Neurologic Examination

Statement of Goals

Understand and perform the neurological examination.

Learning Objectives

A. Describe the anatomy and function of the central and peripheral nervous system in relation to the clinical neurologic examination.
B. List and describe the seven components of the neurological examination.
   1. Mental status
   2. Cranial nerves
   3. Motor
   4. Sensory
   5. Cerebellar
   6. Station and gait
   7. Reflexes
C. Describe and demonstrate assessment of the motor system: muscle bulk, involuntary movements, tone, and strength. Define the scale used to grade muscle strength.
D. Describe and demonstrate assessment of the sensory system: pain, position and vibration, light touch, and discriminative sensations.
E. Describe and demonstrate assessment of the cerebellar system: rapid alternating movements and point-to-point movements.
F. Describe how sensory input, central processing and effector function are interrelated and enable balance and gait. Describe and demonstrate assessment of stance and gait: gait, tandem gait, toe and heel walking, Romberg, and pronator drift.
G. Describe and demonstrate assessment of deep tendon and superficial reflexes. Define the scale used to grade reflexes.
H. Define and describe infantile automatisms (primitive reflexes) in the pediatric neurological exam: grasp, asymmetric tonic neck, and Moro (startle).
I. Describe the usual biological changes of the nervous system that occur with the aging process and how they affect physical findings.
J. Demonstrate the neurologic examination with all seven components.
K. Document the neurologic examination in the format of the medical record.

Student’s Preparation for the Unit

Special Instructions:

Bates includes cerebellum and gait in the motor exam. Other texts divide the components.
of the neurologic exam differently. We will be using the seven components described in the objectives.

The neurologic examination described provides a fairly comprehensive repertoire of assessment skills. A more abbreviated examination may be appropriate for a patient without neurologic symptoms. A more detailed assessment would be indicated in a patient with complex neurologic problems.

Next year, you will learn to organize a comprehensive physical examination by regions of the body. For example, the neurologic evaluation of the extremities will be integrated with the examination of joints and peripheral pulses.

Curriculum Comments

Objective C:

Motor - Know how to test strength in the following muscle groups. Note that you will have tested multiple nerve roots and peripheral nerves. You will have tested both proximal and distal muscle strength in the upper and lower extremities.

| Shoulder abduction (deltoid) | Hip flexion (iliopsoas) |
| Forearm extension (triceps) | Hip adduction |
| Forearm flexion (biceps) | Hip abduction |
| Extension of hand at wrist | Knee extension (quadriceps) |
| Grip strength | Knee flexion (hamstrings) |
| Finger abduction | Ankle dorsiflexion |
| Opposition of thumb | Ankle plantar flexion |
|                        | Great toe dorsiflexion |
|                        | Great toe plantar flexion |

Grip strength is frequently tested. However, since the grip is one of the strongest motor functions, this test may not be very sensitive for subtle weakness. Finger abduction (ulnar nerve) and opposition of thumb (median nerve) are more helpful tests.

For a brief "screening" exam, lower extremities can be evaluated with functional tests:

- Shallow knee bends on one leg at a time test hip and knee extensors.
- Rising from a chair (without arm support) also tests proximal strength.
- Toe walking and heel walking test plantar and dorsiflexion at the ankle.
**Objective D:** Sensory

**Pain** - We will be using wooden swab sticks. Break one in half, using the splintered wood as "sharp" and the cotton as "dull." NOTE that if you ever use safety pins, they must be discarded after one use. If you suspect that pain sensation is abnormal, then test temperature sensation.

**Vibration** - Since both vibration and position involve posterior columns, either one will usually suffice. To test vibration use a 128 Hz tuning fork.

**Light touch** - Ask the patient to close his/her eyes and respond to each touch with its location ("right leg," "left arm," etc.) Be sure to touch each side individually and both sides together. Simultaneous stimulation may detect abnormalities in the sensory cortex.

**Discriminative sensations** - Stereognosis (for example, identifying a coin without looking) requires that touch, position, and the sensory cortex all be intact. Therefore, it is a useful screening test, even in a brief neurologic exam.

**Objective F:**

The body uses a complex "postural control" system to enable balance and gait. You can divide the system into sensory input, central processing, and effector components. One or more deficits in these three components may impair postural control and lead to instability or falls.

<table>
<thead>
<tr>
<th>Sensory Input</th>
<th>Central Processing</th>
<th>Effector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vision</td>
<td>Central control of coordination and speed</td>
<td>Muscle strength</td>
</tr>
<tr>
<td>Proprioception</td>
<td>Cognitive control of judgment and attention</td>
<td>Joint flexibility</td>
</tr>
<tr>
<td>Peripheral sensation</td>
<td></td>
<td>Endurance</td>
</tr>
<tr>
<td>Vestibular function</td>
<td></td>
<td>Foot function</td>
</tr>
</tbody>
</table>

**Objective H:**

**Pediatric neurologic Exam - Primitive Reflexes**

Failure to develop these primitive reflexes suggests a profound neurologic deficit. The persistence of the reflex(es) beyond the time of expected disappearance is a helpful clue to possible neurologic disease.
<table>
<thead>
<tr>
<th>Reflex</th>
<th>Appearance</th>
<th>Disappearance</th>
<th>Concern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moro</td>
<td>birth</td>
<td>4 mos.</td>
<td>absence, asymmetric response or persistence &gt; 4-6 mos.</td>
</tr>
<tr>
<td>palmar grasp</td>
<td>birth</td>
<td>3-4 mos.</td>
<td>absence or persistence &gt; 4 mos.</td>
</tr>
<tr>
<td>asymmetric tonic neck</td>
<td>birth to 2 mos</td>
<td>6 mos.</td>
<td>Abnormal if it occurs each time the maneuver is done, or if it persists after 6 mos.</td>
</tr>
</tbody>
</table>

_Different sources may vary as to precisely when the primitive reflexes appear and disappear in a normal infant._

**Objective I**

In older adults gait may change with decreased speed and agility. Reflexes, especially gag and ankle, may be diminished. Vibration sensation may be diminished in the feet, but should be present in the hands. Position sense is ordinarily intact.

**Objective K:**

Documentation of a neurologic exam as part of the medical record can be found in Bates pp. 20 and 646-647. Your documentation will vary based on the patient's exam findings.

**Apply Your Skills**

Since it is near the end of the M1 year, plan on continuing to practice the neurologic examination in FCM year 2. When you have the opportunity, observe your preceptor performing neurologic examinations. Then perform neurologic examinations yourself. You may find it easier to begin by practicing individual components of the exam on selected patients.
The Neurologic Examination Checklist

Equipment / Supplies: wooden swabs, tuning fork, small objects (coins), reflex hammer

☐ Appropriate draping for all aspects of the exam
☐ Appropriate guidance given to the patient throughout the exam
☐ Mental status - see unit on mental status examination
☐ Cranial nerves - see cranial nerve unit for equipment and checklist
☐ Motor - Upper extremities
  • inspect bulk and involuntary movement (shoulders and hands)
  • test tone
  • test strength
  • Shoulder abduction (deltoid)
  • Forearm extension (triceps)
  • Forearm flexion (biceps)
  • Extension of hand at wrist
  • Grip strength
  • Finger abduction
  • Opposition of thumb

☐ Motor - Lower extremities
  • inspect bulk and involuntary movement (thighs and feet)
  • test tone
  • test strength
  • Hip flexion (iliopsoas)
  • Hip adduction
  • Hip abduction
  • Knee extension (quadriceps)
  • Knee flexion (hamstrings)
  • Ankle dorsiflexion
  • Ankle plantar flexion
  • Great toe dorsiflexion
  • Great toe plantar flexion

☐ Cerebellar
  • Rapid alternating movements of hands
  • Finger - nose - finger
  • Rapid foot taps
  • Heel to shin

☐ Stance and gait
- Romberg  
- Pronator Drift  
- Gait (include turn)  
- Tandem gait  
- Toe walking  
- Heel walking  
- Hop in place (each leg)  
- Shallow knee bend (each leg)

**Sensory - Upper extremities**
- pain  
- position or vibration  
- light touch (include each side and simultaneous stimulation)  
- discriminative sensation (stereognosis)

**Sensory - Lower extremities**
- pain  
- position or vibration  
- light touch (include each side and simultaneous stimulation)

**Reflexes**
- Biceps  
- Triceps  
- Brachioradialis  
- Abdominal  
- Knee (Patellar)  
- Ankle (Achilles)  
- Plantar response

**Primitive Reflexes (pediatrics)**
- Moro  
- palmar grasp  
- tonic neck

**Get-up-and-go test (geriatrics)**

**Study Questions:**

1. **What are the seven components of the neurologic exam?**

2. **How do you assess the motor system? How do you grade muscle strength?**

3. **How do you assess the various aspects of the sensory system? Pain? Light touch? Position and vibration? Discrimination? Do you know what pathways you are checking when evaluating these?**
4. How do you assess the cerebellar system?

5. What components of a patient’s neurologic system need to work together to achieve normal balance and gait?

6. How do you assess balance and gait?

7. How do you check reflexes? What reflexes do physicians check? How are they graded? What nerve roots are tested with each reflex?

8. What is the significance of infantile automatisms? When do they disappear? Can you describe the grasp (palmar) asymmetric neck and more reflex?

9. What test of motor strength is the most sensitive for picking up subtle weakness?