Neurological Assessment & Diagnostics

Purpose of the Neurological Assessment

- Determine the presence or absence of NS malfunction
- Determine the location, type and extent of NS lesions
- Determine the degree to which the healthy portion of the NS can be used for rehab
- Determine the effects of neurological dysfunction on ADL's
- Neuro exam components: mental status, speech, cranial nerve, reflex, motor, & sensory function

Nursing assessment of the conscious patient

Subjective Data:

Historian- Are they a reliable historian?

Chief complaint- Ask open ended questions

Medical history- Any chronic diseases, surgeries, injuries? Family hx?

Exposures- ETOH, Drugs, Meds that affect the NS

Growth and Development- Developmental milestones delay?

Functional Patterns- Any decrease or change in ADL's?

Objective Data:

Physical Exam- full neurological exam

Six Categories to assess during exam:

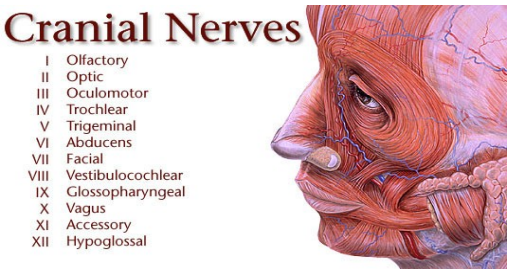
1. Evaluation of mental status

- Assess level of consciousness first: (LOC)- Are they alert, drowsy, sleepy, comatose?
    - Motor activity, body posture, dress/hygiene, facial expression, speech
        - Speech
            - Expressive aphasia- (Broca's aphasia) Patient has difficulty forming complete sentences. Patient knows what they want to say but can't find the words to say it.
            - Receptive aphasia- (Wernicke's Aphasia) Loss of comprehension. Difficulty understanding spoken or written language. Hears/Sees the print but can't make sense of the words. Word Salad.

- Cognition
    - Orientation, Judgment, Calculation, General Knowledge, Recent and remote memory
- Mood & Affect

2. **Cranial nerve assessment**

- Provides information about brain stem and peripheral nerve function



To help remember nerves:

Once **O**ne **O**vercomes
Taking **T**ests **A**nd **F**inals
Very **G**ood **V**acations **A**re
Helpful

3. Cerebellar function

- Provides info about brainstem and peripheral nerve function

-Touch finger to nose, Touch your finger to examiners finger

-Rapid alternating movements

- Patting hands to thighs or Alternate fingers to thumb

-Walking

- heel to toe, tip toes, heel walk

-Romberg's test

- Feet together, arms at sides, eyes open then closed

-Coordination of lower extremity

- Heel down shin bilaterally

4. **Motor function**

- Provides info about muscle tone and strength

-Inspect voluntary muscles- Eval for symmetry or abnormalities

-Assess Tone- passive ROM

-Assess Strength

-Any Abnormalities: atrophy, contractures, tremors, twitching, hypertonia, hypotonia/flaccidity

5. **Sensory function**

- Provides info on primary forms of sensation (sensory cortex and cortical

sensory)

-Touch/Pain/Temperature- Light touch, can use a cotton swab. Touch each extremity and ask patient to indicate when they feel stimulus. Test pain by a sharp and dull end of a paperclip. Ask patient to respond either sharp or dull when sensation felt.

- Extinction tested by touching both sides of the body symmetrically. If patient does not feel both sides simultaneously, the other stimulus is extinguished

-position sense- Test position sense by having the patient, eyes closed, report if their large toe is "up" or "down" when the examiner manually moves the patient's toe in the respective direction. Repeat on the opposite foot and compare.

- vibration- activate a tuning fork and apply to bony prominence

- stereognosis- Test by asking the patient to close their eyes and identify the object you place in their hand. Place a coin or pen in their hand. Repeat this with the other hand using a different object.
- graphesthesia- Test by asking patient to close eyes and identify the number or letter you will write with the back of a pen on their palm. Repeat on the other hand with a different letter or number.

6. **Reflexes**

- Tests both sensory input and motor response. Responses= 0-5 scale

0-absent

1-weak response

2-normal response

3-brisk response

4-hyperreflexia & nonsustained clonus

5- hyperreflexia & sustained clonus

- Deep tendon reflex locations & normal responses
  - Biceps – contraction of biceps, flexion of the arm at the elbow
  - Brachioradialis – flexion of elbow and forearm
  - Triceps – extension of elbow, contraction of the triceps
  - Patellar – extension of knee/ leg, contraction of the quadriceps

- Achilles – plantar flexion of ankle

Pathological reflex

- Babinski Reflex- dorsiflexion of great toe and fanning of other toes

Neuro Check: shortened version of a full neurological exam

- LOC, LOC questions, LOC commands, Motor function of bilateral upper and lower extremities, GCS and Pupils

Geriatric variations- Changes will occur in the Nervous System due to aging.

- **Central Nervous System**

Loss of neurons and a decrease in brain weight

Temperature regulation-decreased efficiency

Cerebral blood flow reduced

Quantity of CSF is decreased

- **Peripheral NS**

Loss of myelin and decrease in conduction speed of nerve impulses

Orthostatic hypotension

Diminished touch, taste, smell, vision, pain, temp, hearing, balance, coordination

Reflexes slower

Continuum of consciousness

Full Consciousness- alert, answers questions, follows commands

Confusion- disoriented

Lethargy- Slowed mental processes, speech or motor activities

Obtundation- requires constant stimulus to answer/follow command

Stupor- requires vigorous physical stimulation

Coma- sleeplike state, doesn't respond to stimulus

Glasgow Coma Scale

Standardized tool- 3 criteria: Eye Opening, best motor response, best verbal response

Limitations: In a patient with an endotracheal tube or a trach

Scoring of GCS:

(M) Motor Response	**(E) Eye Opening**	**(V) Verbal Response**
(6) Follows commands	(4) Natural	(5) Oriented & converses
(5) Localizes to pain	(3) To voice	(4) Disoriented & converses
(4) Withdrawal to pain	(2) To pain	(3) Inappropriate words
(3) Decorticate	(1) No response	(2) Incomprehensible sounds
(2) Decerebrate	(U) Untestable	(1) No response-lack of sounds
(1) No response		(U) Untestable
(U) Untestable		

Motor Assessment of the Unconscious Patient

Verbal stimuli/ Painful stimuli- Nail bed, Trapezius muscle, Sternal pressure

- Motor responses categories

  -Spontaneous- spontaneous movement that does not require stimulus

  -Withdrawal- flexes away from painful stimuli

  -Localization- opposite extremity reaches across to remove stimuli

Decorticate posturing-abnormal flexion response spontaneously or with stimulus

Decerebrate posturing-abnormal extension response spontaneously or with stimuli

NIH stroke scale- Clinical stroke assessment tool used to evaluate neuro status in stroke patients

Serves as a measure of stroke severity

- 11 item Neurological exam
- Quick and easy, have patient answer questions, perform specific activities
- Score indicates level of severity of stroke symptoms
  - 0= no stroke symptoms

Neurological Diagnostics

X-Rays

- Evaluate skull and vertebrae surrounding the spinal cord
- Images used to identify abnormalities, fractures, bone erosions, calcifications or dislocations

Cerebral angiography

- X-ray examination of the brain vasculature (intracranial/extracranial blood vessels)
- Injection of radiopaque contrast medium into femoral artery via catheter

  -Cath threaded up until it reaches base of carotid or vertebral artery

-Serial Xrays then taken to image the contrast flowing through vessels, arteries, veins

-Flushing or warm feeling occurrence during injection of contrast

Prior to the procedure: Contrast allergy? Assess for stroke risk, may need NPO

Disadvantages: Invasive, risk of allergic reaction to dye, must lay still

Nursing Care: Extremity circulation & Neurological status

Computed Tomography (CT) scan

- Computer assisted x-ray to scan tissue and provide a cross sectional view of the body parts. May use contrast or not. Depends on test.
- CT can detect edema, infarction, cysts, growths, clots, hemorrhage, skull fractures

Prior to the procedure: Contrast allergy? May need NPO

Disadvantages: must lay still, claustrophobia issues?

Nursing Care: Drink fluids to excrete dye

Magnetic Resonance Imaging (MRI)

- Magnetic field obtains images and sharp detailed cross sections of living tissues/organs
- Can obtain MRI with or without contrast

Contraindications- Metal objects in the body?

Nursing Care: Position=lay still, Timing= can take up to 1 hr, Noise= it is loud

Magnetic resonance angiography (MRA)

- In MRA imaging of intracranial/extracranial blood vessels is visualized. Contrast may be used
- Similar to MRI (Same machine) - same procedural instructions, contraindications, nsg care

Myelogram

- Xray of spinal cord and vertebral column after injection of contrast into the subarachnoid space looking for lesions, tumors, ruptured discs in a patient who can't have MRI

Nursing care: Lie flat after test and drink plenty of fluids to prevent spinal HA.

Cerebrospinal fluid analysis (CSF)

- CSF is colorless, odorless and normally free of RBCs. Small amount of protein and glucose normal. CSF should look like water.
    - Obtain CSF sample via Lumbar Puncture (LP) procedure: LP can be done at bedside in a lateral recumbent position. HCP and assistant wear masks, sterile procedure, needle introduced into level of the spinal cord at L3/L4 or L4/L5

Nursing Care

Lie flat after procedure (at least 1 hour)

Specimens handled with care and walked to lab

Check puncture site for:

Neuro checks and VS

Electroencephalography or EEG (Electroencephalogram)

- Electrodes placed on scalp with a paste mixture and electrical activity in brain recorded

Indications- used to evaluate for seizure disorders, brain death/injury, cerebral disease

Nursing Care, Hair needs to be clean, avoid medications/substances that may affect brain activity, advise to eat normally prior to test and advise patient=No pain, no shocks

Electromyography (EMG)

- Needle electrodes are inserted into the muscle which records electrical activity
- Muscle at rest will have no electrical activity as it's not being stimulated

Indications- used to evaluate nerve dysfunction, nerve to muscle signal issues

Nursing Care- painful, IM injection like pain, watch out for hematomas

Evoked potentials

- Measures the electric signals along nerve pathways and is used to test for sensory nerve conduction problems

-Three categories based on type of stimulus: Visual, Auditory or Somatosensory

Positron Emission Tomography (PET)

- Nuclear imaging that helps reveal how your tissues and organs are functioning
- Measures metabolic activity of brain to assess for cell death or damage
- Chemical substance is labeled with radioactive atoms and inhaled, injected or swallowed. Areas of disease will uptake the radioactive atoms and show up brightly.

Doppler imaging

Carotid duplex

Combines ultrasound and pulsed Doppler technology to visualize carotid/vertebral arteries

Transcranial Doppler

Evaluates blood flow velocity of intracranial blood vessels