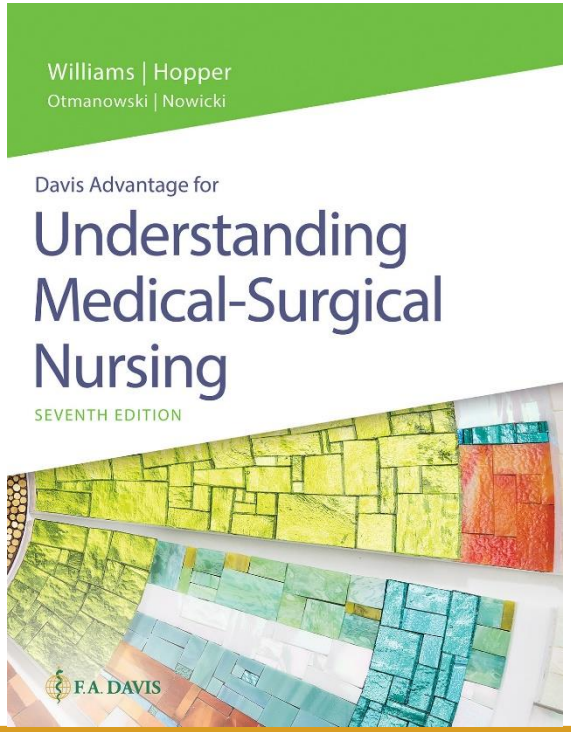


Chapter 47

Neurological System Function, Data Collection, and Therapeutic Measures

Learning Outcomes

- Describe the normal structures and functions of the nervous system.
- Identify the effects of aging on the nervous system.
- List data to collect when caring for a patient with a disorder of the nervous system.
- Identify tests used to diagnose disorders of the nervous system.

Learning Outcomes (continued)

- Assist in planning nursing care for patients undergoing diagnostic tests for disorders of the nervous system.
- Describe common therapeutic measures used for patients with disorders of the nervous system.

Multipolar Neuron Structure

The **cell body** (also called the **soma**) is the control center of the neuron and contains the nucleus.

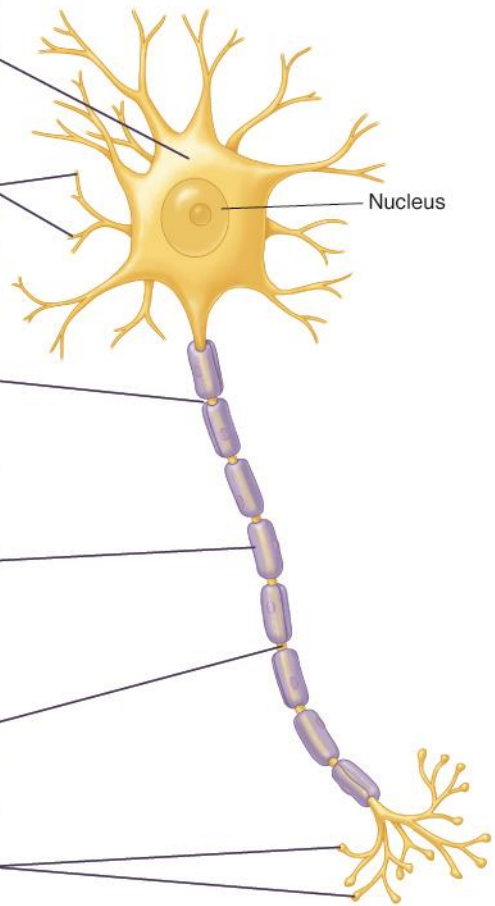
Dendrites, which look like the bare branches of a tree, receive signals from other neurons and conduct the information to the cell body. Some neurons have only one dendrite; others have thousands.

The **axon**, which carries nerve signals away from the body, is longer than the dendrites and contains few branches. Neurons have only one axon; however, the length of the fiber can range from a few millimeters to as much as a meter.

The axons of many (but not all) neurons are encased in a **myelin sheath**. Consisting mostly of lipid, myelin acts to insulate the axon. In the peripheral nervous system, Schwann cells form the myelin sheath. In the CNS, oligodendrocytes assume this role.

Gaps in the myelin sheath, called **neurofibral nodes** (previously called **nodes of Ranvier**), occur at evenly spaced intervals.

The end of the axon branches extensively, with each axon terminal ending in a **synaptic knob**. Within the synaptic knobs are vesicles containing a neurotransmitter.



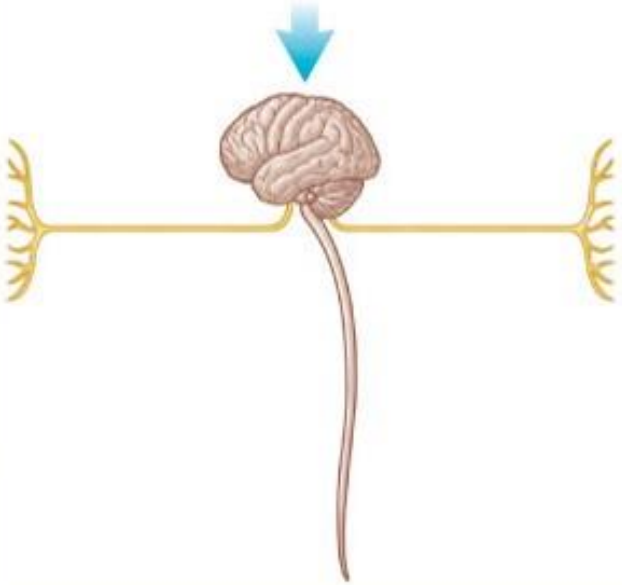
Neurons

Sensory neurons

Sensory (afferent) neurons detect stimuli—such as touch, pressure, heat, cold, or chemicals—and then transmit information about the stimuli to the CNS.

Interneurons

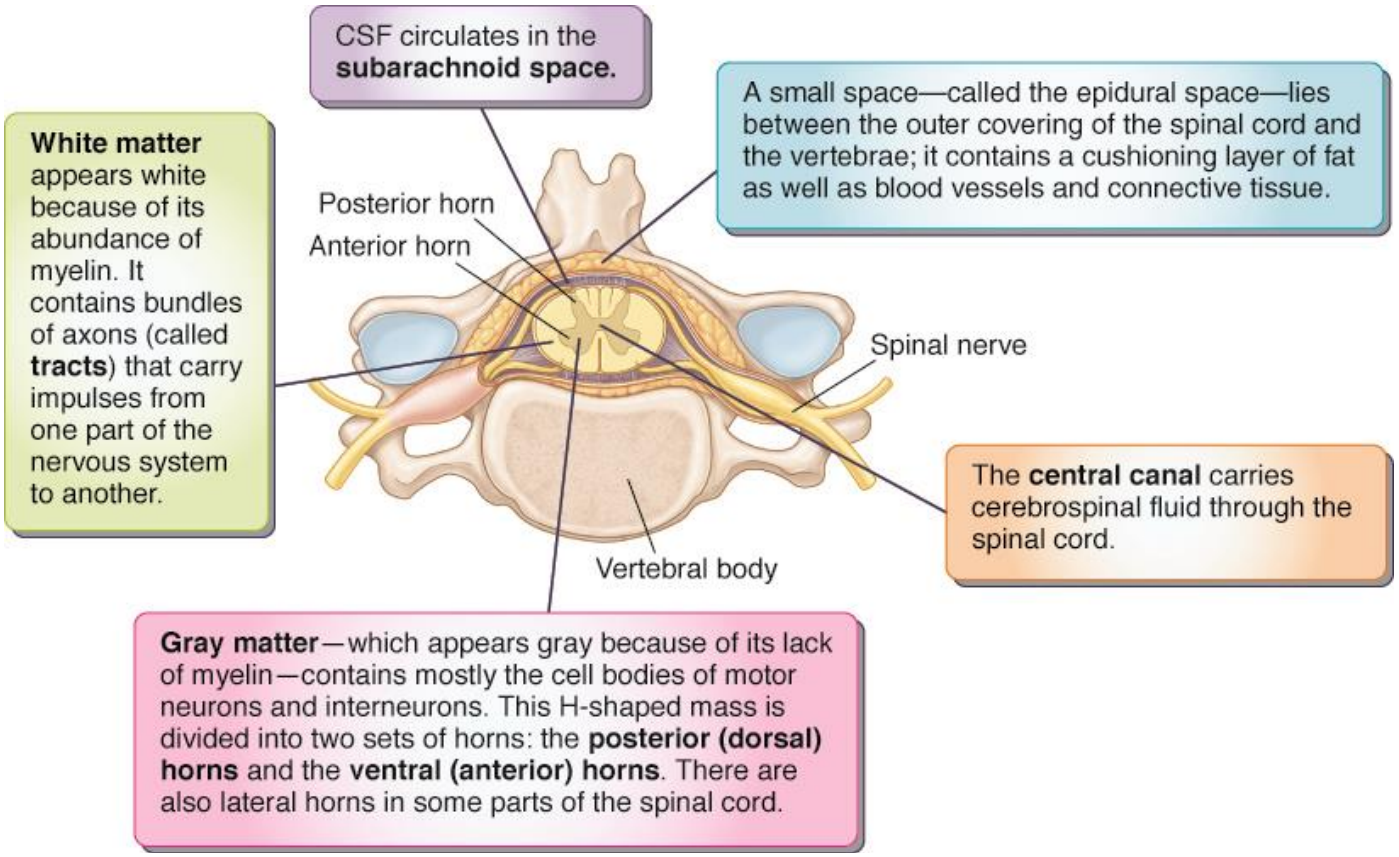
Interneurons, which are found only in the CNS, connect the incoming sensory pathways with the outgoing motor pathways. Besides receiving, processing, and storing information, the connections made by these neurons make each of us unique in how we think, feel, and act.



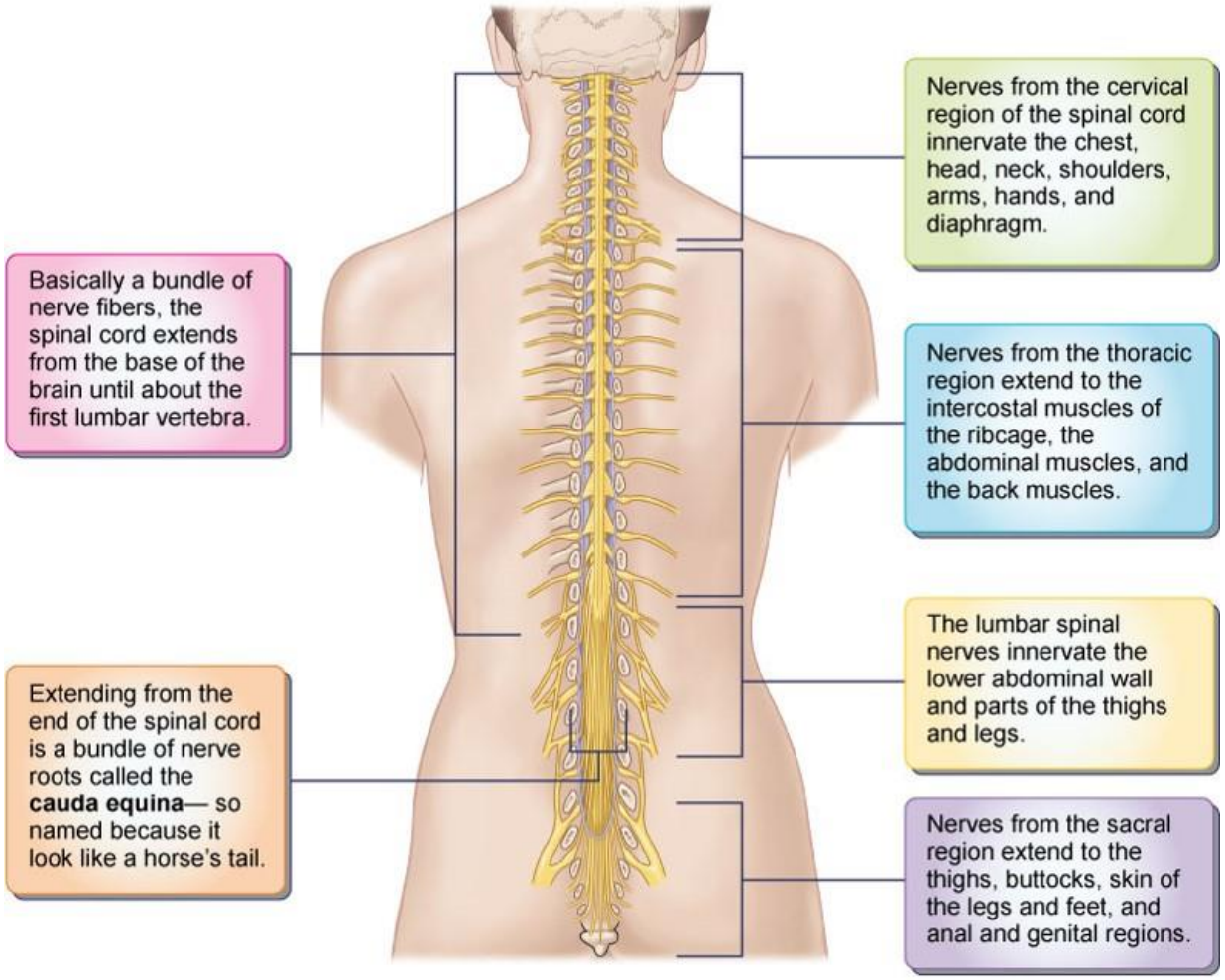
Motor neurons

Motor (efferent) neurons relay messages from the brain (which the brain emits in response to stimuli) to the muscle or gland cells.

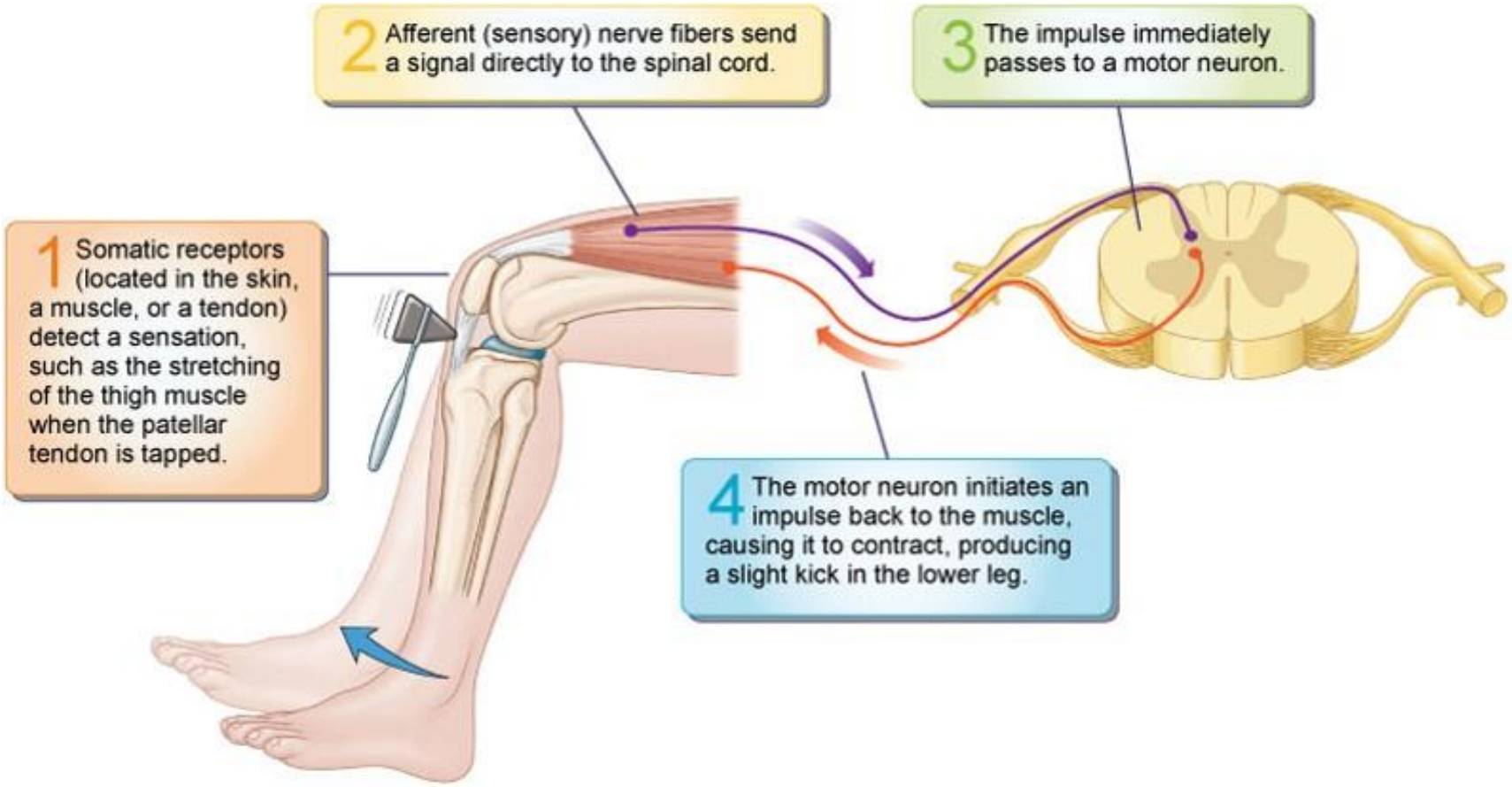
Cross-Section of Spinal Cord



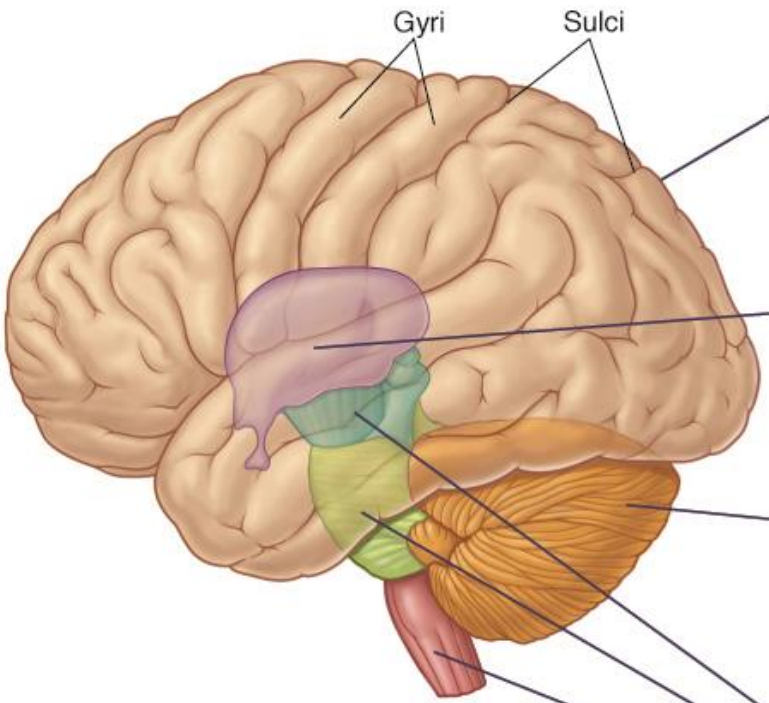
Spinal Cord



Reflex Arc



Brain



The **cerebrum** is the largest portion of the brain. Its surface is marked by thick ridges called **gyri** (singular: **gyrus**). Shallow grooves called **sulci** (singular: **sulcus**) divide the gyri. Deep sulci are called **fissures**.

The **diencephalon** sits between the cerebrum and the midbrain.

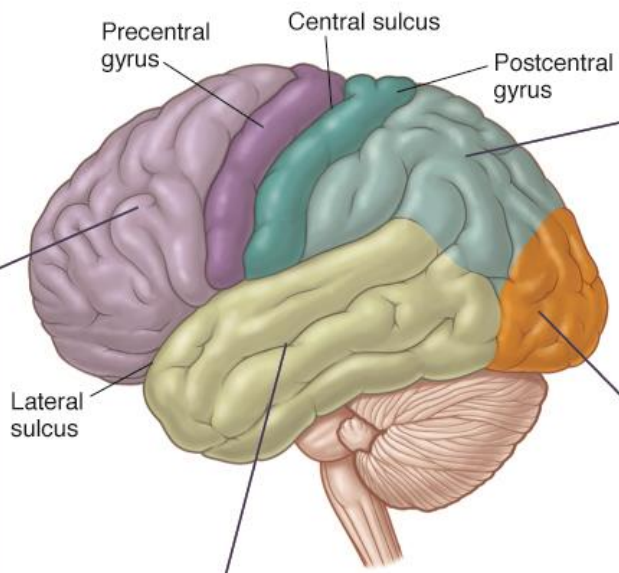
The **cerebellum** is the second largest region of the brain.

The **brainstem** makes up the rest of the brain. It consists of three structures:
- Midbrain
- Pons
- Medulla oblongata

Cerebrum

Frontal Lobe

- Central sulcus forms the posterior border
- Contains the motor areas that generate impulses that bring about voluntary movement
- Each motor area controls movement on the opposite side of the body
- Usually prominent in the left hemisphere, Broca's motor speech area controls the movements involved in speaking
- Personality aspects include: initiative, emotion, judgment, reasoning, conscience



Parietal lobe

- Central sulcus forms the anterior border
- Receives, perceives, and interprets the somatic senses and taste (gustation)

Occipital lobe

- Contains the visual areas that receive and interpret sight

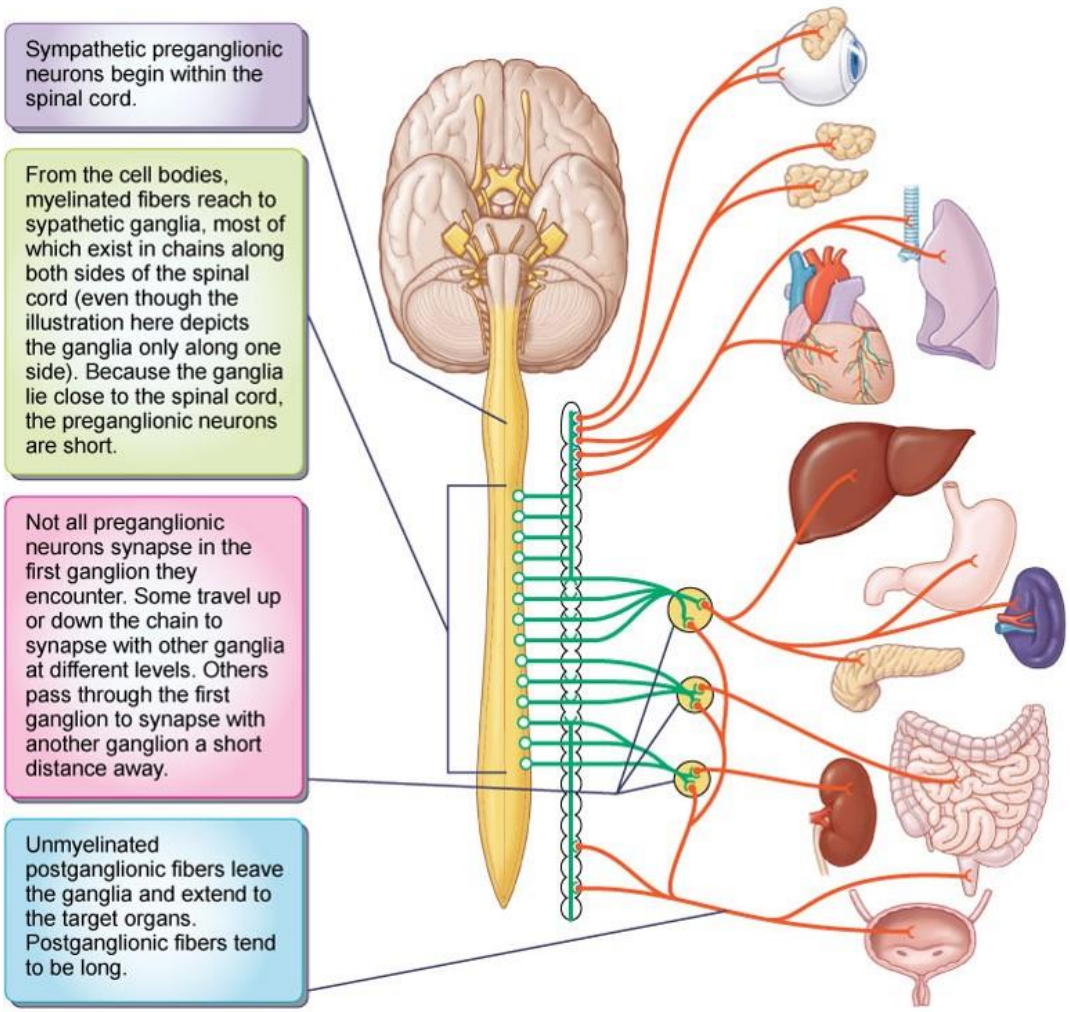
Temporal lobe

- Separated from the parietal lobe by the lateral sulcus
- Contains sensory areas for hearing and olfaction (smell)
- Visual recognition
- Also in the temporal and parietal lobes, usually only on the left side, is Wernicke's area where comprehension of speech occurs.

Cranial Nerves

- Olfactory
- Optic
- Oculomotor
- Trochlear
- Trigeminal
- Abducens
- Facial
- Vestibulocochlear
- Glossopharyngeal
- Vagus
- Accessory
- Hypoglossal

Sympathetic Nervous System



Parasympathetic Nervous System

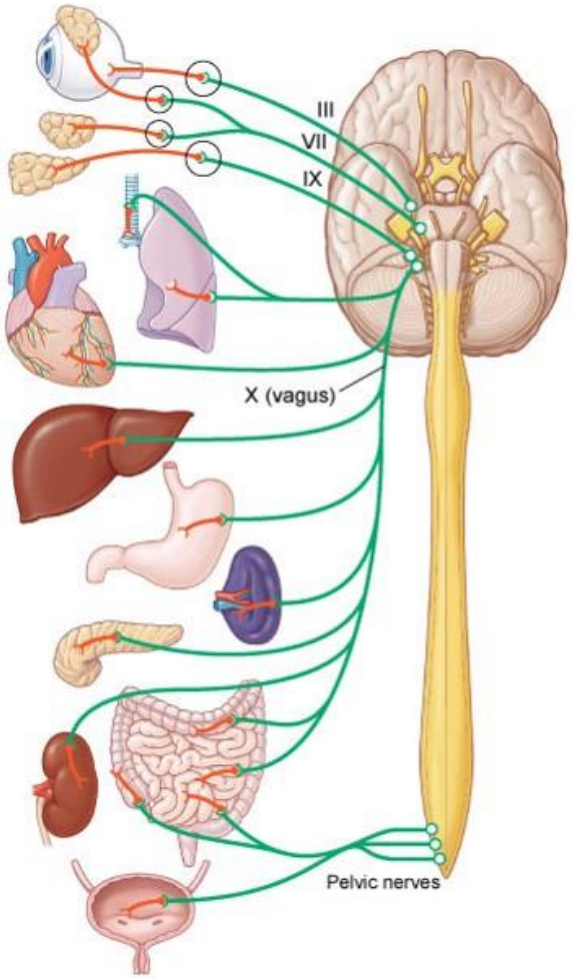
Parasympathetic fibers leave the brainstem by joining one of the following cranial nerves:

- **Oculomotor nerve (III):** Parasympathetic fibers carried in this nerve innervate the ciliary muscle, which thickens the lens of the eye, and the pupillary constrictor, which constricts the pupil.
- **Facial nerve (VII):** These parasympathetic fibers regulate the tear glands, salivary glands, and nasal glands.
- **Glossopharyngeal nerve (IX):** The parasympathetic fibers carried in this nerve trigger salivation.
- **Vagus nerve (X):** This nerve carries about 90% of all parasympathetic preganglionic fibers. It travels from the brain to organs in the thoracic cavity (including the heart, lung, and esophagus) and the abdominal cavity (such as the stomach, liver, kidneys, pancreas, and intestines).

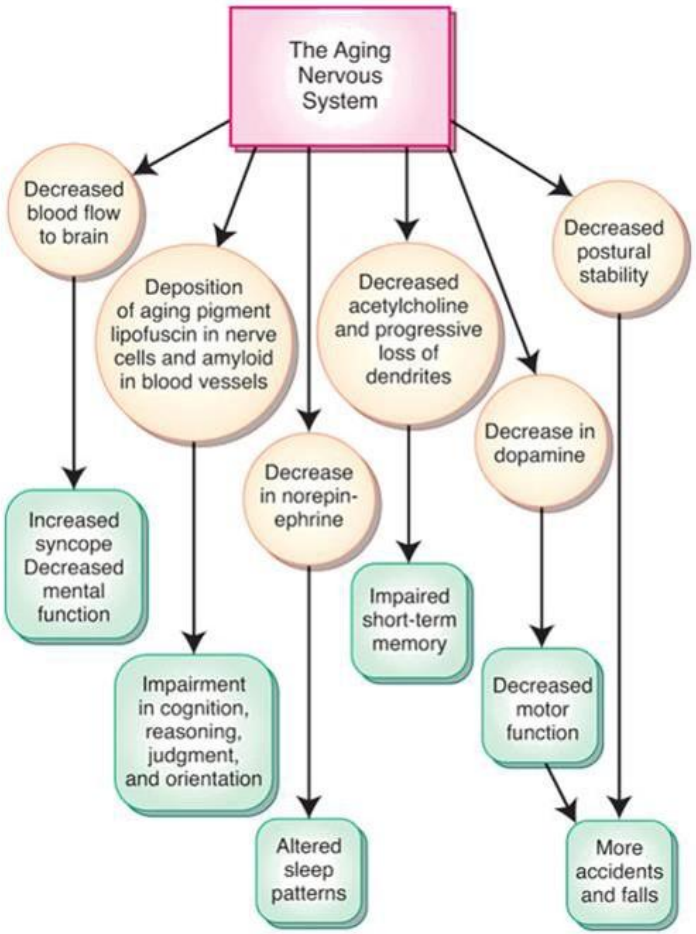
Parasympathetic fibers leave the sacral region by way of pelvic nerves and travel to portions of the colon and bladder.

Unlike the ganglia of the sympathetic division, the ganglia of the parasympathetic division reside in or near the target organ. As a result, the preganglionic fibers of the parasympathetic division are long while the postganglionic fibers are short.

Because the ganglia are more widely dispersed, the parasympathetic division produces a more localized response than that of the sympathetic division.



Aging



Basic Neurological Assessment

- Level of consciousness
- Vital signs
- Pupil response to light
- Extremity strength and movement
- Sensation

History

- Symptoms
- Medication use
- Surgical history
- Family history
- Lifestyle
- **WHAT'S UP?**

Subjective Data

- Mental status
- Intellectual function
- Thought content
- Perception
- Language ability
- Memory
- Pain

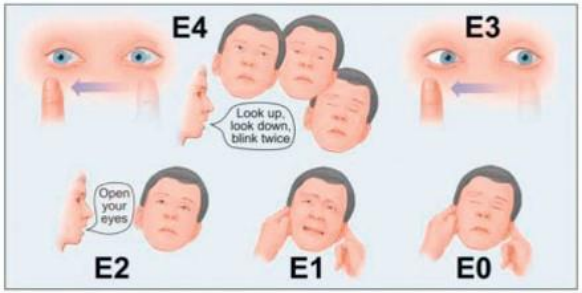
Physical Assessment

- Level of consciousness
- Mental state examination
- Pupillary response
- Muscle function
- Cranial nerve function

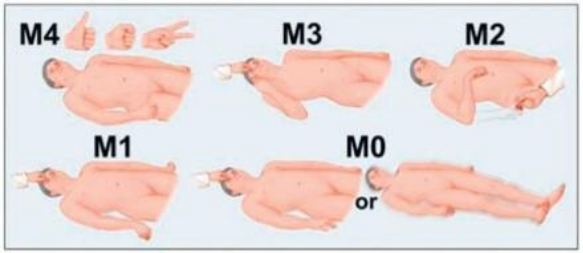
Glasgow Coma Scale

- Eye opening
- Verbal response
- Motor response
  - Posturing

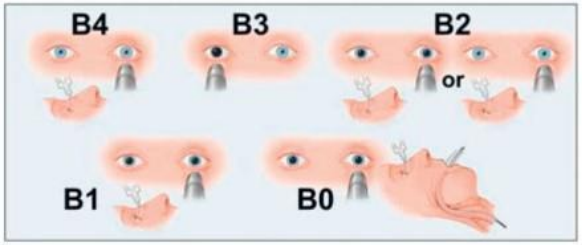
FOUR Score Coma Scale



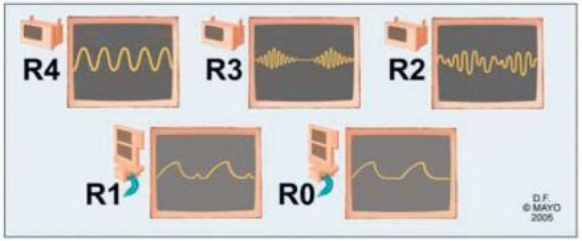
Eye response
4 = eyelids open or opened, tracking, or blinking to command
3 = eyelids open but not tracking
2 = eyelids closed but open to loud voice
1 = eyelids closed but open to pain
0 = eyelids remain closed with pain



Motor response
4 = thumbs-up, fist, or peace sign
3 = localizing to pain
2 = flexion response to pain
1 = extension response to pain
0 = no response to pain or generalized myoclonus status



Brainstem reflexes
4 = pupil and corneal reflexes present
3 = one pupil wide and fixed
2 = pupil or corneal reflexes absent
1 = pupil and corneal reflexes absent
0 = absent pupil, corneal, and cough reflexes



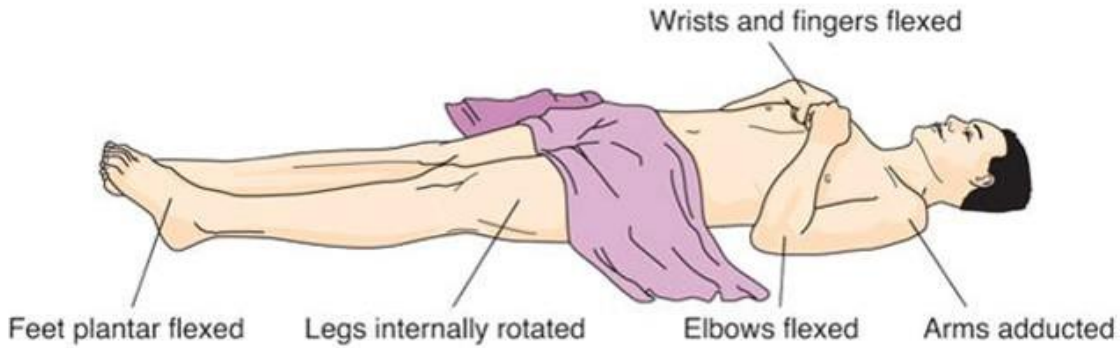
Respiration
4 = not intubated, regular breathing pattern
3 = not intubated, Cheyne-Stokes breathing pattern
2 = not intubated, irregular breathing
1 = breathes above ventilator rate
0 = breathes at ventilator rate or apnea

BE FAST

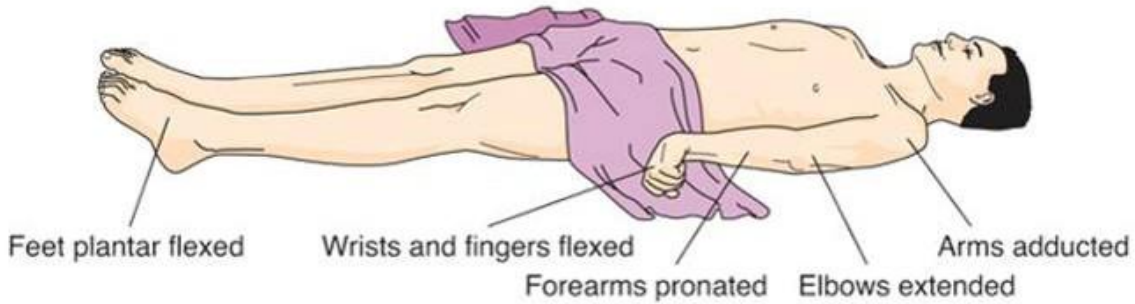
- **B**alance: Loss of balance or coordination
- **E**yes: Vision trouble
- **F**ace: Face drooping
- **A**rms: Weakness or numbness on one side
- **S**peech: Slurred or garbled speech
- **T**ime: Take note of when symptoms began and get immediate intervention

Abnormal Posturing

A. Decorticate posturing

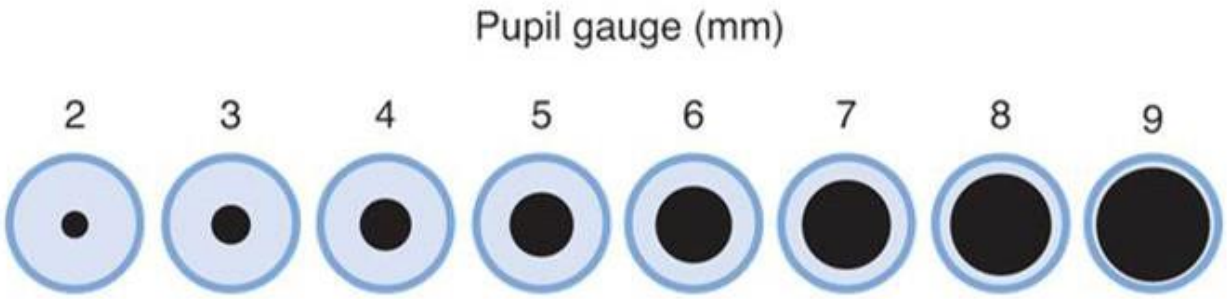


B. Decerebrate posturing



Pupil Assessment

- Equal
- Round
- Reactive to light
- Reactive to accommodation



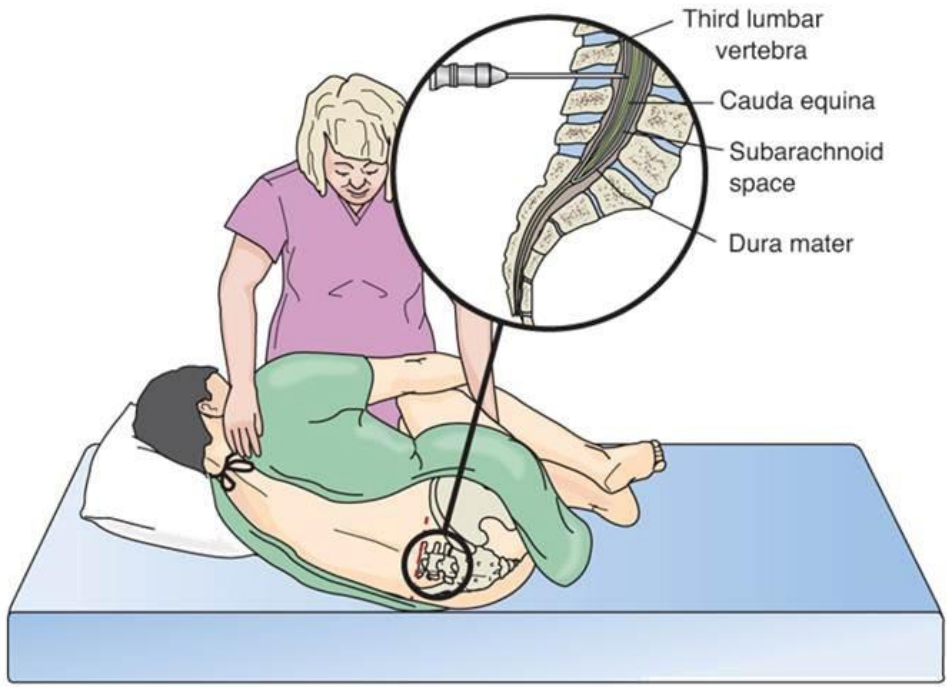
Diagnostic Tests

- Laboratory tests
  - Thyroid
  - Vitamin B12
  - Complete blood count
  - Creatine kinase
  - Erythrocyte sedimentation rate
  - Electrolytes
  - Hormone levels
  - Venereal Disease Research Laboratory
  - Liver function
  - Renal function

Lumbar Puncture

- Preprocedure care
  - Verify informed consent.
  - Assist with positioning.
- Postprocedure care
  - Maintain flat bedrest 6 to 8 hours as ordered by health-care provider (HCP).
  - Encourage fluids.
  - Monitor puncture site.
  - Monitor movement, sensation, and presence of headache.

Lumbar Puncture (continued)



Computed Tomography (CT) Scan

- Preprocedure care
  - Administer contrast dye if ordered.
    - Check allergies.
  - Request order for sedation if indicated.
- Postprocedure care
  - Encourage fluids if contrast dye used.
- Teach
  - Contrast dye may cause feeling of warmth.
  - Signs and symptoms of allergic reaction to report

Magnetic Resonance Imaging (MRI)

- Preprocedure care
  - Assure no pacemaker or metal on patient.
  - Administer analgesic or sedative as ordered.
  - Teach relaxation.
- Postprocedure care
  - No special care

Angiogram

- Preprocedure care
  - Verify informed consent.
  - Give clear liquid diet if ordered.
  - Insert IV catheter.
  - Administer sedation as ordered.

Angiogram (continued)

- Postprocedure care
  - Keep flat in bed 4 to 6 hours.
  - Keep pressure (sandbag) on site for 3 to 6 hours.
  - Monitor.
    - Vital signs
    - Catheter insertion site
    - Pulses
  - Encourage fluids.

Myelogram

- Preprocedure care
  - Check allergies to contrast and shellfish.
  - Assess history of seizures.
  - Verify informed consent.
- Postprocedure care
  - Similar to lumbar puncture
  - Encourage fluids.
  - Head of bed elevated 30 degrees

Electroencephalogram

- Preprocedure care
  - Assure hair is clean and dry.
  - Check medication orders.
- Postprocedure care
  - Wash hair.

Therapeutic Measures

- Moving and positioning
  - Maintain functional positions.
  - Avoid injury.
  - Prevent contracture.
  - Mobilize ASAP.

Activities of Daily Living

- Encourage independence based on functional level.
- Maintain routine.
- Provide assistance as needed.

Communication

- Problems
  - Dysarthria
  - Expressive aphasia
  - Receptive aphasia
- Interventions
  - Use care with yes/no questions.
  - Correct substituted words.
  - Anticipate needs.
  - Use gestures.
  - Be patient!

Nutrition

- Evaluate swallowing.
- Interventions for impaired swallowing
  - Thicken liquids.
  - Position upright for eating.
  - Monitor meals.
  - Provide enteral (tube) feedings.

Practice Analysis Tip
Linking NCLEX-PN® to Practice

- The licensed practical nurse/licensed vocational nurse (LPN/LVN) will
  - Provide care that meets the needs of the adult client age 65 years and older.
  - Use precautions to prevent injury and/or complications associated with a procedure or diagnosis.
  - Perform focused data collection based on client condition (e.g., neurological checks, circulatory checks).

Practice Analysis Tip
Linking NCLEX-PN® to Practice (continued)

- Assist with the performance of a diagnostic or invasive procedure.

Case Study for ISBARR Communication

You are a nurse at South Side Care Home. Mrs. Romano is 84 years old with a history of type 2 diabetes. She has had an elevated blood pressure for several hours and now reports severe headache and double vision. You notice she is having difficulty speaking and raising her right hand.

ISBARR Communication: Activity

- You are preparing to call the on-call physician.
- Think about the information you should include in the phone call.
- Now turn to your neighbor and communicate a phone call using ISBARR.
- Afterwards, review suggested ISBARR report on next slide.

ISBARR Communication: Suggested Answers

- **Identify:** Your name, title
- **Situation:** Mrs. Romano is an 84-year-old resident.
- **Background:** She has a history of type 2 diabetes.
- **Assessment of Situation:** Mrs. Romano has had an elevated BP today: 160/90 to 180/100. She is complaining of a severe headache and double vision.

ISBARR Communication: Suggested Answers (continued)

- **Recommendation:** I would like to have her transferred to the hospital via ambulance.
- **Read back/Repeat:** Restate message received.

Review Question #1

The patient's pupils remain at 3 mm when the penlight is shined over the eyes. What cranial nerve are you concerned may be damaged?

1. Optic
2. Oculomotor
3. Abducens
4. Facial

Review Question #1 Answer

Correct Answer: 2

Review Question #2

Which cranial nerve contributes to control of heart rate and blood pressure?

1. Trochlear
2. Abducens
3. Vagus
4. Accessory

Review Question #2 Answer

Correct Answer: 3

Review Question #3

Which of the following is a parasympathetic response? *Select all that apply.*

1. Increased heart rate
2. Dilated pupils
3. Relaxed urethral sphincter
4. Relaxed urinary bladder
5. Dilated bronchioles
6. Increased salivation

Review Question #3 Answer

Correct Answer: 3, 6

All others are sympathetic responses.

Review Question #4

What does the FOUR Score tool evaluate?

1. Mental status
2. Confusion
3. Cranial nerves
4. Coma

Review Question #4 Answer

Correct Answer: 4

Review Question #5

The older adult female patient is experiencing facial droop, dysphagia, and receptive aphasia after a stroke. What is the most important intervention for this patient?

1. Encouraging regular visitation from grandchildren
2. Collaborating with physical and occupational therapy
3. Using a communication board with common pictures.
4. Ensuring mealtimes are supervised and not rushed

Review Question #5 Answer

Correct Answer: 4