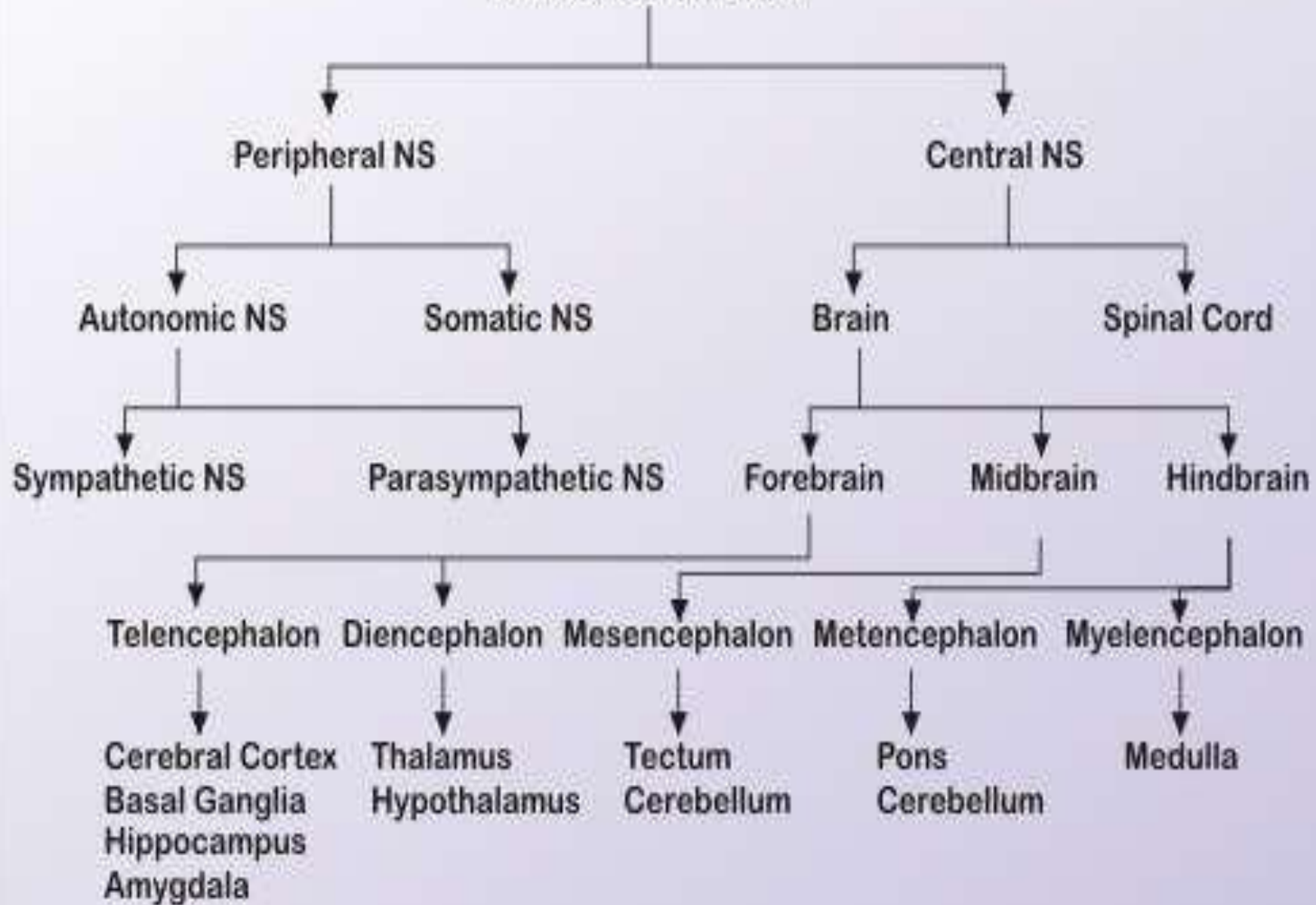


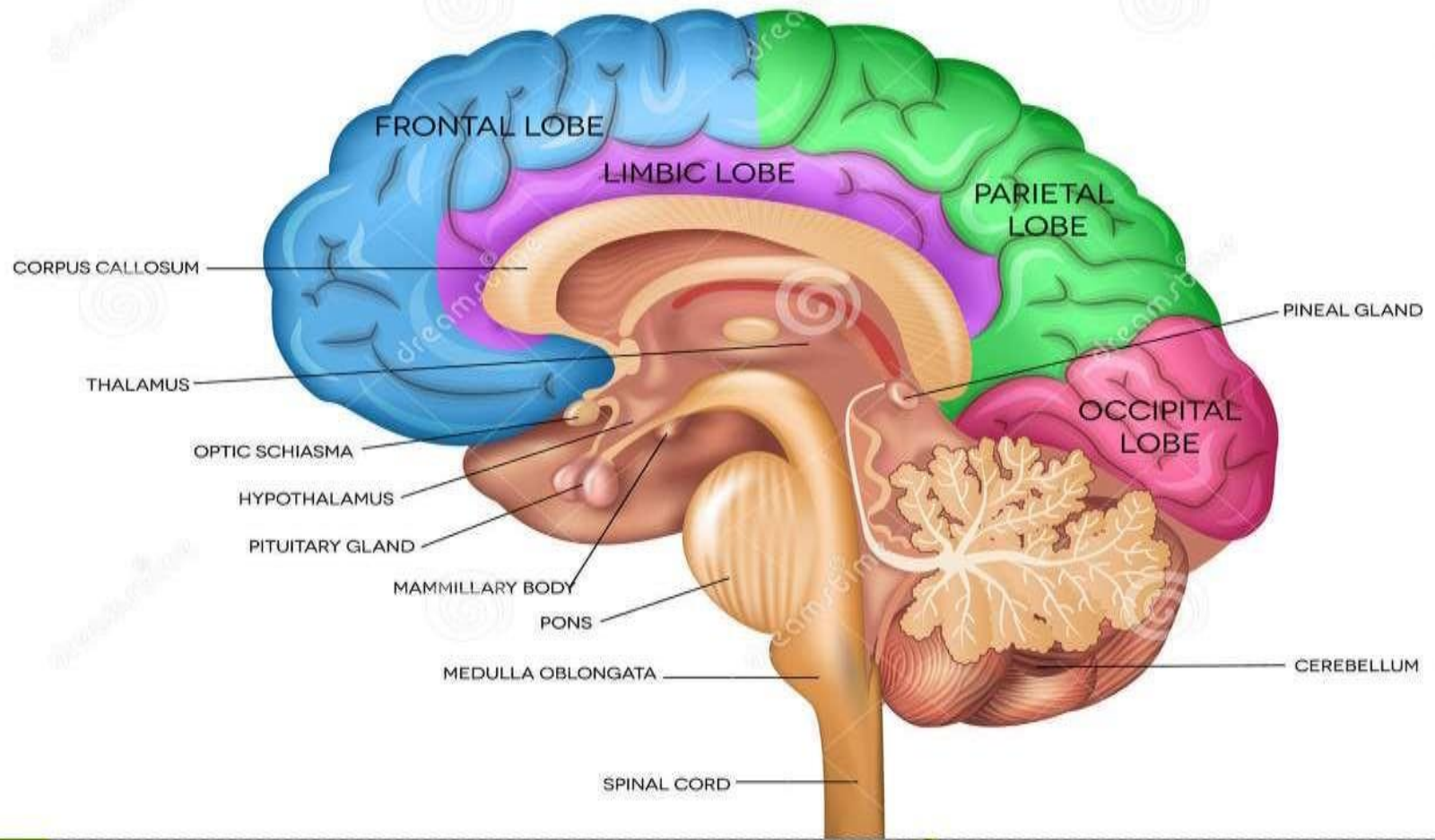
HIGHER MENTAL FUNCTIONS

- ▶ DR AJAZ
QADIR
- ▶ SR
MEDICINE

Nervous System (NS)



ANATOMY OF THE BRAIN



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Definitions



- ▶ **Consciousness:** It is defined as the state of awareness of self and the environment.
- ▶ **Confusion:** it is lack of clarity and coherence of thought , perception, understanding or action. It is often the first feature of cognitive impairment.
- ▶ **Coma:** It is a state of unconsciousness in which the patient does not respond to any type of external stimuli or inner need.

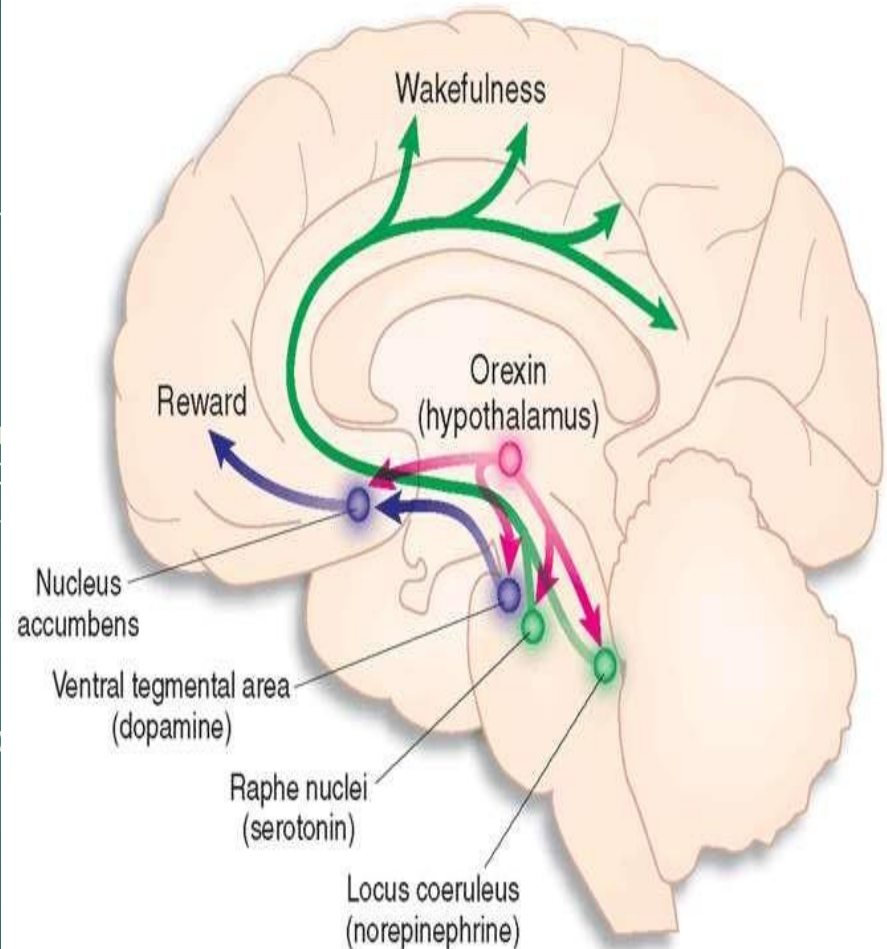
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- ▶ Stupor (or) Semiconsciousness It is a state of disturbed consciousness from which only vigorous external stimuli can produce arousal.

CONSCIOUSNESS

- determine the degree to which an individual is to respond.
- **Ascending reticular activating system:** includes core neurons in the brainstem, the locus coeruleus, and raphe nuclei
- Function- to arouse and awaken the brain and control sleep– wake cycles.
- High levels of activity are associated with extreme excitement (high arousal), whereas lesions in the brainstem are associated with sleep and coma
- **Descending reticular activating system (DRAS)** includes pontine and medullary reticulospinal tracts.
- Pontine (medial) reticulospinal tract enhances cord antigravity reflexes and extensor tone of the limbs.
- Medullary (lateral) reticulospinal tract has the opposite effect, reducing antigravity control.



5 LEVELS OF CONSCIOUSNESS

1. Consciousness- a state of arousal accompanied by awareness of one's environment.

- A conscious patient is awake, alert, and oriented to his or her surroundings.

2. Lethargy - altered consciousness in which a person's level of arousal is diminished.

- The lethargic patient appears **drowsy** but when questioned can open the eyes and respond briefly.
- The patient easily falls asleep if not continually stimulated and does not fully appreciate the environment.

- The therapist should speak in a loud voice while calling the patient's name. Questions should be simple and directed toward the individual (e.g., How are you feeling?).

3. Obtunded state - diminished arousal and awareness.

- The obtunded patient is difficult to arouse from sleeping and once aroused, appears **confused**.
- Attempts to interact with the patient are generally nonproductive.
- The therapist should shake the patient gently as if awakening someone from sleep and again use simple questions.



4.Stupor - a state of altered mental status and responsiveness to one's environment.

- The patient can be aroused only with vigorous or **unpleasant stimuli** (e.g. sharp pressure or pinch, or rolling a pencil across the nail bed).
- No significant voluntary verbal or motor responses.
- **Mass movement** responses may be observed in response to painful stimuli or loud noises.

- 
- The **unconscious** patient is said to be in a coma and cannot be aroused.
 - The eyes remain closed and there are no sleep–wake cycles.
 - The patient does not respond to repeated painful stimuli and may be ventilator dependent.
 - Reflex reactions may or may not be seen, depending on the location of the lesion(s) within the CNS.
 - Clinically the patient can progress from one level of consciousness to another.

- 
- **Minimally conscious (vegetative) state-**
 - return of irregular sleep–wake cycles and normalization of the so-called vegetative functions
 - respiration, digestion, and blood pressure control.
 - The patient may be aroused, but remains unaware of his or
 - her environment. There is no purposeful attention or
 - cognitive responsiveness.

 - **Persistent vegetative state –**
 - individuals who remain in a vegetative state 1 year or longer after TBI and 3 months or more for anoxic brain injury. This state is caused by severe brain injury.

GLASGOW COMA SCALE

- A gold standard instrument used to document level of consciousness in acute brain injury.
- Total GCS scores range from a low of 3 to a high of 15.
- 8 or less- severe brain injury and coma,
- between 9 and 12 - moderate brain injury,
- 13 to 15 - mild brain injury

Glasgow coma scale

ACTIVITY	BEST RESPONSE		
	Adults/Older Children	Infants (modified GCS)	Score
Eye Opening (E)	1. Spontaneous 2. To speech 3. To pain 4. None	1. Spontaneous 2. To speech 3. To pain 4. None	4 3 2 1
Verbal (V)	1. Appropriate speech 2. Confused speech 3. Inappropriate words 4. Incomprehensible or none specific sounds 5. None	1. Coos, babbles 2. Irritable, cries but consolable 3. Cries, inconsolable 4. Moans to pain 5. None	5 4 3 2 1
Motor (M)	1. Obeys commands 2. Localizes pain 3. Withdraws to pain 4. Decorticate to pain 5. Decerebrate to pain 6. None	1. Normal spontaneous movement 2. Withdraws to touch 3. Withdraws to pain 4. Decorticate to pain 5. Decerebrate to pain	6 5 4 3 2 1

PUPILLARY SIZE AND REACTION

- Can also reveal important information about the unconscious patient.
- Pupils that are bilaterally small - damage to the sympathetic pathways in the hypothalamus or metabolic encephalopathy.
- Pinpoint pupils - hemorrhagic pontine lesion or narcotic overdose (e.g., morphine, heroin).
- large bilaterally fixed and dilated pupils -severe anoxia or drug toxicity (e.g., tricyclic antidepressants).
- If only one pupil is fixed and dilated, temporal lobe herniation with compression of the oculomotor nerve and midbrain is likely.

COGNITION

- A screening examination of cognitive abilities should include
- orientation,
- attention,
- memory;
- communication;
- and executive or higher-order cognition
- (e.g., calculating abilities, abstract thinking, constructional ability).

ORIENTATION

- Orientation is the ability to comprehend and to adjust oneself with regard to time, location, and identity of persons. It is examined with respect to

(1) **Time**

- *(What day/month/season/year is it?*
- *What is the time of day?);*

(2) **Place**

- *(Where are you?*
- *What city/state are we in?*
- *What is the name of this place?); and*

(3) **Person**

- *(What is your name?*
- *How old are you?*
- *Where were you born?*
- *What is the name of your wife/husband?).*
- Findings are **documented** in the medical record as follows:
- Patient is alert and oriented ×3 (time, person, place) or ×2 (person, place)
- depending on the domains correctly identified.
- An additional domain that can be examined is **circumstance**
- *(What happened to you? What kind of a place is this? Why do people come here?).*

ATTENTION

- Attention is the directing of consciousness to a person, thing, perception, or thought.
- It depends on the capacity of the brain to process information from the environment or from long-term memory.

- 
- An individual with intact ***selective attention*** is able to **screen and process** relevant sensory information about both the task and the environment while screening out irrelevant information.
 - **Selective attention** can be examined by asking the patient to attend to a particular task.
 - For example, the therapist asks the patient to repeat a short list of numbers forward or backward (*digit span test*).
 - Normally individuals can recall seven forward and five backward numbers.

- 
- **Sustained attention** (*or vigilance*) is examined by determining how long the patient is able to maintain attention on a particular task (time on task).
 - **Alternating attention** (*attention flexibility*) is examined by requesting the patient to alternate back and forth between two different tasks (e.g., add the first two pairs of numbers, then subtract the next two pairs of numbers).

- 
- Requesting the patient to perform two tasks simultaneously is used to determine **divided attention**.
 - For example, the patient talks while walking (*Walkie–Talkie Test*).

MEMORY

- **Memory is the process of registration, retention, and recall** of past experience, knowledge, and ideas.
- **Declarative (explicit) memory** *involves the conscious recollection of* facts, past events, experiences, and places.
- **Motor memory (procedural memory)** -recall of movements or motor information and storage of motor programs, subroutines, or schema as well as perceptual and cognitive skills.

- 
- Patients with brain injury and deficits in the **medial temporal lobe areas and hippocampus** demonstrate impaired explicit memory
 - implicit memory, impaired in damage to the CNS motor areas (cerebellum, premotor cortex).

- 
- **Immediate memory (immediate recall)** -*the immediate* registration and recall of information after an interval of a few seconds (e.g., repeat after me).
 - **Short-term memory (STM) (recent memory)** -*the capability to* remember current, day-to-day events (e.g., what was eaten for breakfast, date
 - **Long-term memory (LTM) (remote memory)** - the recall of facts or events that occurred years before (e.g., birthdays, anniversary, historic facts).

- A simple test for memory involves presenting the patient with a short list of words of unrelated objects (e.g., pony, coin, pencil) and asking the patient to repeat those words immediately after presentation (immediate recall) and again 5 minutes after presentation (STM).
- LTM can be determined by having the patient recall events or persons from his or her past
- (Where were you born?
- Where did you go to school?
- Where do/ did you work?).

COMMUNICATION

- The patient's grasp of information and ability to communicate should be ascertained.

Word comprehension :

- can be determined by varying the difficulty of commands, from one- to two- or three-stage commands (Point to your nose; Point to your right hand and lift your left hand).

Repetition and naming :

- Repeat after me: Name the parts of a watch.

- 
- Problems with **articulation** (*dysarthria*) are evidenced by speech errors, such as difficulties with timing, vocal quality, pitch, volume, and breath control.
 - **FLUENCY**
 - word flow without pauses or breaks, should be noted.
 - Speech that flows smoothly but contains errors,
 - neologisms (nonsense words), misuse of words, and circumlocutions
 - (word substitution) is indicative of *fluent*
 - *aphasia* (i.e., Wernicke's aphasia)

- 
- Speech that is slow and hesitant with limited vocabulary and impaired syntax is indicative of *nonfluent aphasia* (i.e., Broca's aphasia).
 - Articulation is labored and wordfinding difficulties are apparent.

MMSE

- *Mini-Mental Status Examination (MMSE)* provides a valid and reliable quick screen of cognitive function.

The Mini-Mental State Exam

Patient _____ Examiner _____ Date _____

Maximum Score

5 ()

5 ()

Orientation

What is the (year) (season) (date) (day) (month)?

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 ()

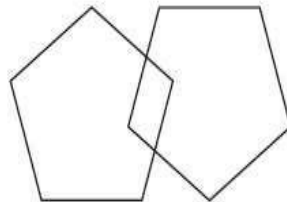
Read and obey the following: CLOSE YOUR EYES

1 ()

Write a sentence.

1 ()

Copy the design shown.



Total Score

ASSESS level of consciousness along a continuum _____

Alert Drowsy Stupor Coma