Advanced Assessment in Clinical Practice:
Neurological Assessment

I. The neurological system

A. Basic anatomy and physiology

1. Central nervous system encompasses the brain and spinal cord.

2. Peripheral nervous system is everything else including the cranial nerves and the autonomic nervous system.

Sympathetic: "Fight or flight"

Parasympathetic: "Rest and digest"

3. Skull protects the brain.

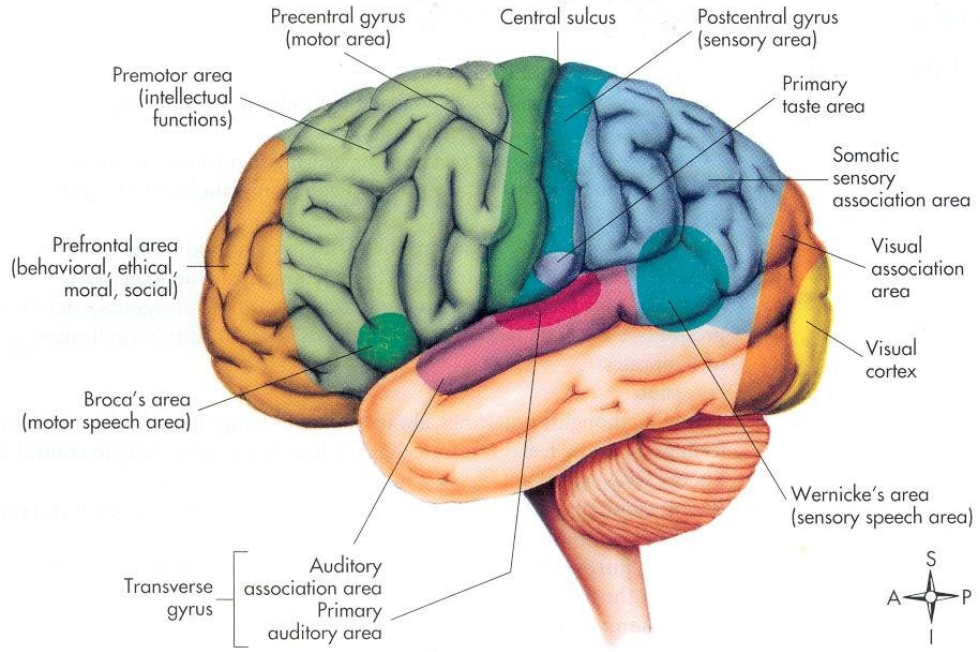
4. Meninges surround the brain and spinal cord. Produces CSF and circulates it.

5. Cerebral spinal fluid circulates through the ventricles and the spinal column. Cushions the brain, supplies nutrition, takes away some waste products.

6. Blood supply and the brain

- Internal carotid arteries
- Vertebral arteries
- Basilar artery
- Venous system

7. Cerebrum



Frontal lobe	Motor control and behavior.
Parietal lobe	Process data and interpret senses. Responsible for proprioception.
Occipital lobe	Vision.
Temporal lobe	Hearing. Interpreting sound and smell with the parietal lobe. Thinking before speaking.
Limbic system	Mating, aggression, fear, and affection.
Association areas	Sense of humor, reasoning, logic, learning and memory.

8. Cerebellum
   - Coordination, balance and smooth movements.
   - Process senses.
   - Reflex control of muscle tone.

9. Brainstem

Midbrain	Reflexes located here also. Visual: See something and duck Auditory: Hear something and look Righting reflex: Keeps head upright and balanced
Pons	Respiratory center and vision
Medulla	Respiratory center and regulation of heart rate and BP. Reflex centers located here. Cough, sneeze, swallow, and vomiting. Reticular activating system also in the medulla.

10. Diencephalon

Thalamus	Conveys all sensory impulses except smell to and from the cerebrum to the association areas of the brain.
Hypothalamus	Control and integration center.
Pituitary gland	Controls the production of many hormones.

:

11. Basal ganglia
    - Processing station between the brain stem and the cerebral cortex.
    - Extrapyramidal system pathways. Help with gross intentional movement, fine movements and muscle tone.
    - Damaged in Parkinson's disease.

B. Assessment parameters

1. State of orientation

Time disorientation	Associated with anxiety, depression and organic brain syndrome.
Place disorientation	Associated with psychiatric disorders and organic brain syndrome.
Person disorientation	Associated with cerebral trauma, seizures and amnesia.

2. Unexpected levels of consciousness

Confusion	Inappropriate response to questions.
Disorientation	Unable to recognize time, then person, and then place. May also see agitation and poor problem-solving. Any change in behavior may indicate an early change in cerebral function.
Lethargy	Drowsy, falls asleep quickly.
Obtunded	Sleeps unless aroused.
Stupor	Requires considerable amount of stimulation to arouse.
Comatose	Neither awake nor aware. May have posturing to stimulation.

3. Gait coordination and balance.

4. Weakness or paresthesia.

5. Glasgow coma scale
   - Eye opening.
   - Most appropriate verbal response.
   - Most integrated motor response.
   - Maximum score of 15.
   - Less than 7 reflect coma state.
   - Less than 5 indicates organ donation.

Assessed Behaviors	Criteria for Scoring	Scores
Eye opening	Spontaneous	4
	To verbal stimulus	3
	To pain	2
	None	1
Most appropriate verbal response	Oriented	5
	Confused	4
	Inappropriate words	3
	Incoherent	2
	None	1
Most integrated motor response	Obeys commands	6
	Localizes pain	5
	Withdraws from pain	4
	Flexion (Decorticate)	3
	Extension (Cerebrate)	2
	None	1

6. Cranial nerve assessment: "On old Olympus towering tops, a Finn and German viewed some hops."

Cranial Nerve		Testing
I	Olfactory	Smell
II	Optic	Vision
III IV VI	Oculomotor Trochlear Abducens	Eyelids for drooping Pupil size Eye movements
V	Trigeminal	Touch the cheek
VII	Facial	Smile
VIII	Acoustic	Whisper
IX	Glossopharyngeal	Swallow and gag reflex
X	Vagus	Swallow and say "ah"
XI	Spinal accessory	Shrug shoulders
XII	Hypoglossal	Tongue midline

7. NIH Stroke Scale
   - Neurologic examination used to evaluate for stroke.
   - Parameters assessed
     - Level of consciousness
     - Language
     - Neglect
     - Visual-field loss
     - Extraocular movement
     - Motor strength
     - Ataxia
     - Dysarthria
     - Sensory loss
   - Scores help to quality the degree of neurological deficit and identify the location of a vessel occlusion.
   - Provides early prognosis.
   - Helps to identify eligibility for interventions and potential for complications.

8. Superficial reflexes

   - Upper abdominal reflex: T7, T8, and T9
   - Lower abdominal reflex: T10 and T11
   - Cremasteric: T12, L1, and L2
   - Plantar reflex: L4, L5, S1 and S2

9. Deep tendon reflexes

   - Deep tendon reflexes are more specific for pathology.
   - If absent, neuropathy or lower motor disorder. Diseases could include polio, muscular dystrophy and myasthenia gravis.
   - If hyperactive, upper motor neuron disorder (brain and spinal cord). Diseases could include neoplasm, strokes, cerebral palsy, multiple sclerosis, and spinal cord injury.
   - Reflexes
     - Biceps
     - Brachioradial
     - Triceps
     - Patellar
     - Achilles

C. Physiologic changes in the geriatric population

1. No decline in general intelligence in the absence of disease.
2. New concepts hard to understand.
3. Remote memory more efficient.
4. Decreased levels of neurotransmitters.

5. Cranial nerve changes
    - Reduced ability to differentiate colors.
    - Decreased sense of smell and taste.
    - Reduced upward gaze.
    - Slower adjustment to lighting changes.
    - Decreased corneal reflexes.
    - Middle to high frequency hearing loss.
    - Reduced gag reflex.
6. Gait more shuffling.
7. Decreased sensory perception.
8. Decreased deep tendon reflexes