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 or should you use family to obtain hx?

Chief complaint- Ask open ended questions

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

Exposures- ETOH, Drugs, Meds that affect the NS such as opioids, sedatives

Growth and Development- Issues as child? 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

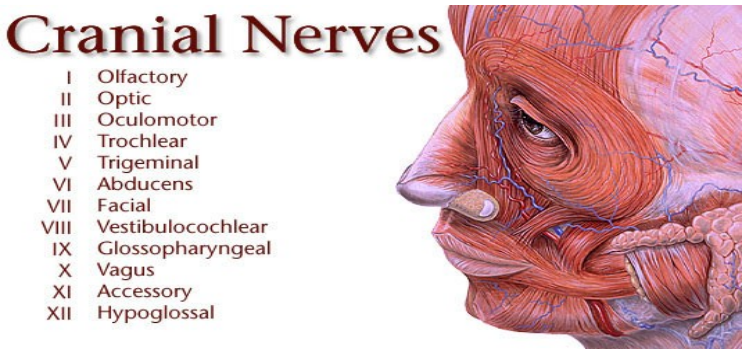
- Assess level of consciousness first: (LOC)- Are they alert, drowsy, sleepy, comatose?
    - Motor activity, body posture, dress/hygiene, facial expression, speech
        - Expressive aphasia- (Broca's aphasia) Patient has difficulty forming complete sentences. Patient knows what they want to say but can't find the words to say it. Inability to produce language.
        - 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. Often says many words together that don't make sense. 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
Finals **V**ery **G**ood
Vacations **A**re **H**elpful

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 (touch, vibration, pain)

- Pain sensation- Use sharp and dull object. A sharp end of paperclip and a qtip. Instruct the patient to say "sharp" or "dull" when they feel the respective object touching them.
- light touch sensation- goes with pain sensation. Pt should respond either sharp or dull when touched with various items. Can use a cotton wisp for test. Upper and lower extremities should be tested bilaterally as well as trunk.
- 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 or finger/toe nails, have pt feel for buzzing sensation.
- extinction- have the patient close eyes. Touch patient on both sides of body at same time. Repeat this maneuver a second time, touching the patient in two places on opposite sides of their body, simultaneously. Should be able to perceive stimulus both sides
- stereognosia- 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

- Reflex responses are documented on a 0-5 scale

0-absent **1**-weak **2**-normal **3**-brisk

4-hyperreflexia & nonsustained clonus **5**- hyperreflexia & sustained clonus

- Deep tendon reflex locations
  - Biceps – contraction of biceps

- Brachioradialis – flexion of elbow and forearm
- Triceps – extension of elbow/ arm
- Patellar – extension of knee/ leg
- Achilles – plantar flexion of ankle

Superficial reflexes

- Abdominal

Pathological reflex

- Pathological reflexes are seen in the presence of NS disease
- Babinski Reflex- dorsiflexion of great toe and fanning of other toes

Neuro Check: shortened version of a full neurological exam

- LOC, LOC question and commands, Motor function of arms and legs, 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

Short term memory issues, long term memory remains intact

- **Peripheral NS**

Loss of myelin and decrease in conduction speed of nerve impulses

Orthostatic hypotension due to altered BP response to position change

Decrease in muscle bulk and strength, diminished agility

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

Reflexes slower

Continuum of consciousness

Full Consciousness-

Confusion- disoriented to person, place, time or situation

Lethargy-

Obtundation-difficult to arouse, requires constant stimulus to answer/follow command

Stupor-

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:

(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

Unconscious= Unable to voluntarily show ability

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

Cranial nerve and reflex assessment

-Reflexes specific to the unconscious population

- Oculocephalic reflex- doll's eye reflex upon movement of head
- Oculovestibular reflex- cold water stimulation into the ear
- CN III – oculomotor- check the pupils for reaction
- CN V – corneal reflex- blink reflex
- CN IX and X- gag reflex- touch posterior pharynx with tongue blade

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

Serves as a measure of stroke severity

- 15 item Neurological exam
- Quick and easy-should take no longer than 10 minutes

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
- 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 blood flow through vessels

-Flushing or warm feeling occurrence during injection of medium

Prior to the procedure:

Advantages: visualizes intracranial and extracranial blood vessels

Disadvantages: Invasive, risk of allergic reaction to dye

Indication: When vascular lesions or tumors are suspected

Nursing Care

Puncture site assessment:

Positioning:

Extremity circulation & Neurological status:

Increase fluids to flush the dye out

Computed Tomography (CT) scan

- CT Scan uses radiation to scan tissue and provide a cross sectional view of the head and brain and identifies changes in tissue density and abnormalities in size, shape and location of structures (brain tissue, ventricles, tumors)
- CT can detect edema, infarction, cysts, growths, clots, hemorrhage, skull fracture

Advantages CT

Easy, painless, quick, non-invasive, highly accurate, in-patient or out-patient, with or without contrast (with contrast it enhances visualization)

Nursing Care

Question allergies if receiving dye

NPO in some cases if possible, to prevent nausea/vomiting

Pt needs to lie still/motionless through test

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

Advantages

Painless and safe, Non-invasive, no radiation

Nursing Care

Position=lay still, Timing= takes 30 min- 1 hr, Noise= it is loud

Magnetic resonance angiography (MRA)

- In MRA, a powerful magnetic field, radio frequency waves and a computer produce detailed images of the major arteries within the body (brain, neck, heart, chest, abd)
- Type of MRI (Same machine) - same advantages, procedural instructions, contraindications

Myelogram

- Visualizes spinal column and subarachnoid space after introduction of a spinal needle into the spinal canal and the injection of contrast material in the space around the spinal cord, meninges and nerve roots (the subarachnoid space) using a real-time form of x-ray called fluoroscopy. Done infrequently and must be done by radiologist

Cerebrospinal fluid analysis (CSF)

- Contents of CSF:
- Obtain CSF sample via Lumbar Puncture (LP) procedure

LP at bedside in a lateral recumbent position to help open vertebrae and allow easier access to the interspace between L3 and L4 or L4 and L5

Procedural technique

OR mask, Sterile technique

Local anesthetic

Spinal needle used to obtain spinal fluid

Transient pain may occur if spinal nerve roots are irritated

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

  Medications

  Advise to eat normally prior to test

  Advise patient=No pain, no shocks, non-invasive.

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

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
- Chemical substance is labeled with radioactive atoms and inhaled, injected or swallowed. Areas of disease will uptake the radioactive atoms and show up brightly.

  Nursing Care

Doppler imaging

Carotid duplex

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

Transcranial Doppler

Image flow velocity of intracranial blood vessels