



Focused Neurological Assessment

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... Lori Constantine MSN, RN, C-FNP, the original course author.

Purpose & Objectives

The fundamental processes of the brain and nervous system are key to understanding why nurses perform a focused neurological assessment. If there is a disruption to any of these processes, the whole body suffers. This course will discuss specific neurological history questions and exam techniques for your adult patient. Physical exam techniques such as inspection, palpation, percussion, and auscultation will be highlighted. Additionally, throughout the course, you will learn how alterations in your neurological assessment findings could indicate potential nervous system abnormalities.

After successful completion of this course, the participant will be able to:

1. Outline a systematic approach to neurological assessment.
2. Discuss history questions which will help you focus your neurological assessment.
3. Describe abnormal neurological assessment findings associated with inspection, auscultation, percussion, and palpation.

Glossary

Definitions from Tabers® dictionary (Venes, 2013) and Mosby's dictionary (Mosby Co., 2012)

Afferent - Transporting toward a center; opposite of efferent.

Amygdala - Brain structure that is part of the limbic system. Implicated in emotion.

Arachnoid mater - Middle layer of the meninges.

Association fibers - Association fibers transmit impulses between gyri in the same hemisphere.

Astrocyte (astroglia) - A glial cell that supports neurons.

Axon - The part of the neuron that takes information away from the cell body.

Basal ganglia - Areas of the brain that are important for movement. These areas include the putamen, caudate nucleus, globus pallidus, subthalamic nucleus and substantia nigra.

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Bipolar neuron - Neuron with only two processes extending from the cell body.

Blood brain barrier - A system of astrocytes and capillaries in the brain that prevents the passage of specific substances.

Brainstem - The central core of the brain.

Cauda equine - The "horse's tail" made up of a bundle of spinal nerves at the base of the spinal cord.

Cell body - Also called the soma; the part of the cell that contains the nucleus.

Central nervous system - The brain and spinal cord.

Central sulcus - Large groove in the brain that separates the frontal and parietal lobes.

Cerebellum - Area of the brain above the pons and medulla that is important for balance and posture.

Cerebral cortex - Outermost layer (the grey matter) of the cerebral hemisphere.

Cerebrospinal fluid (CSF) - Clear fluid in the ventricular system of the brain that cushions and protects the brain from injury.

Cerebrum - The cerebrum is the largest portion of the brain. It covers the diencephalon. The surface of the cerebrum is composed of grey matter and is known as the cerebral cortex.

Choroid plexus - Vascular structures in the ventricular system that produce cerebrospinal fluid.

Cingulate cortex - Part of the limbic system, located directly above the corpus callosum. It is important for emotional behavior.

Circle of Willis - Blood supply of the brain that unites the anterior and posterior circulation so that the brain has a backup system if one source of blood is interrupted.

Commisural fibers - Commisural fibers transmit nerve impulses from gyri on one hemisphere with the corresponding gyri in the opposite hemisphere.

Corpus callosum - Large collection of axons that connect the left and right hemispheres of the brain.

Cranial nerves - Twelve pairs of nerves that exit from the brain.

Dendrite - Extensions from the neuron cell body that take information to the cell body.

Diencephalon - Second portion of the brain that includes the epithalamus, thalamus, metathalamus, and hypothalamus.

Dorsal root - Bundle of nerve fibers taking information into the spinal cord.

Dura mater - Outermost layer of the meninges.

Efferent - Carrying away from a central organ or section; opposite of afferent.

Endorphin - Neurotransmitter with similar properties as opiates. It is important for pain reduction.

Epidural space - The epidural space is the space above the dura mater, between the dura mater and the skull.

Epithalamus - The uppermost portion of the diencephalon of the brain.

Fasciculation - Involuntary contractions or twitches of groups (fasciculi) of muscle fibers.

Fissures - The deep grooves between the gyri.

Frontal lobe - This lobe is associated with a variety of functions like consciousness, response to environment, emotional response, word associations, and memory of habits and motor activities.

Glia - Non-neural support cells of the nervous system.

Graphesthesia - Ability to feel writing on the skin.

Grey matter - Greyish nervous tissue containing cell bodies as well as fibers. It forms the cerebral cortex consisting of unmyelinated neurons.

Gyrus (gyri) - "Hills" or "bumps" on the brain that are separated by fissures.

Hippocampus - Area of the limbic system important for memory.

Hypothalamus - Brain structure that monitors internal environment and attempts to maintain balance of these systems. Controls the pituitary gland.

Limbic system - Interconnected areas of the brain important for emotional and other behaviors.

Medulla - Part of the brain stem important for breathing, respiration and other behaviors.

Meninges - Three sets of membranes (dura mater, arachnoid mater, pia mater) that cover the brain and spinal cord.

Metathalamus - The posterior part of the thalamus.

Myelin sheath - Fatty substance that surrounds some axons.

Neurotransmitters - Chemicals that transmit information across the synapse to communicate from one neuron to another.

Node of Ranvier - Short unmyelinated segment of an axon.

Occipital lobe - Area of the brain located behind the parietal lobe and temporal lobe and responsible for vision.

Optic chiasm - Crossing of the fibers from each retina.

Parietal lobe - Lobe associated with visual attention, touch perception, goal-directed, voluntary movements, manipulation of objects, and the integration of different senses that allows for understanding a single concept.

Pia Mater - Inner most layer of the meninges, which lines the surface of the brain.

Pituitary - "Master" gland attached to the base of the brain that secretes hormones for regulation of many body functions.

Pons - Area of the brainstem between the medulla and the midbrain.

Postcentral gyrus - (Primary somatosensory cortex) - The postcentral gyrus is the landmark for the primary somatosensory area of the cerebral cortex.

Precentral gyrus - (Primary motor cortex) - The precentral gyrus is the landmark for the primary motor area of the cerebral cortex.

Proprioception - Ability for brain to sense body position in space.

Protection fibers - Protection fibers transport nerve impulses from parts of the cerebrum to other parts of the brain and spinal cord.

Soma - The neuron cell body, which contains the nucleus.

Spinothalamic tract - Two spinal cord tracts carrying afferent nerve fibers to the thalamus.
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Stereognosis - The ability to perceive and understand the form and nature of objects by the sense of touch.

Subarachnoid space - Space between pia mater and the arachnoid mater that contains CSF; surrounds the entire brain and spinal cord.

Subdural space - The subdural space is the space below the dura mater, between the dura mater and the arachnoid mater.

Sulcus (sulci) - Groove located on the surface of the brain.

Synapse - Functional connection between a terminal end of one neuron with a membrane of another neuron.

Temporal lobe - Associated with hearing ability, memory acquisition, some visual perceptions, and categorization of objects.

Thalamus - Brain structure in which all sensory stimuli, with the exception of olfactory, are received.

Ventricles - Hollow spaces within the brain that are filled with cerebrospinal fluid.

White matter - White matter is underneath the cerebral cortex which consists of nerve fibers.

Introduction

The neurological history and exam allows the examiner to pinpoint various areas of the brain or nervous system that may be dysfunctional. Specific signs and symptoms manifested by your patient are associated with specific areas of the brain. Nurses observe for signs and symptoms that may be abnormal and link them to general areas of the nervous system that may be causing the disturbance. You must also recognize when further neurological injury is manifesting, intervene appropriately, and notify the physician for a change in plans for the patient.

Integrate the steps of the neurological history with the steps taken during the complete physical examination. It may not be necessary to perform the entire neurological exam on a patient with no suspicion of neurological disorders. You should perform a complete, baseline neurological examination on any patient that has verbalized neurological concerns in their history. Recheck the neuro exam at periodic intervals with any patient that has a neurological deficit (Jarvis, 2011; Shaw, 2012).

History & Examination

The exam and history should be in an orderly, symmetrical fashion. This way, you will be certain that all areas are assessed. Each side of the body should be compared with the other side to detect any abnormalities. When reporting off, it is recommended to perform a brief exam with the oncoming nurse at the bedside. This ensures the subjectivity of your exam is not misinterpreted by the next examiner. It allows for baseline neurological status to be ascertained at the beginning of each shift. Also, when a change in neurological function is experienced by the patient it is more easily identified (Jarvis, 2011).

History Taking: The Adult Patient

Communication during the history and physical must be respectful and performed in a culturally-sensitive manner. Privacy is vital, and the healthcare professional needs to be aware of posture, body language, and tone of voice while interviewing the patient (Jarvis, 2011; Caple, 2011). Take into consideration that a patient's ethnicity and culture may affect the history that the patient provides.

When your adult patient is conscious, you can ask the patient the following history questions. If they are not conscious, sometimes a family member or friend can provide some of this information.

The past medical records may also provide some answers to the following questions as well.

When assessing the nervous system with your adult patient, ask the following:

- Do you have any past history of head injury? (location, loss of consciousness) This question may give you clues to underlying neurological damage that may change your patient's baseline.
- Do you have frequent or severe headaches? (when, where, how often) Pain is a neurological phenomenon or symptom. Most patients do not complain of pain in the neurological history. Their complaints of pain are mentioned more in association with an extremity, back, or head assessment.

Assessing for Syncope & Vertigo

Inquire if there has been any history of dizziness or vertigo. Clarify frequency, precipitating factors, and whether onset is gradual or sudden.

Syncope (fainting) is a sudden lack of strength or a sudden loss of consciousness usually due to a lack of cerebral blood flow.

Vertigo is experienced as a rotational spinning. It is usually due to a neurological disorder or an inner ear disturbance.

Inquire about seizures (when did they start, frequency, course and duration, motor activity associated with, associated signs, post-ictal phase, precipitating factors, medications, and coping strategies).

Seizures typically occur in disorders such as epilepsy. Often, the patient will describe an aura; an auditory, visual, or motor warning of the impending seizure (Jarvis, 2011).

Assessing for Swallowing, Speech & Coordination

Inquire about difficulty in swallowing: solids or liquids, or excessive salivation. Difficulty in swallowing may indicate a possible abnormality with cranial nerves IX and X.

Inquire about difficulty with speech: Forming words or saying what was intended. If the patient answers yes to this question, then ask when it was first noticed and how long did it last.

These questions may clue you in to potential transient ischemic attacks (TIAs), which may be a warning signal for impending stroke.

Inquire about coordination difficulties: Ask the patient to describe in detail. Muscle tone and strength may be affected by both peripheral and central abnormalities (Jarvis, 2011).

Assessing for Neurological Deficits, Mental Illness & Environmental Hazards

Inquire about numbness or tingling: Ask the patient to describe in detail. Abnormal sensations such as numbness or tingling may be referred to as paresthesia.

Inquire about the patient's past neurologic history: Occurrence of a cerebral vascular accident [CVA], spinal cord injury, neurologic infections, or congenital disorders. Specific neurological infections could include meningitis and encephalitis.

Inquire about the patient's stress or presence of any mental health disorders: Anxiety or stress disorder, depression, mania, or schizophrenia. History of excessive stress, anxiety, or known mental health disorders should precipitate a further assessment, including a mini mental status exam.

Inquire about environmental or occupational hazards: Type, length and nature of exposure. Exposure to insecticides, lead, organic solvents, drugs, and alcohol may all manifest in neurological symptoms (Jarvis, 2011; Shaw, 2012).

Test Yourself

Seizures typically occur with:

- A. Stress disorder
- B. Peripheral abnormalities
- C. Epilepsy – correct

Infant, Pediatric, and Elderly Patients

Additional history questions you may wish to ask regarding your infant, pediatric, or aging patients are listed in the table below:

Additional History for Infants	Additional History for Children	Additional History for Elderly Patients
Did the mother have any health problems during pregnancy?	Does the child have any balance problems? Any unexplained falling? Muscle weakness? Difficulty getting up and down stairs?	Any problems with dizziness? If so when does it occur?
Tell me about the baby's birth? Premature or term? Birth weight? Apnea? APGAR scores?	Does the child have any seizures? Describe the circumstances around which they occurred.	Any decrease in memory or change in mental functioning?
Any congenital defects?	Did motor and developmental milestones occur during the appropriate age range?	Any tremors in your hands or face?
Are sucking and swallowing coordinated?	Has your child had any environmental exposure to lead?	Any sudden vision changes or sudden blindness?
Does baby turn his head toward touch?	Any learning problems in school?	Any sudden weakness on one side of the body and not the other?
Does baby startle with a loud noise?	Any family history of neurological disorders?	Ever experience loss of consciousness?

The Complete Neurological Exam

Integrate the steps of the neurological history with the steps taken during the complete examination. It may not be necessary to perform the entire neuro exam on a patient with no suspicion of neuro disorders.

You should perform a complete baseline neurological examination on any patient that has verbalized neuro concerns in their history.

Recheck the neuro exam at periodic intervals with any patient that has a neuro deficit (Jarvis, 2011; Shaw, 2012).

Evaluation of Mental Status

When performing the complete neuro exam, begin by assessing mental status.

The mental status portion of the examination is a series of detailed but simple questions designed to test cognitive ability including:

- The patient's awareness and responsiveness to the environment
- Assessment of the senses, appearance, and general behavior
- Assessment of mood, content of thought, and orientation with reference to time, place, and person

Most healthcare professionals will not perform a detailed mental status exam, but should establish if the patient is oriented to person, place, and time.

Additionally, determine if the patient is alert. If not, what does it take to get them alert: Calling their name, light touch, vigorous touch, pain?

Verbal response to your questions should also be noted (Jarvis, 2011; Malik, 2013).

Mental Status: Appearance & Hygiene

Healthcare professionals should know that many neurological diseases, such as dementia, cause changes in intellectual status or emotional responsiveness, and specific personality features. If other parts of the neurological exam are normal, and you still feel the patient's neurological status is impaired, completion of a full mental status exam may be warranted.

Presenting Appearance: Overall appearance including apparent age, ethnicity, height and weight (average, stocky, healthy, petite), any physical deformities (hearing impaired, injured and bandaged right hand).

Basic Grooming and Hygiene: Appropriateness of attire for age, weather, and situation (physician visit) and the purpose of accessories like glasses or a cane (Jarvis, 2011; Malik, 2013).

Mental Status: Co-ordination, Behavior & Speech

Gait and Motor Coordination: Movement: Is movement awkward, staggering, shuffling, rigid, or trembling with intentional movement or at rest? Is movement speed normal? Is posture slouched or erect? Are there any inappropriate mannerisms or gestures?

Behavior: Is the patient's behavior distant, indifferent, unconcerned, evasive, negative, irritable, depressive, anxious, sullen, angry, assaultive, exhibitionistic, seductive, frightened, alert, agitated or lethargic? Does the patient need minor/considerable reinforcement and soothing? Is the patient's behavior oppositional/resistant, submissive, defensive, open and friendly, candid and cooperative, or exhibits subdued mistrust and hostility or excessive shyness?

Speech: Is the patient's speech delivered at a normal rate and volume, or is it pressured, slow, accented? Describe the enunciation quality, tempo and whether it is loud, quiet or impoverished (Jarvis, 2011; Malik, 2013).

Gait can be evaluated by having the patient walk across the room under observation. Gross gait abnormalities should be noted. Next ask the patient to walk heel to toe across the room, then on their toes only, and finally on their heels only. Normally, these maneuvers should be executed without too much difficulty (New York University School of Medicine, 2006).

Walking on heels is the most sensitive way to test for foot dorsiflexion weakness, while walking on toes is the best way to test early foot plantar flexion weakness (New York University School of Medicine, 2006).

Mental Status: Eye Contact, Comprehension, Memory & Recall

Eye Contact: Does the patient make eye contact or avoid it?

Comprehension: Does the patient appear to understand conversation and instructions? Can the patient express feelings, provide circumstantial and tangential responses, exhibit anomia (difficulty finding words) or misuse words in a low-

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vocabulary-skills way or misuse of words in a bizarre-thinking-processes way? Is there evidence of echolalia (repetition of other people's words), perseveration (the tendency of a memory or thought to persist) or mumbling?

Recall and Memory: Can the patient recall three random words (e.g., Cadillac, zebra, and purple) immediately after two rehearsals, and then again five minutes later (five minutes is how long it takes for information to move from short-term to long term memory).

If they can't, you can prompt them? Can the patient recall your name after 30 minutes? (Jarvis, 2011; Malik, 2013).

Mental Status: Orientation, Attention & Thought Processes

Orientation: Check orientation to person, place, time, presidents and your name. Establish alertness by evaluating for sleepiness, alertness, disinterest or distractibility.

Concentration and Attention: Evaluate based on Digit Span (recall of numbers) and attention to your questions. To test digit span, request that the patient count backwards from 100 to 50 in multiples of 7's or 3's). Or ask the patient to name the days of the week or months of the year in reverse order, or spell the word "world" or their own last name; or recite the ABC's backwards.

Thought Processes: Ask the patient to recall the plot of a favorite movie or book logically, identify if line of reasoning is difficult to follow, or shows loose associations, confabulations, flight of ideas, ideas of reference, illogical thinking, grandiosity, magical thinking, obsessions, perseveration, delusions, or reports experiences of depersonalization (Jarvis, 2011; Malik, 2013).

Mental Status: Hallucinations, Judgment & Intellect

Hallucinations and Delusions: Is there evidence of hallucinations or delusions? Is the patient absent on questioning, or displaying signs of visual, olfactory or auditory hallucinations during testing; which are denied except for times associated with the use of substances or medications?

Judgment and Insight: Is judgment and insight present? This would be evident in explanations of what they did, what happened, and if they expected the outcome to be what it was.

Intellectual Ability: Assess if intellect is average, above average, or below average based on answers to questions like "name last four presidents," "who is the governor of the state?" (Jarvis, 2011; Malik, 2013).

Mental Status: Abstraction Skills, Mood & Affect

Abstraction Skills: Are based on proverbs and sayings ("What do people mean when they say...") or similarities in thought. For example, how two words are alike or different, and giving both definitions for word. An example of this would be: What are two different meanings for the word "right" "bit" or "left?"

Mood: Inquire how the patient feels most days: Happy, sad, despondent, melancholic, euphoric, elevated, depressed, irritable, anxious or angry.

Affect: Is how the patient feels or felt at any given moment: Can include a wide range of emotions like restricted, blunted, flat, inappropriate or labile emotions. Also consider if the affect is consistent with the content of the conversation and facial expressions (e.g. pessimistic or optimistic) as well as inappropriate signs (began dancing in the office, verbally threatened examiner, cried while discussing recent happy event and unable to explain why) (Jarvis, 2011; Malik, 2013).

Mental Status: Testing

A commonly used test of mental status is the Mini Mental State Exam (or Mini Mental Status Exam). [Click here](#) for example.

Mental Status: Additional Clues

Assess the patient for additional clues to mental stability, including assessment of:

Rapport: How difficult is it to establish rapport with the patient: Is it easy to establish, initially difficult but easier over time, difficult to establish, or tenuous and easily upset?

Facial and Emotional Expressions: Does the patient appear to be relaxed, tense, happy, sad, alert, day-dreamy, angry, distrustful / suspicious, or tearful when discussing something? Is the patient anxious? If anxiety is present, how does the patient handle this emotion?

Suicidal and Homicidal Ideation: Suicide ideation is a plan or intent to kill oneself, compared to homicidal ideation, which is the plan or intent to kill another person.

Risk for Violence: Is the patient's risk for violence fair, low, high, uncertain or affected by substance use?

Response to Failure on Test Items: Does this make the patient frustrated, anxious or obsessed; or is the patient unaware?

Impulsivity: Is it low, medium, high, affected by substance use? (Jarvis, 2011; Malik, 2013).

Test Yourself

Concentration and attention can be tested by:

- A. Evaluating the patient's speech pattern and tempo
- B. Use of digit span, by counting numbers backwards by 7's or 3's - correct
- C. Assessing if the patient can understand the conversation and instructions

Twelve Cranial Nerves

The cranial nerves arise directly from the central nervous system. Most often, a neurological problem is detected through the assessment of these nerves. The cranial nerves are composed of twelve pairs of nerves that stem from the nervous tissue of the brain. Some nerves have only a sensory component, some only a motor component, and some both.

The motor components of cranial nerves transmit nerve impulses from the brain to target tissue outside of the brain. Sensory components transmit nerve impulses from sensory organs to the brain.

There are several mnemonics to remember the cranial nerves. Two mnemonics that may be helpful are:

Oh, Oh, Oh, To Touch And Feel Vintage Green Velvet, Simply Heaven

Only Owls Observe Them Traveling And Finding Voldemort Guarding Very Secret Horcruxes

Table of Cranial Nerves

Cranial Nerve Number	Name	Nerve Component	Function
I	Olfactory	Sensory	Smell
II	Optic	Sensory	Vision
III	Oculomotor	Motor	Movement of eyelid and eyeball
IV	Trochlear	Motor	Movement of eyeball- turns eye downward and laterally
V	Trigeminal	Both sensory and motor	Mastication (chewing), movement of lower jaw, sensation of touch (face and mouth), taste
VI	Abducens	Motor	Movement of eyeball- turns eye laterally
VII	Facial	Both sensory and motor	Controls most facial movements, tear secretion, salivation
VIII	Vestibulocochlear (or Auditory)	Sensory	Hearing, equilibrium
IX	Glossopharyngeal	Both sensory and motor	Taste, salivation, swallowing, and senses carotid blood pressure
X	Vagus	Both sensory and motor	Cardiac reflex, senses aortic blood pressure, stimulates gastric and pancreatic secretions, taste
XI	Spinal Accessory	Motor	Controls trapezius & sternocleidomastoid muscles, controls swallowing movements
XII	Hypoglossal	Motor	Tongue movement

(Jarvis, 2011; Shaw, 2012)

Testing Cranial Nerves I and II

1. Cranial nerve I- Olfactory:

- Check that air can move freely through each nostril by occluding one at a time.
- Use an alcohol pad to check sense of smell. With the patient's eyes closed, slowly bring the alcohol pad up towards their nose. The smell is usually detected at a distance of about 3-4 inches

2. Cranial nerve II- Optic:

- Check visual acuity by using either a Snellen eye chart at a distance, or a hand held visual acuity card. If a patient wears glasses, let her/him keep them on. Test each line with the patient until they are not able to read the letters clearly.
- For checking visual fields, face the patient at the same level, about 1-2 feet apart. Have your patient close his/her right eye, while you close your left. Raise your index finger and hold your left arm out until your index finger is just outside your field of vision. Move your finger and begin bringing it in towards your nose. Tell your patient to let you know when he/she sees it; you should both be able to see it at the same time. Do this test from the upper left field, middle field, and lower left field of vision. Repeat the test with the other eye, using your right index finger.
- Pupillary responses should also be tested. This tests both cranial nerves II and III.

Testing Cranial Nerves III through VI

3. Cranial nerve III- Oculomotor; cranial nerve IV- Trochlear; cranial nerve VI- Abducens:

- While patient holds his/her head still, trace an "H" in the air, and have the patient follow your finger with only their eyes.
- An alternate test is tracing a rectangle in the air instead of the "H".

4. Cranial nerve V- Trigeminal:

- Sensory: Have the patient close his/her eyes. Lightly touch above the eye (temporal), on the cheek, and on the jawbone (mandibular), asking patient to ask when he/she feels the touch and where.

- b) Motor: Have the patient clench and grind his/her teeth. While doing so, palpate the temporal and mandibular areas to feel if there is equal strength and movement.
- c) Corneal reflex: Use a small piece of cotton, and touch the outer area of the cornea. The patient should blink in reflex.

Testing Cranial Nerves VII through VIII

5. Cranial nerve VII- Facial:

- a) Observe for facial symmetry with the patient's relaxed expression.
- b) Have the patient wrinkle his/her forehead, smile, puff out cheeks, and frown. The facial expressions should demonstrate symmetry.

6. Cranial nerve VIII- Vestibulocochlear:

- a) Rub your fingers together next to each ear. Ask patient if the sound is the same on both sides.
- b) Whisper a word over the patient's right shoulder and then the left, and ask the patient to repeat the word back to you.
- c) Use a tuning fork by striking on the palm of your hand, and then place on the patient's skull, midline. The patient should be able to hear the ringing equally in both ears.

Testing Cranial Nerves IX through XII

7. Cranial nerve IX- Glossopharyngeal; cranial nerve X- Vagus; cranial nerve XII- Hypoglossal:

- a) Have the patient stick out his/her tongue and say "Ahhhhh." The uvula should be midline, and the palate and uvula should rise. The tongue should also be midline.
- b) Using a tongue blade or a cotton tip swab, touch it at the back of the mouth/uvula. This should elicit the gag reflex.

8. Cranial nerve XI- Spinal Accessory:

- a) Ask your patient to turn his/her head to the left, while you place some resistance against their face with your right hand. Repeat this with the patient turning to the right with resistance. The strength should be equal bilaterally.
- b) Place your hands on the patient's shoulders, and ask him/her to shrug while you place some resistance. The shoulder strength should be equal bilaterally.

Test Yourself

Using an alcohol pad to test a patient's sense of smell is related to which cranial nerve?

- a) Cranial nerve I- Olfactory - correct
- b) Cranial nerve II- Optic
- c) Cranial nerve III- Oculomotor

Inspection and Palpation of the Motor System

A comprehensive inspection and palpation of the motor system includes evaluation of muscle size, strength and tone of muscles.

Inspection and Palpation: Muscle Size

Begin the inspection and palpation of the motor system by examining muscle size.

Does your patient have appropriate size muscles for body type, age, and gender?

Atrophy is abnormally small muscles with a wasted appearance. This can occur with disuse, injury, motor neuron diseases, and muscle diseases.

Hypertrophy (increased size) occurs with athletes and body builders. It is characterized by increased size and strength of muscles.

Inspection and Palpation: Muscle Strength

Test muscle strength against a resistance, using a 0 - 5 scale, with 0 = no movement and 5 = strong muscle strength.

Muscle strength should be equal bilaterally.

When testing muscle strength in the arms ask your patient to do the following against resistance:

- Lift arms away from side
- Push arms towards side
- Pull forearm towards upper arm
- Push forearm away from upper arm
- Lift wrist up; push wrist down
- Squeeze examiners finger
- Pull fingers apart
- Squeeze fingers together (Jarvis, 2011)

Inspection and Palpation: Muscle Tone

When testing muscle strength in the legs ask your patient to do the following against resistance:

- Lift legs up
- Push legs down
- Pull legs apart
- Push legs together
- Pull lower leg towards upper leg
- Push lower leg away from upper leg
- Push feet away from legs
- Pull feet towards legs

When testing muscle strength, abnormalities in muscle tone will become more evident.

Abnormal muscle tone findings can include:

- Limited range of motion
- Pain on motion
- Decreased resistance (flaccidity) or increased resistance (rigidity), or spasticity (Jarvis, 2011)

Involuntary Movements:

Tics, tremors, and fasciculation (involuntary contraction of a muscle) are all examples of abnormal involuntary movements you may note on exam (Jarvis, 2011; Shaw, 2012).

Cerebellar Function

Although the cerebellum does not initiate movements, it interrelates with many brainstem structures in executing various movements, including maintaining proper posture and balance; walking and running; fine voluntary movements as required in writing, dressing, eating, and playing musical instruments; and smooth tracking movements of the eyes.

The cerebellum controls the property of movements, such as speed, acceleration, and trajectory. Checking cerebellar functioning includes testing balance, coordination, and skilled movements.

Assessment of Cerebellar Function: Gait & Romberg's Test

Gait: Have the patient walk heel to toe in a straight line - forwards and backwards. Assess for abnormalities such as stiff posture, staggering, wide base of support, lack of arm swing, unequal steps, dragging or slapping of foot, and presence of ataxia (lack of co-ordination).

Romberg's Test: With eyes closed, have the patient stand with feet together and arms extended to the front, palms up. Your patient should be able to maintain their balance. Stay next to the patient when they are performing this test in particular, so if they begin to fall, you can catch them. Balance should be maintained (Jarvis, 2011).

Assessment of Cerebellar Function: Rapid Alternating Movements

To further assess cerebellar function, rapid alternating movements are assessed, using a variety of quick tests:

The Alternating Palm Slap Test: Have your patient rapidly slap one hand on the palm of the other, alternating palm up and then palm down - test both sides. Abnormal findings might be lack of coordination, or slow, clumsy movements.

The Finger to Finger Test: To perform, have the patient touch your index finger with their index finger, as you move your index finger in the space around them. Patients should be able to do this without missing the mark.

Assessment of Cerebellar Function: Rapid Alternating Movements

The Finger to Nose Test: To perform, have your patient touch their nose with their index finger of each hand with eyes shut. Patients should be able to do this without missing the mark.

The Heel to Shin Test: While standing, have your patient touch the heel of one foot to the knee of the opposite leg. While maintaining this contact, have the patient run the heel down the shin to the ankle. Test each leg. If your patient misses the mark, lower extremity coordination may be impaired.

Assessment of the Sensory System

Testing the sensory system checks the intactness of peripheral nerves, sensory tracts, and higher cortical discrimination. Have your patient close his eyes while checking sensory perception.

Light Touch: Can your patient feel light touch equally on both sides of the body?

Sharp/Dull: Can your patient distinguish between a sharp or dull object on both sides of the body?

Hot/Cold: Can your patient distinguish between a hot or cold object on both sides of the body?

(Jarvis, 2011; Shaw, 2012).

Test Yourself

The Finger to Nose test assesses:

- a) The sensory system
- b) Cerebellar function - correct
- c) Involuntary movements

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Assessing the Spinothalamic Tract

Checking the spinothalamic tract tests your patient's ability to sense pain, temperature, and light touch.

Presence of Pain: Pain can be tested by a simple pin prick with the patient's eyes closed. Abnormal findings would include hypalgesia, hypoalgesia, and analgesia.

Temperature: Temperature should be tested only if pain test is normal. Hot and cold objects may be placed on the patient's skin at various locations bilaterally to test for temperature sensation.

Light touch: With a cotton ball or soft side of a Q-tip, touch the patient's body bilaterally with their eyes closed. Ask them to indicate when you have touched them. Abnormal responses include hypoesthesia, anesthesia, and hyperesthesia.

Assessing the Posterior Column Tract

Assessing the posterior column tract may identify lesions of the sensory cortex or vertebral column.

Vibration: Test the patient's ability to feel vibrations by placing a tuning fork over various bony locations on the patient's toes and feet. If these areas are normal, then you may assume the proximal areas are also normal.

Position: Position or kinesthesia is tested by having the patient close their eyes and move their big toe up and down. The patient should be able to tell you which way their toes are moving.

Assessing the Posterior Column Tract

Tactile discrimination

Tactile discrimination tests the discrimination ability of the sensory cortex. Stereognosis tests the patient's ability to recognize objects by feeling them. You can place car keys, a spoon, a pencil, or other common object in your patient's hand. They should be able to identify that object by feel only. Graphesthesia is the ability to "read" a number "written" in your palm.

Two point discrimination

Two point discrimination tests the brain's ability to detect two distinct pin pricks on the skin. An increase in the distance it normally takes to identify two distinct pricks occurs with sensory cortex lesions (Jarvis, 2011; Shaw, 2012).

Checking Reflexes

Reflexes are involuntary actions in response to a stimulus sent to the central nervous system. Alterations in reflexes are often the first sign of neurological dysfunction such as upper motor neuron disease, diseases of the pyramidal tract, or spinal cord injuries.

Stretch or Deep Tendon Reflexes: Deep tendon reflexes, also known as muscle stretch reflexes, are reflexes elicited in response to stimuli to tendons. Normally, when a specific area of the muscle tendon is tapped with a soft rubber hammer, the muscle fibers contract. Abnormal responses may indicate injury to the nervous system pathways that produce the deep tendon reflex. Deep tendon reflexes can be influenced by age, metabolic factors such as thyroid dysfunction or electrolyte abnormalities, and anxiety level of the patient.

Reflexes & Spinal Nerve Roots

The main spinal nerve roots involved in testing the deep tendon reflexes are summarized in the following table:

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Reflex	Main Spinal Nerve Roots Involved
Biceps	C5,C6
Brachioradialis	C6
Triceps	C7
Patellar	L4
Achilles Tendon	S1

Reflexes & Spinal Nerve Roots

Check the deep tendon reflexes with a reflex hammer to stretch the muscle and tendon. The limbs should be in a relaxed and symmetric position. Strike the reflex hammer across the selected tendon with a moderate tap. If you cannot elicit a reflex, you can sometimes bring it out by certain reinforcement procedures. For example, have the patient grit their teeth then try to elicit the reflex again. Or you may have them clench their fists together when checking lower extremity reflexes.

A video demonstrating the deep tendon reflexes can be viewed [here](#).

Rating Deep Tendon Reflexes

When reflexes are very brisk, clonus is sometimes seen. This is a repetitive vibratory contraction of the muscle that occurs in response to muscle and tendon stretch.

Deep tendon reflexes are often rated according to the following scale:

Rating	Reflex Response
0	Absent reflex
1+	Race, or seen only with reinforcement
2+	Normal
3+	Brisk
4+	Non-sustained clonus (i.e., repetitive vibratory movements)
5+	Sustained clonus

Deep tendon reflexes are considered normal if they are 1+, 2+, or 3+. Reflexes that are asymmetric, or there is a large difference between the arms and legs, or are rated as 0, 4+, or 5+ abnormal (Jarvis, 2011; Shaw, 2012).

Absence of superficial reflexes or unilateral suppression of superficial reflexes often results from upper motor lesions subsequent to a stroke. Presence of primitive reflexes in adults is often a sign of frontal lobe lesions.

Superficial Reflexes

The following superficial reflexes are considered normal in adults:

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Upper Abdominal: Ipsilateral contraction of abdominal muscles on the stroked side.

Lower Abdominal: Ipsilateral contraction of abdominal muscles on the stroked side.

Cremasteric: Stroke inner thigh, elicits elevation of testes.

Superficial Reflexes

Below is a video demonstrating testing of the superficial abdominal reflexes.

Link to video: <http://www.youtube.com/watch?v=4oo1oDQSFps>

Test Yourself

Which statement describes reflexes?

- a) Involuntary actions in response to a stimulus sent to the central nervous system - correct
- b) Abnormal responses to external stimuli
- c) Voluntary actions that a patient can control

The Neurological Recheck Exam

Perform the neurological recheck exam at periodic intervals with any patient that has a neuro deficit. This exam is also useful for your inpatient with a head injury or systemic disease process that may be manifesting as a neuro symptom. When performing this abbreviated exam, carefully evaluate the following:

Vital Signs

Is there a change in vital signs from patient's baseline?

Pain - does your patient have pain? Use a rating scale.

Level of Consciousness

(Monitors for signs of increasing intracranial pressure)

Is your patient oriented to person, place, and time? What about event- do they know why they are there?

Is your patient alert? If not, what does it take to get them alert - calling their name, light touch, vigorous touch, pain?

Are your patient's responses to questions appropriate? Is speech intelligible?

Rechecking Motor Function

Assess your patient's position (looking for any abnormal positioning or posturing).

Ask your patient to squeeze your fingers with their hands and let go; test both sides at same time for bilateral comparison (tests for strength and symmetry of strength in the upper extremities).

Ask your patient to push and pull their arms toward and away from you when their elbows are bent. Provide some resistance; test both sides at same time for bilateral comparison (tests for strength and symmetry of strength in upper extremities).

Ask your patient to dorsiflex and plantarflex their feet, while providing some resistance; test both sides at same time for bilateral comparison (tests for strength and symmetry of strength in lower extremities).

Ask your patient to perform straight leg raises with and without resistance (tests for strength and symmetry of strength in lower extremities).

Rechecking Sensory Function

Test your patient's ability to feel light touch on each extremity; compare bilaterally as well as upper and lower extremities.

Test your patient's ability to distinguish between a sharp or dull object on each extremity; compare bilaterally as well as upper and lower extremities.

Pupillary Response

Size, shape, and symmetry of both pupils should be the same. Note the size in mm before shining light.

Each pupil should constrict briskly when a light is shined into the eyes. Note the size in mm after constriction, and how long in seconds each eye takes to constrict.

Each pupil should have consensual light reflex.

The Glasgow Coma Scale

The Glasgow Coma Scale assesses how the brain functions as whole and not as individual parts (Altman, 2010). The scale assesses three major brain functions: eye opening, motor response, and verbal response. A completely normal person will score 15 on the scale overall.

Scores of less than 7 reflect coma. Using the scale consistently in the setting allows healthcare providers to share a common language and monitor for trends across time (Jarvis, 2011; Altman, 2010).

Glasgow Coma Scale	
Best Eye Opening Response	1 = No response
	2 = To pain
	3 = To speech
	4 = Spontaneously
Best Motor Response	1 = No response
	2 = Extension – abnormal
	3 = Flexion - abnormal
	4 = Flexion – withdrawal
	5 = Localizes pain
	6 = Obeys verbal commands
Best Verbal Response	1 = No response
	2 = Sounds - incomprehensible
	3 = Speech - inappropriate
	4 = Conversation - confused
	5 = Oriented X 3

Conclusion

Integrating the neurological health history and physical exam takes practice. It is not enough to simply ask the right questions and perform the physical exam. As the patient's nurse, you must critically analyze all of the data you are obtaining, synthesize the data into relevant problem areas, and identify a plan of care for your patient based upon this synthesis. As the plan of care is being carried out, reassessments must occur on a periodic basis. How often these reassessments occur is unique to each patient and is based upon their physical disorder. Knowing when and how often to reassess is based on the specific patient, evidence presented, and facility policies, standards, and protocols.

References

- Altman, G.B. (2010). *Fundamental and advanced nursing skills* (3rd ed.). Clifton Park, NY: Delmar.
- Berman, A., Snyder, S., Kozier, B., & Erb, G. (2008). *Kozier & Erb's Fundamentals of nursing: Concepts, process, and practice*, (8th ed.). Upper Saddle River, N.J.: Pearson Education, Inc.
- Caple, C. (2011). *Physical assessment: Performing- cultural considerations*. Glendale, CA: Cinahl Information Systems.
- Hebbin, N., & Milberg, W. (2009). *Essentials of neuropsychological assessment*. Hoboken, NJ: John Wiley & Sons.
- Hines, T. (2013). *Anatomy of the brain*. Retrieved September, 2014 from <http://www.mayfieldclinic.com/PE-AnatBrain.htm#.VBXzx9h0zIU>
- Jarvis, C. (2011). *Physical examination and health assessment* (6th ed). St. Louis: W.B. Saunders.
- Malik, A. (2013). *Neuropsychological evaluation*. Retrieved September, 2014 from <http://emedicine.medscape.com/article/317596-overview>
- Mosby Company. (2012). *Mosby's medical dictionary* (9th ed.). New York: Elsevier.
- Shaw, M. (2012). *Assessment made incredibly easy* (5th ed.). Philadelphia, PA: Lippincott Williams & Wilkins.

Venes, D. (ed.) (2013). Tabers® cyclopedic medical dictionary (22nd ed.). Philadelphia: F.A. Davis Co.

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