Unit # 11
ASSESSMENT OF THE MENTAL STATUS AND SENSORY NEURO SYSTEM

Shahzad Bashir
RN, BScN, DCHN, MScN (Std. DUHS)
Instructor
New Life College of Nursing
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Acknowledge:
Myung-Hee Pak, RN, MSN, CNS
Learning Objectives

• By the end of the unit, learners will be able to
  – Review Structure and function of Nervous System.
  – Perform mental status examination of a client.
  – Assess cranial nerve, sensory, sense of proprioception and cerebellar functions and deep tendon reflexes.
  – Document findings.
  – List the changes in the nervous system that are characteristics of the aging process.
• Structure and Function
• Subjective Data—Health History Questions
• Objective Data—The Physical Exam
• Abnormal Findings
Structure and Function

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)

Central Nervous System (CNS) • Hypothalamus
• Cerebral cortex
  – Frontal lobe
  – Parietal lobe
  – Occipital lobe
  – Wernicke’s area
  – Broca’s area
• Basal ganglia
• Thalamus

• Cerebellum
• Brainstem
  – Midbrain
  – Pons
  – Medulla
• Spinal cord
Neurons – The Building Blocks of Our Mental Computer
Basic Anatomy

• Impulses transmitted by:
• Neurons- Basic structures for receiving and sending signals.
• Dendrites – receive signals
• Axons – send signals
• Synapse is space between axon and dendrite.
Brain

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

• Cerebrum

• 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.
Components of CNS

A. Medial view of right hemisphere

B. Coronal section

COMPONENTS OF THE CENTRAL NERVOUS SYSTEM
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
Structure and Function, cont.

Pathways of the CNS

• Crossed representation

• Sensory pathways
  – Spinothalamic tract
  – Posterior (dorsal) column

• Motor pathways
  – Corticospinal or pyramidal tract
  – Extrapyramidal tracts
  – Cerebellar system

• Upper motor neurons

• Lower motor neurons
Sensory Pathway

Major Sensory Pathways
- Lateral spinothalamic tract - pain, temperature
- Anterior spinothalamic tract - crude touch
- Posterior (dorsal) columns - fine touch

Comparison to pain and pressure receptors:
Motor Pathway
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 45-75mg/dl, Protein 15-45 mg/dl.
Peripheral Nervous System

• Cranial nerves
• Spinal nerves
• Autonomic nervous system
• Reflex arc
Subjective Data—Health History Questions

- Headache
- Head injury
- Dizziness/vertigo
- Seizures
- Tremors
- Weakness

- Incoordination
- Numbness or tingling
- Difficulty swallowing
- Difficulty speaking
- Significant past history
- 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
Objective Data—
The Physical Exam

• Preparation
  – Screening neurologic examination
  – Complete neurologic examination
  – Neurologic recheck

• Equipment needed
  – Penlight
  – Tongue blade
  – Cotton swab
  – Cotton ball
  – Tuning fork (128 Hz or 256 Hz)
  – Percussion hammer
  – Occasionally need: familiar aromatic substance
Objective Data—
The Physical Exam, cont.

- Cranial nerves – 12 pairs, motor, sensory, mixed function.

Test Cranial Nerves
- I—Olfactory (sensory) – smell.
- II—Optic (sensory) – sight.
- III—Oculomotor, (motor) – eye movements
- IV—Trochlear, (motor) – eye movements
- V—Trigeminal (motor & sensory) chewing and pain sensations of face.
  - Motor function
  - Sensory function
  - Corneal reflex VI
- VI—Abducens (motor) eye movements
- VII—Facial
  - Motor function: facial expressions
  - Sensory function: - taste
- VIII—Acoustic (vestibulocochlear) – hearing
- IX—Glossopharyngeal, – swallowing
- X—Vagus – swallowing, gag
  - Motor function
  - Sensory function
- XI—Spinal accessory – trapezius, sternomastoid muscles
- XII—Hypoglossal, – motor – tongue.
The Six Cardinal Fields of Gaze

Superior rectus, CN III

Inferior oblique, CN III

Inferior oblique, CN III

Superior rectus, CN III

Lateral rectus, CN VI

Inferior rectus, CN III

Superior rectus, CN IV

Inferior oblique, CN IV

Superior rectus, CN III

Inferior rectus, CN III

Lateral rectus, CN VI

Medial rectus, CN III
Accomodation and Convergence
Cranial Nerve Assessment

- **Trigeminal Nerve V**
  - sensory function
  - Corneal Reflex Test
  - Cotton ball light touch & Sharp and dull test on Face

- **Facial Nerve VII**
  - motor function
  - Eye Blinking
Conti...

- Trigeminal Nerve
- Motor Test
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.
Objective Data—
The Physical Exam, cont.

Motor System—Inspect and Palpate

• Muscles
  – Size
  – Strength
  – Tone
  – Involuntary movements

• CEREBELLAR FUNCTION
  – Balance tests
    • Gait – steady gait with arm swing, balance maintained.
    • Tandem walking
    • Romberg test— Have pt. stand, feet together, arms side, eyes closed.
    • Shallow knee bend

  – Coordination and skilled movements
    • Rapid alternating movements (RAM)
    • Finger-to-finger test
    • Finger-to-nose test – Eyes closed touch his finger to nose. Have pt. touch his fingertip to your fingertip, alter position.
    • Heel-to-shin test
Objective Data—
The Physical Exam, cont.

**SENSORY SYSTEM**
- Person is alert, cooperative, and comfortable
- Guidelines for sensory testing
- Spinothalamic tract
  - Pain
  - Temperature
  - Light touch

**POSTERIOR COLUMN TRACT**
- Vibration – tuning fork to bony prominence
- Position (kinesthesia) – Grasp toe or finger and move it up/down or side/side.
- Tactile discrimination (fine touch)
  - **Stereognosis** – place object in hand to identify (coin, paperclip).
  - **Graphesthesia** – trace letter or number on palm to identify.
- Two-point discrimination
- Extinction
- Point location
• Stereognosis

• Graphesthesia
Finger-to-Nose Test
Rapid Alternating Movement

Heel to shin test
Objective Data—
The Physical Exam, cont.

- Test the stretch or deep tendon reflexes (DTRs)
  - Technique
  - Grading
  - Reinforcement
  - Biceps reflex
  - Triceps reflex
  - Brachioradialis reflex
  - Quadriceps reflex
  - Achilles reflex (“ankle jerk”)
    - Clonus

- Test the superficial reflexes
  - Abdominal reflex
  - Cremasteric reflex
  - Plantar reflex
– Biceps reflex
Triceps reflex
Brachioradialis reflex
Let the Lower Legs Dangle Freely to Flex the Knee and Stretch the Tendons. Strike the Tendon Directly Just Below the Patella.
Achilles reflex ("ankle jerk")
Test the reflexes

• Compare right and left
• The response should be equal
  – 4+ Very brisk, hyperactive with clonus (short jerking contraction of the same muscle), indicative of disease
  – 3+ Brisker than average, may indicate disease
  – 2+ average, normal
  – 1+ diminished, low normal
  – 0 no response

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Objective Data—
The Physical Exam, cont.

• Neurologic recheck

• Level of consciousness
  – Person
  – Place
  – Time

• Motor function

• Pupillary response

• Vital signs

  Glasgow coma scale (GCS)
### Glasgow coma scale

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<tr>
<th>Eye opening</th>
<th>Score</th>
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<tbody>
<tr>
<td>spontaneously to speech</td>
<td>4</td>
</tr>
<tr>
<td>to pain</td>
<td>3</td>
</tr>
<tr>
<td>none</td>
<td>2</td>
</tr>
<tr>
<td>none</td>
<td>1</td>
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<table>
<thead>
<tr>
<th>Verbal response</th>
<th>Score</th>
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<tbody>
<tr>
<td>orientated</td>
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<tr>
<td>confused</td>
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<tr>
<td>inappropriate</td>
<td>3</td>
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<tr>
<td>incomprehensible</td>
<td>2</td>
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<tr>
<td>none</td>
<td>1</td>
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<table>
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<tr>
<th>Motor response</th>
<th>Score</th>
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<tr>
<td>obeys commands</td>
<td>6</td>
</tr>
<tr>
<td>localises to pain</td>
<td>5</td>
</tr>
<tr>
<td>withdraws from pain</td>
<td>4</td>
</tr>
<tr>
<td>flexion to pain</td>
<td>3</td>
</tr>
<tr>
<td>extension to pain</td>
<td>2</td>
</tr>
<tr>
<td>none</td>
<td>1</td>
</tr>
</tbody>
</table>

**Maximum score**: 15

Fully alert - 15, a score of 7 or less reflects coma. (Kozier p. 703-704)
Decorticate Rigidity (abnormal flexion)

Decerebrate Rigidity (abnormal rigidity)
Abnormal Findings
Abnormalities in Muscle Movement

Paralysis
• Loss or impairment of the ability to move a body part, usually as a result of damage to its nerve supply.
• Loss of sensation over a region of the body.

Hemiplegia
• paralysis of one side of the body

Paraplegia
• paralysis of both lower limbs due to spinal disease or injury

Quadriplegia
• paralysis of all four limbs or of the entire body below the neck

Paresis
• partial motor paralysis
Fasciculations
Rapid, continuous twitching of resting muscle
Tic

Repetitive twiching of a muscle group
Myoclonus
Rapid, sudden jerk at a fairly regular intervals
Tremor
Involuntary contraction of opposing muscle groups
• Rest tremor
• Intention tremor
• Chorea
Sudden, rapid, jerky, purposeless movement involving limbs, trunk, or face
Athetosis

Slow, twisting, writhing, continuous movement, resembling a snake or worm
Abnormal Findings

Abnormal Gaits

- Spastic hemiparesis
- Cerebellar ataxia
- Parkinsonian (festinating)
- Scissors
- Steppage or footdrop
- Waddling
- Short leg
Abnormal Findings
Common Patterns of Sensory Loss

- Peripheral neuropathy
- Individual nerves or roots
- Spinal cord hemisection (Brown- Séquard syndrome)
- Complete transection of spinal cord
- Thalamus
- Cortex
Abnormal Findings

Abnormal Postures

• Decorticate rigidity
• Decerebrate rigidity
• Flaccid quadriplegia
• Opisthotonos
References
