Neurological Assessment
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Learning Objectives
- Identify the structures and functions of the Nervous system
- Discuss how the nurse focus and prioritize subjective / objective data collection
- Implement safety r/t metallic piercings or allergy
- Identify normal and abnormal findings
- Identify teaching opportunities for health promotion and risk reduction r/t the neurological system
- Demonstrate application of the knowledge: Think like Nurse & Act like Nurse: Pulling it ALL together: Reflection and critical thinking

Neurological Anatomy
- Nervous system: divided into 2 structural parts
  - Central Nervous System (CNS): brain & spinal cord
  - Peripheral Nervous System: cranial nerves (carry impulses to and from brain) & spinal nerve (carry messages to and from spinal cord)
- Nerve Conduction:
- Parkinson’s disease:

Neuro. Videos
- Alzheimer’s Disease:
- Bladder Function – neurological control:
- Brain components:

Neurons – The Building Blocks of Our Mental Computer
- Impulses transmitted by:
  - Neurons: Basic structures for receiving and sending signals.
    - Dendrites: receive signals
    - Axons: send signals
    - Synapse: is space between axon and dendrite.

Basic Anatomy
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**Brain**

Cerebrum

Largest part of the brain, composed of 2 hemispheres and 4 lobes. Frontal, parietal, temporal and occipital.

- **Frontal** - Conceptualization, motor ability and judgment, thought process, emotions.
- **Parietal** - Interpretation of sensory information, ability to recognize body parts.
- **Temporal** - Memory storage, integration of auditory stimuli.
- **Occipital** - Visual Center.

**Cerebellum**

- **Cerebellum** - Keeps person oriented in space, balance. Doesn’t initiate movement but coordinates it
- Controls skeletal muscles
- Controls voluntary movements
**Diencephalon**

Area between cerebral hemispheres and the brainstem it contains:

- **Thalamus** – relay station for the nervous system, sorts out impulses and directs them to the cerebral cortex
- **Hypothalamus** – maintains homeostasis by controlling vital functions: temperature, heart rate, BP, pituitary regulator, emotions

**Brain Stem**

- **Brain stem** – central core of the brain, contains midbrain, pons and medulla.
- **Midbrain** – contains many neurons and tracts
- **Pons** – Controls rhythmicity of respiration, contains motor and sensory pathways.
- **Medulla** – Cardiac, respiratory, vasomotor control. Swallow, gag and cough reflex. Motor and sensory fibers cross here.
- **Spinal Cord** – continues with the brain stem.

**Cerebral Circulation**

- Originates from carotid and vertebral arteries.
- Blood Brain Barrier: Prevents diffusion of toxic substances and large molecules.
- Cerebrospinal fluid: Contains no RBC’s, few WBC’s, Glucose 45-75 mg/dl, Protein 15-45 mg/dl.
Neuro. Videos

- Stroke (CVA)
- Cerebral aneurysm:
- Concussion:
- Pain:

Functional Divisions

- Functional divisions of Nervous System:
  - Central Nervous System: Brain and spinal cord, receives and conducts stimuli.
  - Autonomic Nervous System: Regulates autonomic body functions, e.g., Heart rate.
    - Sympathetic: maintains homeostasis and defense against stressors. Fight/flight
    - Parasympathetic: Restorative and vegetative functions; Decrease heart rate, dilate blood vessels constricts pupils. S= Stress and P= Peace.

Coverings of the Brain & Spinal cord

- Meninges: 3 layers tissue
  - Dura mater
  - Arachnoid layer
  - Pia mater
- Spaces:
  - Epidural
  - Subdural
  - Subarachnoid

Neurological Assessment

Subjective

- Headaches
- Head injury
- Syncope (faint)
- Dizziness
- Vertigo (rotational spinning)
- Seizures
- Tremors
- Paresthesia (burning/numbness/tingling)
- Dysphagia (difficulty swallowing)
- Dysphasia (difficulty speaking)
- Significant past Hx
- Environmental/occupational hazards

Mental Status Assessment

- Level of Consciousness (LOC): alert, somnolent, stuporous, comatose.
- Orientation: person, place, time = A&O x 3.
- Memory:
  - Immediate, recent and remote

Cognitive Assessment

- Thought process
- Calculations
- Current events
- Response to proverbs
- Judgment & problem solving ability
- Communication abilities
- Emotion- Mood and affect
Cranial Nerve Assessment

- Cranial nerves – 12 pairs, motor, sensory, mixed function.
- CN 1 – Olfactory (sensory) – smell.
- CN 2 – Optic (sensory) – sight.
- CN 3 – Oculomotor (motor) – eye movements
- CN 4 – Trochlear (motor) – eye movements
- CN 5 – Trigeminal (motor & sensory) chewing and pain sensations of face.
- CN 6 – Abducens (motor) eye movements

- Trigeminal Nerve V
  - sensory function
  - Corneal Reflex Test
  - Facial Nerve VII
    - motor function
    - Eye Blinking

- PERRLA
Cranial Nerve Assessment

- **CN 7** – Facial (motor) – facial expressions
- Facial (sensory) - taste
- **CN 8** – Vestibulocochlear (acoustic) – hearing
- **CN 9** – Glosopharyngeal – swallowing
- **CN 10** – Vagus – swallowing, gag
- **CN 11** – Spinal Accessory – trapezius, sternomastoid muscles
- **CN 12** – Hypoglossal – motor – tongue.

Motor Function Assessment

- **Motor function** - Test motor strength and compare bilaterally. Assess ROM against resistance.
- **Scale used**:
  5 = Full ROM  full resistance
  4 = Full ROM  some resistance
  3 = Full AROM
  2 = Full PROM
  1 = trace movement, flicker finger.
Muscle Tone Assessment
- Muscle Tone - ranges from flaccid to taut
- Atonia - no muscle tone, no resistance
- Hypotonia - slight muscle tone, little resistance
- Hypertonia - too much resistance
- Spasticity - stiff, awkward movements
- Rigidity - tightness, inability to bend
- Involuntary movements - tics, fasciculations (fine tremors) and tremors (resting or intentional).

Sensory Assessment
- Sensory Function: Perform all sensory testing with the patient’s eyes closed and test bilaterally.
- Spinothalamic tract - pain, temp. touch
- Posterior (Dorsal) Columns - position (proprioception), vibration and tactile discrimination (fine touch)
- Vibration – tuning fork to bony prominence
- Position (kinesthesia) – Grasp toe or finger and move it up/down or side/side.
- Stereognosis – place object in hand to identify (coin, paperclip).
- Graephesthesia – trace letter or number on palm to identify.
Cerebellar Function Assessment

- **Posture and gait** – steady gait with arm swing, balance maintained.
- **Romberg test** – Have pt. stand, feet together, arms side, eyes closed.
- **Finger to nose test** – Eyes closed touch his finger to nose. Have pt. touch his fingertip to your fingertip, alter position.
**Cerebellar Assessment**

- Hand movements - Tap finger to thumb, rapidly. Tap each finger to thumb rapidly.
- Pronate and supinate hands rapidly.
- Feet movements – Tap toes rapidly, stand on one foot, hop on one foot, walk on heels, then toes, run heel down opposite shin.

**Deep Tendon Reflexes Assessment**

- **Deep tendon reflexes** - Have pt. in relaxed position, with joint supported.
- **DTR** – compare L to R
- Short blow with reflex hammer to the muscle’s insertion tendon (wrist action)
- Reinforcement – Have pt. contract muscles not being tested this aids in relaxing muscles to be tested
DTR Assessment

- Scale 0 - 4+
- 0 = absent,
- 1+ = diminished
- 2+ = average
- 3+ = brisk
- 4+ = hyperactive, clonus.

Deep Tendon Reflexes (DTR) –
- Biceps – Forearm flexes at elbow.
- Triceps – Forearm extends at elbow.
- Brachioradialis – Slight flexion of forearm at elbow and forearm pronation.
- Patella – Leg extends at knee.
- Achilles – Plantar flexion.
Superficial Cutaneous Reflex Assessment

- **Abdominal** - Umbilicus shifts toward stimulus.
- **Cremasteric** – Testicle on same side of stimulation rises.
- **Babinski (Plantar)** – Toes flex.
Using the Glasgow Coma Scale

Every brain injury is different, but generally, brain injury is classified as:

- **Severe**: GCS 3-8 (You cannot score lower than a 3.)
- **Moderate**: GCS 9-12
- **Mild**: GCS 13-15

http://www.youtube.com/watch?v=Fi8zndAdT7k

Summary

- Neurological assessment includes:
  - Mental status
  - Cognitive assessment
  - Cranial nerves
  - Motor Functions & Muscle tone
  - Sensory Function
  - Cerebellar Function
  - DTR & superficial cutaneous reflexes
  - Glasgow Coma Scale