WEEK 1: Nursing Management of Patients with Nervous System Disorders

- Assessment and diagnostic test

The Assessment

Health History

A complete health history and a neurological screening assessment allow the nurse to identify areas of dysfunction in order to focus the neurological assessment. Observation (inspection) is necessary for most of the assessment; palpation, auscultation, and percussion are also used. A baseline assessment is essential to ascertaining changes in neurological functioning. Any change from the baseline assessment must be identified and early intervention initiated. A thorough health history includes asking the client about headaches, clumsiness, loss of or change in function of an extremity, seizure activity, numbness or tingling, change in vision, pain, extreme fatigue, personality changes, and mood swings.

Data Collection

The neurological screening involves assessment of level of consciousness and verbal responses to specific questions; selected cranial nerves for eye movement and visual acuity; muscle strength; movement; gait for motor function; and tactile and pain sensation of extremities for sensory screening. A complete nursing assessment of neurological function includes assessment of the following areas: cerebral function, cranial nerve function, motor function, sensory function, and reflexes. Neurological nursing assessment is discussed in more detail in the next section.

Cerebral Function

Areas of assessment of cerebral function include level of consciousness, mental status, intellectual function, emotional status, pupil reaction, and communication.

Table 1 Sympathetic and Parasympathetic Responses

System	Sympathetic Response	Parasympathetic Response
Neurological	Pupils dilated Heightened awareness	Pupils normal size
Cardiovascular	Increased heart rate Increased myocardial contractility Increased blood pressure	Decreased heart rate Decreased myocardial contractility Vasodilation
Respiratory	Increased respiratory rate Increased respiratory depth Bronchial constriction	Bronchial relaxation
Gastrointestinal	Decreased gastric motility Decreased gastric secretions Increased glycogenolysis Decreased insulin production Sphincter contraction	Increased gastric motility Increased gastric secretions Sphincter dilation
Genitourinary	Decreased urine output Decreased renal blood flow	Normal urine output

Level of Consciousness

Level of consciousness is assessed by determining the client's awareness and orientation and is the most important indicator of change in neurological status. Awareness is the person's
ability to perceive environmental stimuli and body reactions and then respond with thought and action. The client's awareness is assessed through four components: orientation, memory, calculation, and fund of knowledge (Lower, 2002). A more objective assessment is made using the Glasgow Coma Scale, an objective tool for assessing consciousness in clients, most frequently in clients with head injuries. With the Glasgow Coma Scale, eye opening, verbal response, and motor response are scored using measurable criteria (Table 2).

The totaled scores indicate coma severity. A score of 15 indicates a fully oriented person. A score of 3 is the lowest possible score, indicating deep coma. A score of 7 or less is considered a state of coma. Changes in the Glasgow Coma Scale indicate changes in client condition. To prevent further damage to the brain in instances of decreasing scores, the nurse acts quickly. The physician must be notified immediately and measures taken to decrease intracranial pressure.

Table 2 Glasgow Coma Scale

BEHAVIOR	RESPONSE	SCORE
Eye opening response	Spontaneous To verbal command To pain No response	**4** **3** **2** **1**
Best verbal response	Oriented, conversing Disoriented, conversing Use of inappropriate words Incomprehensible sounds No response	**5** **4** **3** **2** **1**
Best motor response	Obeys verbal commands Moves to localized pain Flexion withdrawal to pain Abnormal posturing—decorticate Abnormal posturing—decerebrate No response	**6** **5** **4** **3** **2** **1**
Total		**3 to 15**

Orientation is the person's awareness of self in relation to person, place, and time. Using open-ended communication techniques, instruct the client to "tell me your first and last name and age," "tell me the month, day, year, and day of the week," or "tell me where you are (city, state, hospital)" in order to ascertain the client's level of orientation. The client also is asked to open and close his eyes or open and close his fist.

Mental Status

Assessment of mental status requires observation of the client's appearance, behavior, posture, mood, gestures, movements, and facial expressions. The nurse compares these behaviors to expected behaviors based on the client's age, health status, educational level, and social position. Mood is assessed by observation and asking the client about moods and feelings.

Intellectual Function

Intellectual function is the ability of the brain to perform thought processes. Ability to concentrate, memory function (both long-term and short-term), recall, calculation activities, and fund of knowledge are all aspects of intellectual function.

Nursing assessment of intellectual function involves asking individuals to perform certain tasks, such as the following:

- Repeating a series of numbers, such as 1, 3, 7, 1
- Telling what the individual ate for breakfast
- Adding two numbers, for example, 2 + 4 = 6
- Reporting what is on the national news

The nurse determines the client's ability to process thoughts by evaluating the responses to tasks such as these.

For purposes of comparison, the client's ability to perform these tasks before assessment should be ascertained by asking the family. For example, if the client was math illiterate before the nursing assessment, the client will still not be able to add or subtract.

Emotional Status

Emotional status is assessed by observation of the client's affect (emotional response or mood). Is affect appropriate for the situation? Is affect labile (prone to rapid change)? Is affect consistent with verbal communication?

Pupil Reaction

Size, equality, and roundness of pupils are assessed (Figure 1). Size is measured in millimeters. Pupils are evaluated for symmetry of size and for reaction to light. The nurse briefly shines a penlight obliquely into the client's eye by passing the light from the outer edge of the eye toward the center of the eye (Figure 5). Reaction is assessed as being brisk, sluggish, or nonreactive; consensual reaction (the opposite pupil responding at the same time) is also noted.

Accommodation is assessed as described in Table 1 under cranial nerve III.

The abbreviation **PERRLA** is used for documenting pupils that are equal, round, and reactive to light and that demonstrate accommodation. This abbreviation is used only when pupil reaction is normal. If any part of the assessment is abnormal in one or both eyes, the assessment findings are written out for clarity.

Figure 1 A, Unequal pupils; B, dilated, fixed pupils.

Communication

Written and oral communication is assessed. Various specialized areas of the nervous system are involved in communication. The inability to communicate verbally, termed aphasia, is caused by the inability to form words or the inability to understand written or spoken words. To assess communication function, various approaches are necessary. Ask the client to follow a simple command such as "Close your eyes." Also use a written card instructing the client to complete a simple task such as "Touch your nose." Note the ability to form words; appropriate use of words; speech patterns, clarity, rate, and flow; and voice modulation. During the health history, ask the client about health care expectations to evaluate the client's ability for verbal expression. Have the client write his name and address on paper to evaluate the ability to write.

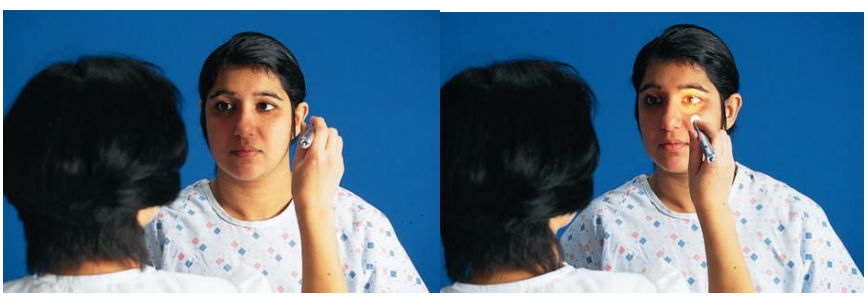

Figure 2 Pupil assessment: A, starting position, with penlight to side of pupil; B, moving penlight directly in front of pupil. B (Delmar Cengage learning)

Cranial Nerve Function

Cranial nerve function essentially reflects brainstem activity. A complete cranial nerve examination, if required, is usually performed by the physician or advanced-practice nurse.

Motor Function

The neurological screening includes assessment of muscle strength, arm and leg movement, and gait. A complete motor function assessment is performed if a deficit is identified. A complete motor function assessment includes evaluating muscle size, symmetry, tone, and strength; coordination; balance; and posturing.

Muscle Size and Symmetry

Muscle size and symmetry are assessed by palpating major muscle groups of the arms and legs and then comparing them to the muscle groups of the opposite side of the body. Unilateral atrophy indicates a nervous system problem.

Muscle Tone

Muscle tone is assessed during palpation of major muscle groups for size and symmetry, while at rest and during passive movement. Muscle tone is described as normal, flaccid, spastic, or rigid. Flaccid muscles are hypotonic, or soft and flabby. Spastic muscles are at first resistant to passive movement, but then release resistance. Rigid muscles may have tremors but are constantly rigid. Rigidity is a more constant state of spasticity, with fewer periods of release of resistance.

Muscle Strength

To assess muscle strength, each extremity is placed through passive movement. The client is then asked to move the extremity, first against gravity, by lifting the extremity off the bed, then against resistance, by lifting against slight resistance exerted by the nurse's hand pushing on the extremity. Strength is graded on a scale of 0 to 5 (Table 3).

Table 3 Muscle Strength

Score	**Definition**
5/5	Full power of contraction
4/5	Fair or moderate power of contraction
3/5	Just able to overcome force of gravity
2/5	Can move, but cannot overcome power of gravity
1/5	Minimal contractile power
0/5	No movement

Coordination

Coordination, a function of the cerebellum, is assessed by asking the client to perform repetitious movement. The client should close her eyes and repeatedly, rapidly touch her own nose with alternate index fingers (Figure 3). Lower extremity coordination is assessed by asking the client to run the heel of one foot down the opposite shin, and then repeat with the other heel (Figure 4). Inability to perform these movements is termed ataxia, incoordination of voluntary muscle action.

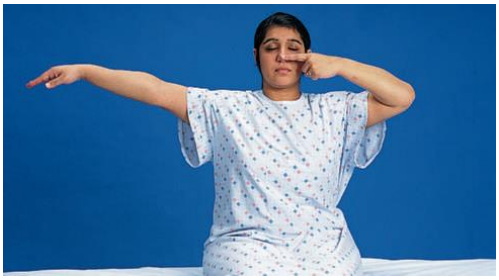

Figure 3 Assessment of coordination: fingertip-to-nose

Figure 4 Assessment of coordination: heel slide.

Balance

Balance is evaluated by using the Romberg test. The client stands with the feet together, arms at the side with eyes open, then eyes closed for 20 seconds. Balance is observed; a slight swaying is normal. If the client becomes unsteady and tends to fall, the test is considered positive.

Posturing

Abnormal posturing occurs with injury to the motor tract. Two types for which to observe are decorticate (flexion) and decerebrate (extension) posturing (Lower, 2002). Decorticate posturing is characterized by flexion of the arms, adduction of the upper extremities, and extension of the lower extremities.

Lesions of the cerebral hemispheres or internal structures of the brain cause flexion posturing. Decerebrate posturing is caused by brainstem injury and is characterized by an arching of the back, backward flexion of the head, adduction and hyperpronation of the arms, and extension of the feet (Figure 5).

Abnormal posturing may be present either at all times or in response to stimuli such as loud noises, bright lights, or painful stimuli. The nurse notes whether bilateral or unilateral posturing is present, and, if intermittent, the cause of the posturing. The presence of either type of posturing is reported at once, because either represents an ominous sign of cerebral dysfunction. Decerebrate posturing represents greater dysfunction than does decorticate posturing, and any change from decorticate to decerebrate posturing indicates a worsening of condition.

A

B

Figure -5 Abnormal posturing: A, decorticate posturing;
B, decerebrate posturing.

Sensory Function

A subjective examination of sensory function, performed with the client's eyes closed, is generally done only when a dysfunction is suspected. Different pathways are used to transmit different sensory impulses. To evaluate all pathways, the examiner must test tactile sensation, pain and temperature, vibration, proprioception, stereognosis, graphesthesia, and integration of sensations.

Tactile Sensation

Tactile sensation is tested by using a cotton ball to lightly touch the client's arms, hands, upper legs, and feet. Comparison is done side to side. The client, with eyes closed, indicates whether the cotton ball is felt.

Pain and Temperature

Sensations of pain and temperature are transmitted along the same pathways and are evaluated using a sharp and dull touch. A paper clip or cotton-tipped applicator is used.

Touch the client with the rounded end of a paper clip or cotton-tipped applicator to test for dull sensation, and the pointed end of a paper clip or uncovered end of the applicator to test for sharp sensation. The client's ability to distinguish sharp and dull is noted, again comparing both sides of the body.

Vibration

Vibration is tested using a tuning fork. Strike the tuning fork on the palm, holding only the handle, then place the end of the handle first on the client's wrists and then on the ankles and ask whether vibrations are felt (Figure 6). The client's eyes should be closed during the test.

Figure 6 Assessment of vibration.

Proprioception
Proprioception is the sense of joint position in space. With the client's eyes closed, move a joint of the client's finger or extremity up or down in space and ask the client to distinguish the direction of movement of the digit or extremity as being either up or down.

Stereognosis
Stereognosis is the ability to recognize an object by feel. Place a familiar object such as a coin or key in the client's hand and ask what the object is. The sensation is a function of the brain, not of the spinal pathways (Figure 7).

Figure 7 Assessment of stereognosis.

Graphesthesia
Graphesthesia is the ability to identify letters, numbers, or shapes drawn on the skin. Hold the client's hand and, with the stick end of a cotton-tipped applicator or a closed pen, trace an outline on the open palm, ensuring that the letter, number, or shape is right side up for the client (Figure 8).

Figure 8 Assessment of graphesthesia

Integration of Sensation
Integration of sensation is a higher cortical function. A two-point discrimination test is performed by touching the client simultaneously on opposite sides of the body with a sharp object and asking the client to ascertain the number of objects felt. The normal response is two. If only one is felt, the brain function of integration is abnormal.

Reflexes

Both deep tendon reflexes and superficial reflexes are assessed. Deep tendon reflexes (biceps, brachioradialis, triceps, patellar, and Achilles) are involuntary contractions of muscles or muscle groups responding to brisk stretching near the insertion site of the muscle (Smeltzer, Bare, Hinkle, & Cheever, 2008; Blumenfeld, 2011). Testing these reflexes is generally the responsibility of the physician or registered nurse, although the LPN/LVN should be familiar with these assessments, because abnormal reflex responses are an early indicator of motor or sensory dysfunction.

Superficial, or cutaneous, reflexes are elicited by irritating the skin on the area being assessed. They are diminished or absent with dysfunction of the reflex arc. The superficial reflex generally assessed is the plantar. To assess the plantar reflex, the handle of the reflex hammer is used to stroke the outer aspect of the sole of the foot from the heel and across the ball of the foot to just below the big toe. Plantar flexion, or curling under of the toes, should occur.

Abnormal Reflexes

The absence of deep tendon reflexes in clients is considered an abnormal finding. A fanning of the toes and dorsiflexion of the big toe in response to the assessment of the plantar reflex

Subjective Data

For clients describing neurological symptoms, the subjective data includes a description of the present concerns, including length and frequency of symptoms, when symptoms occur, as well as aggravating factors.

Figure 9 Pathological reflex: Babinski.

Common Diagnostic Tests

Commonly used diagnostic tests for clients with symptoms of nervous system disorders are listed in Tables 1, 2 and 3.

Laboratory Tests	**Explanation/ Normal Values**	**Significance of Test Relating to The Neurological System**	**Nursing Responsibilities**
Lumbar puncture (LP) (spinal tap)	A needle is inserted into the subarachnoid space of the spinal column. Normal pressure: 60–180 mm water pressure Normal specific gravity: 1.007 Normal glucose:	To measure CSF pressure and/or to obtain a specimen.	Obtain informed written consent. Have the client empty the bowel and bladder prior to procedure. Assist in setting up a sterile field and pouring solutions, if not included in the tray. Assist the client

	45–100 mg/100 mL Normal complete blood count (CBC): 0 Normal WBC: 0–5 cells//mm3		to maintain the position. Post procedure, deliver the specimen to the lab for testing, keep the client flat in bed for 3–24 hr or as ordered by physician; encourage fluid intake to replace fluids lost; and monitor vital and neurological signs.

Common Radiological Studies for Neurological System Disorders

Radiological Studies	**Explanation/ Normal Values**	**Significance of Test Relating to The Neurological System**	**Nursing Responsibilities**
Skull and spine x-ray	Simple x-ray of the skull or spinal column.	To determine fractures, calcification, abnormal vascularity.	Explain that the test is noninvasive and what position the client is to assume for the test.
Carotid Doppler	Evaluates carotid arteries in client at high risk or having symptoms of cerebrovascular disease. Normal: no occlusion or stenosis	To determine the patency of the carotid arteries. Patency of these arteries determines oxygen supply to the brain.	Explain the procedure to the client. Requires no special preparation.
Cerebral angiography	Performed when vessels in the brain need to be visualized to identify obstruction or abnormality. Involves the insertion of a catheter into a venipuncture site with the injection of a contrast medium, after which angiographic films are taken as the contrast medium enters the area being studied. Normal: no occlusions and patent	Assesses for pathology such as narrowing of the arteries in the brain or an aneurysm.	Physician explains procedure to the client and obtains consent. Obtain baseline vital signs. Assess for potential allergies to contrast medium.
Computed tomography (CT) scan	Provides a three dimensional cross-sectional view of tissues. Computer constructed picture interprets densities of the brain	To detect problems of the brain such as atrophy, edema, hemorrhage, infarction, or tumor.	Explain the procedure to the client. Remove wigs and hairpins and clips from hair. Assess for iodine allergy. Observe for signs of anaphylaxis, if dye is used. Check for claustrophobia.

			Inform the client that the test will take approximately 45 min to 1 hr. The client must lie still on a hard, flat table as the body slides through the middle of the CT scanner.
Magnetic resonance imaging (MRI)	Uses magnetic field and radio waves to detect edema, hemorrhage, blood flow, infarcts, tumors, infections, aneurysms, demyelinating disease, muscular disease, skeletal abnormalities, intervertebral disk problems, and causes of spinal cord compression. Performed by qualified technologist. Test usually takes about 1 hr.	Scans for tumors, pathological lesions and masses, and abnormalities.	Assess the client for the presence of metal objects within the body (i.e., shrapnel, cochlear implants, pacemakers). Explain the procedure to the client: The client will be required to lie still for up to 20 min at a time; the client will be placed within a scanning tunnel; sedation may be required if the client has claustrophobic tendencies; the magnet will make a loud thumping noise as images are obtained (provide earplugs as necessary). Because the test may take up to 2 hr to perform, have the client void prior to entering the scanning tunnel. Obtain informed written consent, per facility policy.
Myelogram	X-ray of spinal subarachnoid space following injection of an opaque medium.	To detect spinal cord tumors or herniated or ruptured disk	Follow nursing responsibilities as described for lumbar puncture. Inform the client that the table may be tilted during the procedure. Obtain informed consent according to facility guidelines. Withhold the meal prior to procedure. Administer a light sedative, if ordered. Post procedure care is determined by the type of medium used; follow physician's orders for activity and fluids.

Positron emission tomography (PET) scan	Radioactive tracers are injected intravenously prior to the test. Nuclear imaging is used to confirm tissue that has adequate blood supply and tissue that has become impaired due to a lack of blood.	To detect damage to brain cells due to lack of blood supply. Also used in diagnosing Alzheimer's disease, epilepsy, Parkinson's disease, Huntington's disease, and a hematoma.	Instruct the client not to smoke or consume caffeine or alcohol for 24 hr prior to the test. Initiate NPO status from 10 p.m. the evening before the test, except for medications and water. Obtain informed written consent. Encourage the client to drink fluids after the procedure to facilitate faster excretion of the radioactive material.
Single-photon emission computed tomography (SPECT)	Radioactive tracers are injected intravenously prior to the test. Nuclear imaging is used to visualize blood flow, oxygen in brain tissue, or glucose uptake by the brain.	Used to diagnose strokes, brain tumor, and seizure disorders.	Similar to PET scan.

Other Diagnostic Tests for Neurological System Disorders

Diagnostic Tests	**Explanation/ Normal Values**	**Significance of Test Relating to The Neurological System**	**Nursing Responsibilities**
Caloric test	The client is placed in a supine or Fowler's position and each ear is irrigated with cold and then warm water. Cold water causes rotary nystagmus away from injected ear and back to midline; warm water toward injected ear. Most commonly done on comatose clients. A punctured eardrum or Ménière's disease may contraindicate the test.	Assesses alteration in vestibular function.	Explain the procedure and its purpose to the client. Tell the client that nystagmus, vertigo, nausea, vomiting, and an unsteady gait represent a normal response. Stay with the client and have an emesis basin and tissues available?
Electroencephalogram (EEG)	Record of electrical activity generated in the brain and obtained through electrodes applied to the scalp or microelectrodes placed in brain tissue during surgery.	To detect seizure disorders.	Withhold caffeine due to stimulant effect. Serve meal so that blood sugar will not be altered. Shampoo hair night before test. Explain the procedure to the client: that the test takes approximately

			45 min to 2 hr; the procedure is painless; the client may be asked to open and close the eyes during the test and that there may be flashing lights or small electrical stimulations.
Electromyography (EMG)	A needle electrode is inserted into the muscle being examined. Measures electrical activity of skeletal muscle at rest and during voluntary muscle contraction	Detects primary muscular disorders.	Explain the procedure to the client. Obtain informed written consent. Instruct the client to refrain from consuming caffeine and smoking for 3 hr before the test. Assure client that the needle will not cause electrocution. Inform the client that there will be temporary discomfort when the needle electrode is inserted.

Self-assessment MCQs (select the best answer)

1. A client does not respond to continuous or painful stimulation but does have a reflex response. What is the best classification of this client's level of consciousness?
   a. Stuporous
   b. Lethargic
   c. Comatose
   d. Obtunded

2. How can the nurse best assess the orientation level for a client who is awake?
   a. Ask similar questions in a conversational and nonthreatening tone to determine orientation.
   b. Tell the client that you will be assessing their mentation and then begin to ask questions to determine their orientation.
   c. Do not tell the client your intent to assess their mentation and begin to ask as many questions as possible in a quick and short tone.
   d. Ask similar questions repeatedly to see if the client answers consistently.

3. When assessing a client's orientation, what are the best techniques a nurse should use to establish trust and build a relationship with the client? Select all that apply.
   a. Ask direct questions without allowing the client to elaborate.
   b. Make eye contact with the client.
   c. Speak to the client with a smile.
   d. **Introduce yourself and ask conversational questions**.
   e. Face away from the client to ensure that any facial reactions are not visible

4. Which of the following is expected of a client's pupils when there are no pre-existing conditions?
   a. Pupils are independent of each other, and each will have their own unique shape, size, and reactivity to light.
   b. It is normal for pupils to be different sizes as long as they are both reactive to light and the same shape.
   c. It is normal for pupils to be different shapes as long as they are both reactive to light and the same size.
   d. Both pupils should be the same shape and size and have the same reactivity to light.

5. Which of the following is true regarding the effect of narcotics and sympathomimetics on pupil size?
   a. Narcotics and sympathomimetics should have no effect on pupil dilation.
   b. Narcotics and sympathomimetics can cause either a pupil dilation or a pupil constriction.
   c. Narcotics can cause pupil constriction, and sympathomimetics can cause pupil dilation.
   d. Narcotics can cause pupil dilation, and sympathomimetics can cause pupil constriction.

6. Which possible condition can cause a change in pupil size, shape, or reactivity of a client?
   a. Decreased urine output
   b. Increased intracranial pressure
   c. Mental health status
   d. Electrolyte disturbances

7. When assessing the motor strength for a client, the nurse knows to assess which functions? Select all that apply.
   a. Strength of the leg while pressing down and lifting against the nurse's hand
   b. Flexion and extension of the arms
   c. Squeezing of the fingers
   d. Dexterity of the fingers
   e. Coordination by asking the client to walk in a straight line

8. Which ways apply noxious stimulus in order to observe an unconscious client's motor function?
   a. Yell loudly, or rub your hand across the client's forehead.
   b. Rub upward on the bottom of the client's foot, or apply a light hammer to their patella tendon.
   c. Stand directly in front of the client and wave, or put their hand lightly.
   d. Put pressure on the client's nail bed, or apply a sternal rub.

9. What is the best motor classification for a client with straight arms and legs, toes pointed downward, and an arched neck and back?
   a. Decompensation posturing
   b. Decerebrate posturing
   c. Detachment posturing
   d. Decorticate posturing

10. How should the nurse assess a client for superficial pain sensation?
   a. Ask the client to distinguish between the touch of a clean, sharp object and the touch of a dull object.
   b. Apply a cold object to the client's skin and ask if it feels equal on both sides.
   c. Lightly touch the client's skin and ask if the sensation feels equal on both sides.
   d. Ask the client to distinguish between the hard touch of a fingernail and the light touch from the pad of a finger.

11. The nurse grasps the client's big toe by its sides and points it upward. What is the nurse testing when the nurse asks the client to state which direction the toe is pointing to?
   a. Pressure
   b. Proprioception

c. Prorogation
d. Pain

12. What does a deep tendon reflex graded as a 2+ indicate about that client's reflex?
a. There is no reflex.
b. The reflex is hyperreflexive.
c. The reflex is normal.
d. The reflex is hyporeflexive.

13. Which reflex should be tested by striking the reflex hammer against the health care provider's thumb instead of striking the client directly?
a. Biceps
b. Triceps
c. Brachioradialis
d. Patella

14. Which of the following is is true regarding the Babinski's sign? Select all that apply.
a. It can only be tested on clients who are alert and responsive.
b. It is normal in clients younger than age 2 years.
c. **It can be assessed by testing the plantar reflex**.
d. A positive sign is described as a curling under of the toes when testing the plantar reflex.
e. It is abnormal in adult clients.

15. What is the name of the reflex that is assessed by turning the client's head side to side and observing for contralateral eye movement?
a. Oculocephalic reflex
b. Crossed extensor reflex
c. Oculovestibular reflex
d. Corneal reflex

16. When assessing a client's oculovestibular reflex, the client's eyes remain midline. What does this indicate?
a. Traumatic brain injury
b. Severe brain stem injury
c. That this is a normal finding
d. Large hemorrhagic stroke

17. It is especially important to assess for metal implants prior to which diagnostic test?
a. Transcranial Doppler ultrasonography
b. Cerebral angiography
c. **MRI**
d. CT scan

18. If a client presents to the emergency department with signs of a stroke, which diagnostic test should the nurse anticipate completing first?
a. Transcranial Doppler
b. Cerebral angiography
c. **CT scan or MRI**
d. EEG

19. Why is it important to consider cardiac diagnostics when assessing neurological function? Select all that apply.
a. **Some heart rhythms place clients at a greater risk for strokes**.
b. It must be ensured that the blood is sufficiently oxygenated.
c. Myocardial infarct should first be ruled out.

d. Many strokes are caused by clots from the heart.
e. The cardiovascular system perfuses the brain.

20. In assessing for seizure activity, which diagnostic test should the nurse anticipate being used?
a. Cerebral angiography
b. MRI
c. EEG
d. Digital subtraction angiography

21. When completing a neurological assessment, what should the nurse consider? Select all that apply.
a. The neurological test should include level of consciousness, mentation, pupillary response, movement, sensation, and reflexes.
b. A more accurate assessment can not be completed if the nurse does not establish a client relationship.
c. Negative changes should be reported to the health care provider because they can indicate neurological deterioration.
d. Neurological assessments should be completed only on clients who are alert.
e. Describing the client's behavior is more useful than only using the neurological terminology.

22. A diffuse axonal injury of the brain's axons is classified as what type of acceleration/deceleration injury?
a. Tensile stress
b. Contusion
c. Shearing
d. Compression

23. An acceleration/deceleration injury that results in an injury to both sides of the brain is known as what type of injury?
a. Concussion injury
b. Compression injury
c. Contusion injury
d. Coup-contrecoup injury

24. Which type of skull fracture is the most common and is not typically treated with medical intervention?
a. Diastatic skull fracture
b. Basilar skull fracture
c. Linear skull fracture
d. Depressed skull fracture

25. Diastatic skull fractures are most commonly seen in which client population?
a. Infants
b. Young adults
c. Geriatric patients
d. School-aged children

26. Battle sign and raccoon eyes are signs of which type of skull injury?
a. Depressed skull fracture
b. Basilar skull fracture
c. Linear skull fracture
d. Diastatic skull fracture

27. A client at risk for a CSF leak should have fluid tested if it is draining from what locations? Select all that apply.
a. Throat
b. Mouth
c. Eyes
d. Ears
e. Nose

28. Which is true regarding traumatic brain injuries? Select all that apply.
a. Clients with a TBI can have a conversation with other distractions occurring.
b. All clients with a TBI present in a similar manner.
c. TBIs can cause changes in a client's physical, emotional, social, and vocational health.
d. TBIs are a group of injuries that cause traumatic insult to the brain.
e. Priority assessment includes monitoring for CSF leaks, Battle sign, and raccoon eyes.

29. What is the definition of a transient ischemic attack (TIA)?
a. A temporary interruption of blood flow to a local portion of the brain
b. Hemorrhage in the brain
c. Uncontrolled electrical activity in the brain
d. An interruption of blood flow to the entire brain

30. Transient ischemic attacks (TIAs) can present similarly to other transient neurological events. What are four other neurological events that may mimic a TIA? Select all that apply.
a. Hyperglycemia
b. Subdural hematoma
c. Syncope
d. Migraine aura
e. Seizure

31. What is the purpose of a computed tomography (CT) scan for a client with transient ischemic attack (TIA)?
a. To rule out hemorrhagic stroke
b. To confirm the time the ischemic stroke occurred
c. To rule out a hemorrhagic stroke or a subdural hematoma
d. To rule out an arachnoid hematoma

32. Which cardiac arrhythmia is most likely associated with transient ischemic attacks (TIAs)?
a. Atrial flutter
b. Atrial tachycardia
c. Supraventricular tachycardia
d. Atrial fibrillation

33. A magnetic resonance angiogram (MRA) is done to identify what three conditions? Select all that apply.
a. Hematoma
b. Clot
c. Aneurysm
d. Hemorrhage
e. Stenosis

34. Why is it important for a client to avoid taking metformin 1–2 days before and after a computed tomography angiogram (CTA)?
a. The dose of contrast dye should be reduced since metformin is a form of contrast dye.
b. This scan is contraindicated in a client who has taken metformin.
c. Metformin interacts with the contrast dye and can cause anaphylactic shock.

d. The combination of both metformin and contrast dye can cause kidney failure.

35. Which statements are true in describing the brain stem? Select all that apply.
- **a. It connects the brain to the spinal column**
- b. Breathing will not be impacted if the brain stem is injured
- c. It is a reservoir for cerebrospinal fluids
- **d. It is composed of the midbrain, pons, and medulla oblongata**
- **e. It provides basic motor and sensory responses**

36. Which of the following is the primary function of the spinal cord?
- a. To process motor signals from the brain
- b. To process sensory signals to the brain
- c. To act as a structural support aligning the center of the body
- **d. To facilitate transfer of information to and from the brain**

37. Which parts make up the white and gray matter of the spinal cord?
- a. The gray matter contains the nuclei, and the white matter contains the dendrites of the axon.
- b. The white matter contains the nuclei, and the gray matter contains the dendrites of the axon.
- c. The gray matter contains the myelinated axons, and the white matter contains the cell bodies of the axons.
- **d. The white matter contains the myelinated axons, and the gray matter contains the cell bodies of the axons.**

38. What types of signals travel along the ascending tracts of the spinal cord?
- a. Pressure signals
- b. Motor signals
- **c. Sensory signals**
- d. Reflex signals

39. What is the term used to describe the structures that transmit signals through the gray matter between the sensory to the motor tracts?
- **a. Interneurons**
- b. Dorsal root
- c. Root ganglion
- d. Ventral root

40. Why is the spinal cord shorter than the vertebral column?
- a. To provide additional sensory pathways
- b. To provide protection to the brain
- **c. To provide protection for the structures within it**
- d. To provide additional motor pathways

41. Where does the spinal cord start and end?
- a. It begins at the midbrain and ends at the lower 1st sacral vertebra or superior of the 2nd sacral vertebra.
- b. It begins at the midbrain and ends at the lower 1st lumbar vertebra or superior of the 2nd lumbar vertebra.
- **c. It begins at the medulla oblongata and ends at the lower 1st lumbar vertebra or superior of the 2nd lumbar vertebra**
- d. It begins at the medulla oblongata and ends at the lower 1st sacral vertebra or superior of the 2nd sacral vertebra.

42. Which of the following structures are present to protect the spinal cord? Select all that apply.
- **a. The bone and the meninges**
- b. White matter

c. A cushion of fat and a network of veins
d. Gray matter
e. Cerebrospinal fluid (CSF)

43. Which Glasgow Coma Scale score usually indicates coma and will likely need intubation?
a. 12
b. 7
c. 10
d. 15

44. What is the primary role of the CSF in the spinal cord?
a. To protect the spinal cord from damage by the vertebral column
b. To protect the spinal cord from pathogens that can cause infections
c. To transport nutrients to and from the brain
d. To transport signals to and from the brain

45. Which is true of the spinal cord and the vertebral column? Select all that apply.
a. The bones, meninges, fat, veins, and CSF provide protection to the spinal cord.
b. The intervertebral discs facilitate movement within the vertebral column.
c. The vertebral column is composed of 36 bones.
d. The spinal cord contains both white and gray matter.
e. The brain and the spinal cord are connected by the dura mater.

46. What is the main priority for a client who presents with neurological symptoms?
a. Ruling out other possible causes of neurological deficits, including low blood glucose
b. Airway, breathing, and circulation
c. Rapid assessment and identification of a stroke
d. Urgent brain imaging (with CT or MRI) to determine if ischemic or hemorrhagic stroke occurred

47. Which of the following is the most important piece of information when dealing with a client who is experiencing neurological symptoms?
a. Time in which symptoms began
b. Imaging of neurological tissue to determine ischemic or hemorrhagic stroke
c. Medication history to determine potential influencers with neurological symptoms
d. Cause of neurological symptoms

48. What does the acronym "FAST" stand for?
a. Facial drooping, arm weakness, seizure, and time
b. Facial drooping, acute headache, speech difficulties, and tremors
c. Facial drooping, arm weakness, speech difficulties, and time
d. Facial drooping, acute headache, speech difficulties, and time

49. If any of the FAST-screening symptoms are present, what do positive symptoms typically indicate?
a. The client is having a stroke.
b. The client is having a TIA.
c. The client has tissue damage and permanent deficits.
d. The client should seek immediate medical attention by calling an ambulance.

50. What is the definition of an acute stroke?
a. A cerebrovascular event that takes weeks to months to fully manifes
b. A cerebrovascular event that develops gradually over several days
c. A cerebrovascular event with sudden onset of neurological symptoms
d. A cerebrovascular event that occurs only during sleep hours

51. Which membrane is located directly under the skull?
- a. Pia mater
- b. Sub-arachnoid mater
- **c. Dura mater**
- d. Arachnoid mater

52. Which meninge is closest to the brain?
- a. Sub-arachnoid mater
- b. Dura mater
- **c. Pia mater**
- d. Arachnoid mater

53. What is meningitis?
- a. Inflammation of the medulla of the brain stem
- **b. Inflammation of the membranes that surround the brain**
- c. Inflammation of the mid-brain
- d. Inflammation of the ventricles of the brain

54. What is the most common cause of meningitis?
- a. Fungi
- **b. Viruses**
- c. Parasites
- d. Bacteria

55. How is meningitis spread?
- a. Contact
- b. Vectors
- **c. Droplets**
- d. Airborne

56. Which symptom is considered a classic sign of meningitis?
- a. Fever with headache
- b. Unequal pupils
- **c. Neck stiffness**
- d. Photophobia

57. What is the Brudzinski sign?
- a. Involuntary movement of the toe when the sole of the foot is stroked
- **b. Flexing of the hips and knees when the neck is flexed**
- c. Inability to stand up straight when the eyes are closed
- d. Inability to extend the leg when the hip is flexed

58. The nurse is preparing the client for a lumbar puncture. Which nursing action is most appropriate?
- a. Ensuring that an intubation tray is ready at the bedside
- b. Making sure that the client's neck and upper spine are cleansed with chlorhexidine
- c. Assisting the client to lay on their stomach with their head tilted to the left
- **d. Ensuring that the client has emptied their bladder before the procedure**

59. What is the main reason why clients with meningitis receive intravenous fluids?
- a. To help prevent seizures
- **b. To maintain a safe blood pressure**
- c. To make up for fluid lost during their lumbar puncture
- d. To compensate for them being NPO (nothing by mouth)

60. Which classes of medications are commonly prescribed for clients with meningitis? Select all that apply.
- **a. Anticonvulsants**
- **b. Analgesics**
- c. Antitussives
- d. Antiplatelets
- **e. Antipyretics**

61. The new graduate nurse is caring for a client with meningitis. Which nurse action causes the nurse manager to intervene?
- a. The nurse regularly checks the client's neurological vital signs
- b. The nurse lowers the lights in the client's room
- **c. The nurse places the client in Trendelenburg position**
- d. The nurse advocates for the client to move rooms to a quieter part of the unit

62. Which vital signs change is indicative of increased intracranial pressure?
- **a. Increased systolic blood pressure and decreased diastolic blood pressure**
- b. Decreased systolic blood pressure and increased diastolic blood pressure
- c. Decreased heart rate and increased blood pressure
- d. Increased heart rate and decreased blood pressure