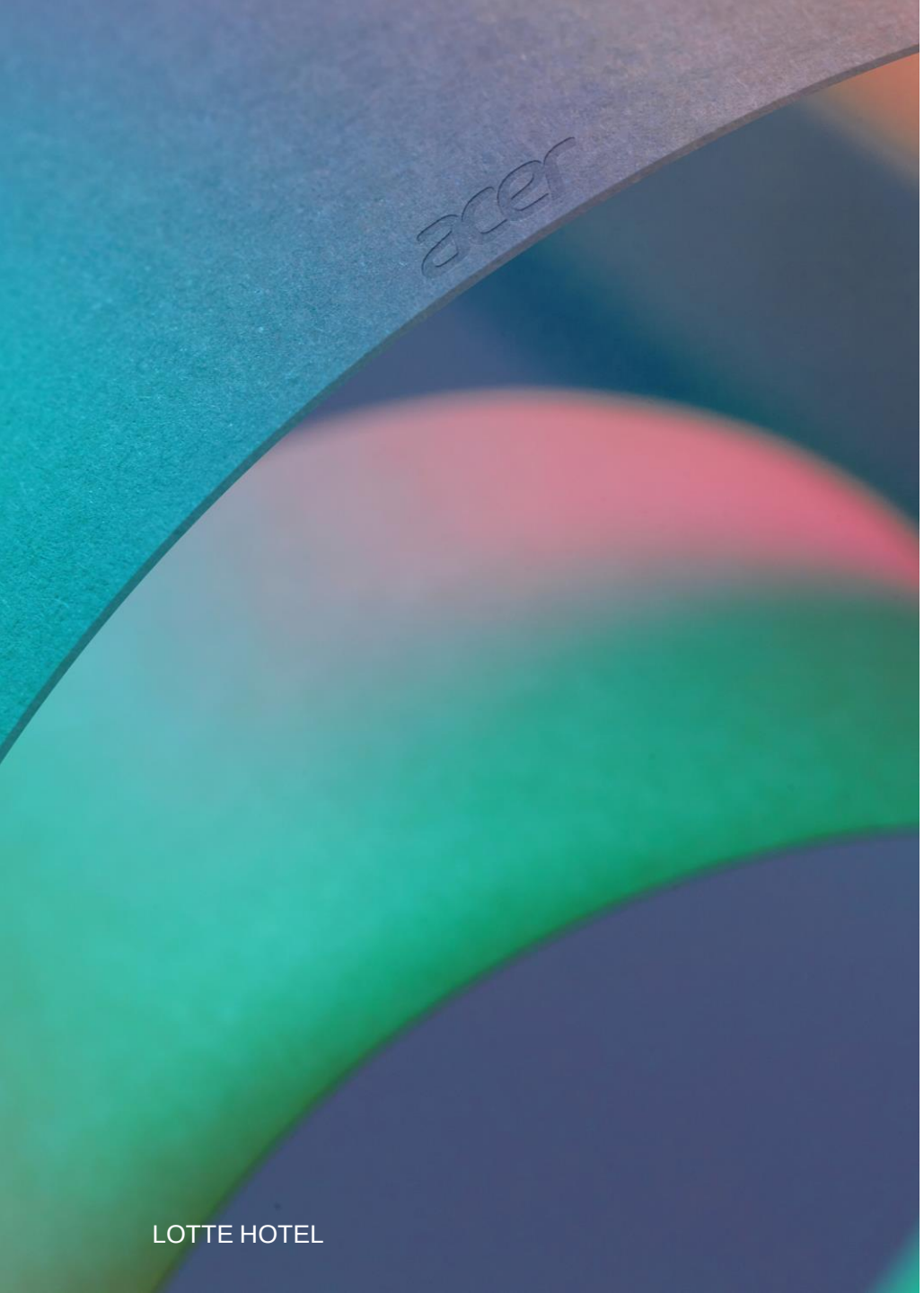




ABBREVIATION

FTD-Frontotemporal dementia

SVD-Small vessel disease

PD-Parkinson disease

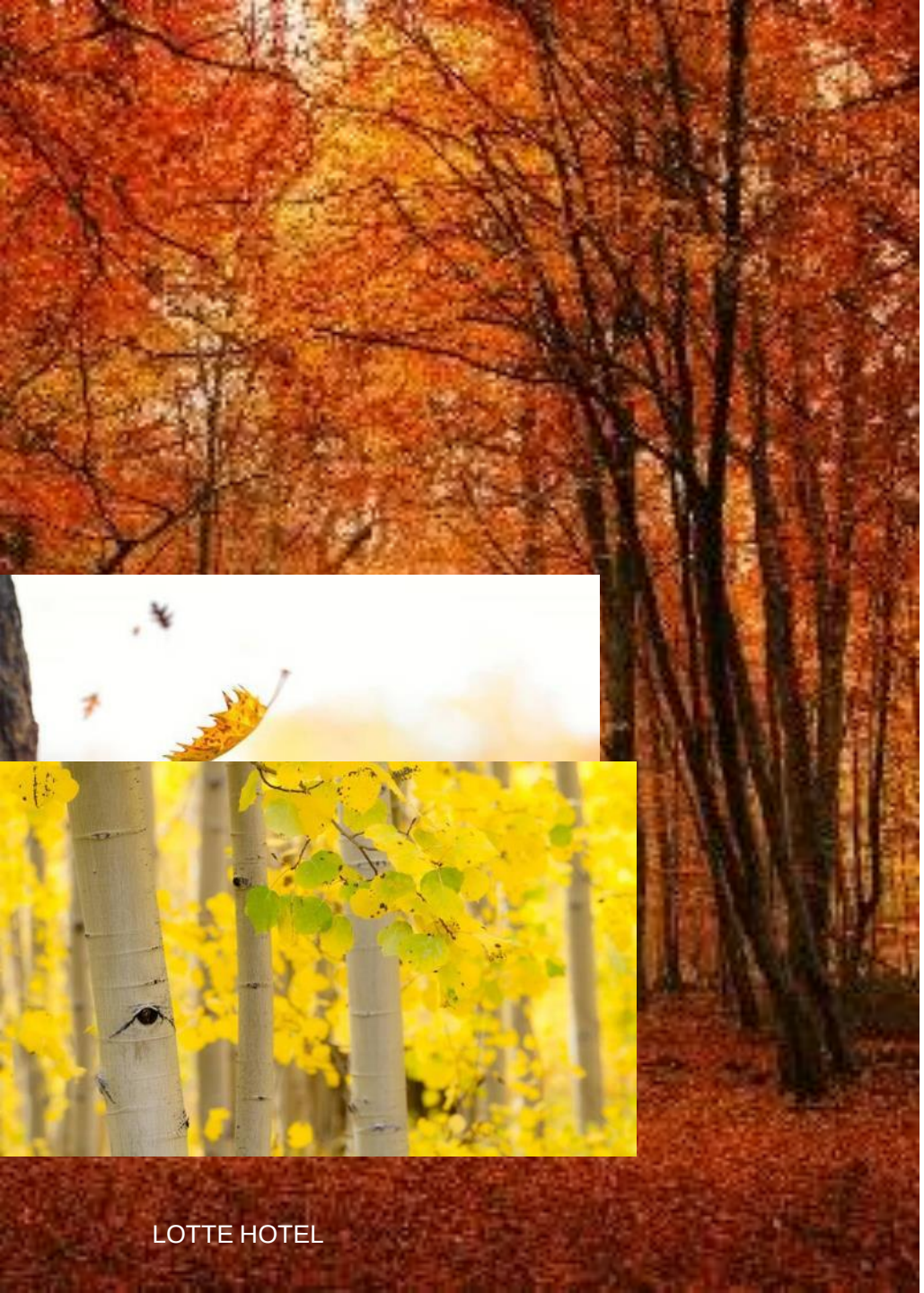
MND-Motor Neurone Disease

CBD-Corticobasal Degeneration

AD-Alzheimer’s Disease

DLBD-diffuse Lewey body Dementia

PPA-Primary progressive aphasia



SUMMARY

- Diagnosis of cognitive impairment is clinical.
- Approach should be tailored to the clinical problem, guided by
- Accurate& Repeated history and careful observation are essential.
- Structured mental state examination tools are helpful and should practice.
- Some blood tests and selected imaging help to specify types of dementia.

REFERENCES

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THANK YOU FOR YOUR KIND ATTENTION