The Neurologic Exam
Sources: UST-FMS Med1 Lecture (Sept 24, 2014), Mosby’s Guide to Physical Exam, Internet (pictures), OSCE checklist

“One learns by doing the thing; for though you think you know it, you have no certainty until you try.”

- Sophocles

- At all times, one must treat patients with respect and kindness.
- When you enter the room, identify yourself and tell the patient why you are there.
- Do not persist with the history or examination past the point at which the patient is tired or uncooperative.
- Patients are most cooperative with students and doctors who are clean, neat and polite.

“Have a system of examination and learn to follow it in the same way each time.”

MOSBY’S NOTES

The Nervous System: Anatomy and Physiology

1. CNS – brain and spinal cord, main network of coordination and control for the body
2. PNS – cranial and spinal nerves, ascending and descending pathways, carries information to and from the central nervous system
3. ANS – coordinates and regulates the internal organs of the body

Sympathetic – prods the body into action during times of stress
Parasympathetic – functions in a complementary and a counterbalancing manner to conserve body resources and maintain day-to-day functions such as digestion and elimination

Functions of the nervous system

- Receive sensory stimuli from the environment
- Identify and integrate adaptive processes needed to maintain current body functions
- Orchestrate body function changes required for adaptation and survival
- Integrate the rapid responsiveness of the central nervous system with the more gradual responsiveness of the endocrine system
- Control cognitive and voluntary behavioral processes
- Control subconscious and involuntary body functions

Protection

- Skull and vertebrae
- Meninges: pia, dura, arachnoid
  - assists in protection and drainage of CSF
- Cerebrospinal fluid – shock absorber

LEVEL OF LESION

- Cerebral – general higher cognitive function
  - Parietal – sensory
  - Frontal – motor
  - Temporal – sounds, reception of speech
  - Occipital – visual
- Brainstem – 10 cranial nerves
  - Midbrain
  - Pons
  - Medulla – decussation of CS tracts
- Cerebellum – balance and coordination
- Spinal Cord – weakness bilaterally
  - Paraparesis – weakness of lower limbs
  - Paraplegia – complete paralysis of lower limbs
  - Quadriparesis – weakness of upper and lower limbs
  - Quadriplegia – complete paralysis of upper and lower limbs

Upper Motor Neuron vs Lower Motor Neuron

<table>
<thead>
<tr>
<th>UMN signs</th>
<th>LMN signs</th>
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<tbody>
<tr>
<td>Spasticity</td>
<td>Flaccidity</td>
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<tr>
<td>Hyperreactivity</td>
<td>Atrophy</td>
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<tr>
<td>Babinski (lower limb)</td>
<td>Hyporeflexia</td>
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<tr>
<td>Hoffman’s (upper limb)</td>
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</tbody>
</table>

- Peripheral Nerve
  - Generalized
    - Polynuropathy - metabolic or endocrinologic problems, distal muscle weakness
  - Focal
    - Peroneal neuropathy – foot drop
    - Radial neuropathy – wrist drop

- Neuromuscular Junction
  - Myasthenia Gravis – fatigability in the afternoon, ptosis, proximal muscle weakness

- Muscle
  - Myopathy – Duchenne’s, proximal muscle weakness

Figure: Hoffman’s sign. It is elicited by tapping or flicking the terminal phalanx of the middle or ring finger and a (+) response is seen with flexion of the terminal phalanx of the thumb. Babinski reflex. “Fanning” of toes
**MOSBY’S NOTES**

**Brain**
- Receives its blood supply (20% of cardiac output) from the two internal carotid arteries and two vertebral arteries
- Venous drainage: venous plexuses and dural sinuses that empty into the internal jugular veins

**Cerebrum**
- **Gray outer layer**: higher mental functions, general movement, visceral functions, perception, behavior, and integration of these functions
  - **Commissural fibers**: corpus callosum, interconnect the two hemispheres
- **Frontal lobe**: motor cortex associated with voluntary skeletal movement and fine repetitive motor movements; control of eye movements
- **Parietal lobe**: sensory cortex; visual, gustatory, olfactory and auditory sensations; proprioception
  - **Association fibers**: provide communication between the sensory and motor areas
- **Occipital lobe**: primary visual center
- **Temporal lobe**: sensory cortex; visual, gustatory, olfactory and auditory sensations; proprioception
- **Basal ganglia system**: extrapyramidal pathway and processing station between the cerebral motor cortex and upper brainstem with the thalamus, motor cortex, reticular formation, and spinal cord; refine motor movements

**Cerebellum**
- Integration and Coordination

**Brainstem**
- Controls involuntary functions
  - **Medulla oblongata**: decussation of CS tracts
  - **Pons**: transmits info between brainstem and cerebellum, relaying information from the cerebral cortex to the contralateral cerebellum
  - **Midbrain**
    - **Diencephalon (Thalamus)**: relay system

**Cranial Nerves**
- **Olfactory, Optic, Oculomotor, Trochlear, Trigeminal, Abducens, Facial, Vestibulocochlear or Acoustic, Glossopharyngeal, Vagus, Spinal Accessory, Hypoglossal**
  - **Midbrain**: CN III and IV
  - **Pons**: CN V to VIII
  - **Medulla**: CN IX to XII
  - **Diencephalon**: CN I and II

**Diencephalon**
- Relays impulses between cerebrum, cerebellum, pons and medulla
- **Thalamus**: conveys all sensory impulses (except olfaction) and from cerebrum before distribution to appropriate associative sensory areas; integrates impulses between motor cortex and cerebrum, influencing voluntary movements; Controls state of consciousness, conscious perception of sensations, and abstract feelings
- **Epithalamus**: houses the perineal body, sexual development and behavior
- **Hypothalamus**: main processing center of internal stimulis for autonomic nervous system; maintains temperature, water metabolism, body fluid osmolarity, feeding behavior, and neuroendocrine activity
- **Pituitary gland**: hormonal control for growth, lactation, vasoconstriction and metabolism

**SPINAL CORD AND SPINAL TRACTS**
- **Spinal cord**: 40 to 50 cm long, begins at the foramen magnum as a continuation of the medulla oblongata and terminates at L1 or L2 of the vertebral column
- **Gray matter**: butterfly-shaped, anterior and posterior horns, sensory and autonomic
- **White matter**: contains the ascending and descending spinal tracts

**Ascending Spinal Tracts**
- **Spinothalamic**: light and crude touch, pressure, temperature and pain
- **Spinocerebellar**
- **Dorsal column (fasciculus gracilis and cuneatus)**: fine touch, 2-point discrimination, conscious proprioception

**Descending Spinal Tracts**
- **Corticospinal (Pyramidal)**: skilled, delicate and purposeful movements
- **Reticulospinal**
- **Vestibulospinal**: causes the extensor muscles of the body to suddenly contract when the individual starts to fall
- **Corticobulbar**: motor func. of cranial nerves

**Upper Motor Neurons**: within CNS; influencing, directing and modifying reflex arcs and circuits
**Lower Motor Neurons**: cranial and spinal motor neurons; from anterior horn of spinal cord; transmit neural signals directly to the muscles to permit movement

**Spinal Nerves**
- 31 pairs, exit at each intervertebral foramen
- Spinal nerve supply: dermatome
- Motor/Efferent: Anterior
- Sensory/Afferent: Posterior
HISTORY

- Chief Complaint – dizziness, weakness, facial asymmetry, numbness, headache
- HPI – characterize chief complaint and associated symptoms
- Past Medical Hx
- Family Hx
- Personal and Social Hx

PHYSICAL EXAM

MOSBY'S NOTES

EQUIPMENT FOR PHYSICAL EXAM

- Penlight
- Tongue blade
- Sterile needles
- Tuning forks, 200 to 400 Hz and 500 to 1000 Hz
- Familiar objects – coins, keys, paper clip
- Cotton wisp
- 5.07 Monofilament or Waardenberg wheel
- Reflex hammer
- Vials of aromatic substances – coffee, orange, peppermint extract, oil of cloves
- Vials of solutions – glucose, salty, lemon or vinegar, quinine – with applicants
- Test tubes of hot and cold water for temperature sensation testing
- Denver Developmental Screening (for infants and children)

INSPECTION

Gait/Station

- Observe the patient while walking normally, on heels & toes following a straight line
- Romberg’s Test
- Ex. Hemiparetic gait, Ataxic gait, Parkinsonian gait

MOSBY’S NOTES

UNEXPECTED GAIT PATTERNS

A. Spastic hemiparesis – bilateral, lesion at spinal cord; The affected leg is stiff and extended with plantar flexion of the foot; movement of the foot results from pelvic tilting upward on the involved side; the foot is dragged, or it is circled stiffly outward and forward (circumduction); the affected arm remains flexed and adducted and does not swing

B. Spastic diplegia (scissoring) – injury to pyramidal system; Short steps, dragging the ball of the foot across the floor; the legs are extended, and the thighs tend to cross forward on each other at each step

C. Steppage gait – patient cannot dorsiflex the foot; to compensate he will excessively flex the knee

D. Cerebellar ataxia – feet are wide-based, staggering and lurching from side to side often accompanied by swaying of the trunk

E. Sensory ataxia – also wide-based, patient watches the ground to guide his steps; present: (+) Romberg’s sign

F. Tabetic – the legs are positioned far apart, lifted high and forcibly brought down with each step; the heel stamps on the ground

G. Parkinsonian gait – the patient’s posture is stooped and body held rigid, steps are short and shuffling, with hesitation on starting and difficulty stopping

H. Dystonia – Jerky, dancing, nondirectional

I. Ataxia – Uncontrolled falling occurs

J. Antalgic limp – Patient limits the time of weight on the affected leg to limit pain

Figure: Some abnormal gait patterns

Figure: Typical gait disturbance of a hemiparetic patient.

Circumduction of the spastically paretic leg with predominantly extensor tone, and flexion of the spastically paretic arms at the elbow because of predominantly flexor tone.
THE NEUROLOGIC EXAM

**Sequence of Examination**

1. Cerebrum
2. Cerebellar functions
3. Cranial Nerves
4. Motor System
5. Sensory System
6. Reflexes

**MENTAL STATUS EXAM**

Enumerate (at least 4 of the following):
- General behavior/appearance
- Stream of thought
- Mood and affect
- Thought content
- Intellectual capacity
- Orientation
- Memory
- Calculation
- Insight
- Judgment
- Impulse control

- Difficulties with communication
- Determine whether recall & insight into recent & past events are intact

1. Level of consciousness
2. Orientation
3. Memory
4. Language
5. Speech
6. Insight & judgment
7. Abstract thinking
8. Calculation

**GLASGOW COMA SCALE**

If there is decreased sensorium

<table>
<thead>
<tr>
<th>Glasgow Coma Scale</th>
<th>Eye Opening Response</th>
<th>Verbal Response</th>
<th>Motor Response</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Spontaneous - open with blinking at baseline</td>
<td>Oriented</td>
<td>Obey commands for movement</td>
</tr>
<tr>
<td></td>
<td>Open to verbal command, speech or shout</td>
<td>Confused conversation, but able to answer questions</td>
<td>Purposeful movement to painful stimulus</td>
</tr>
<tr>
<td></td>
<td>Open to pain, not applied to face</td>
<td>Inappropriate responses, words discernable</td>
<td>Withdraws from pain</td>
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<tr>
<td></td>
<td>None</td>
<td>Incomprehensible speech</td>
<td>Abnormal (spastic) flexion, decorticate post.</td>
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<td></td>
<td>4</td>
<td>3</td>
<td>6</td>
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<td></td>
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<td>2</td>
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<tr>
<td></td>
<td>1</td>
<td>1</td>
<td>3</td>
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<tr>
<td></td>
<td>Generally, brain injury is classified as:</td>
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<td></td>
<td>Severe: GCS ≤ 8</td>
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<td>Moderate: GCS 9-12</td>
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<td>Minor: GCS ≥ 13</td>
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**Classification of Aphasia**

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<th>Comprehension</th>
<th>Repetition</th>
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<tr>
<td>Global</td>
<td>Poor</td>
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<td>Poor</td>
<td>Poor</td>
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<tr>
<td>Broca (motor)</td>
<td>Poor</td>
<td>Good</td>
<td>Variable</td>
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<td>Isolation</td>
<td>Poor</td>
<td>Poor</td>
<td>Good</td>
<td>Poor</td>
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<tr>
<td>Transcortical motor (sensory)</td>
<td>Poor</td>
<td>Good</td>
<td>Good</td>
<td>Poor</td>
</tr>
<tr>
<td>Wernicke (sensory)</td>
<td>Good</td>
<td>Poor</td>
<td>Poor</td>
<td>Poor</td>
</tr>
<tr>
<td>Transcortical sensory</td>
<td>Good</td>
<td>Poor</td>
<td>Good</td>
<td>Poor</td>
</tr>
<tr>
<td>Conductive</td>
<td>Good</td>
<td>Poor</td>
<td>Good</td>
<td>Poor</td>
</tr>
<tr>
<td>Anomic</td>
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<td>Good</td>
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Mental Status Exam: Language

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Mental Status Exam: **Speech**

- Fluency, rhythm, ease of expression
- Speech with rapid fire delivery, stuttering, repetitions, slow utterances
- Irregular speech with unnatural separation of syllables

Mental Status Exam: **Insight and Judgment**

- **Insight** – awareness of patient regarding his own medical condition or impairment
  - Is he aware that he has the condition or he’s just denying it?
- **Judgment** – ability to solve a hypothetical question or real life problems
  - E.g. What would you do if you find a hundred peso bill on the floor?

Mental Status Exam: **Abstract Thinking**

a) Interpret some common proverbs
b) “Ang hindi marunong lumingon sa pinanggalingan, hindi makararating sa paroroonaan.”

2. **CEREBELLMUM**

**MOTOR COORDINATION**

1. **FINGER TO NOSE TEST**

- Test the accuracy of movements and fine motor function
- Patient alternatively touches own nose and the examiner's index finger with the index finger of one hand

- **Normal**
- **Ataxia** – alternating movements seen throughout the movement
- **Intention tremor** – alternating movements seen in proximal location of finger to nose

If the movement is not smooth, there is dysmetria (ataxia or intention tremor).

II. **ALTERNATING PRONATION SUPINATION TEST (APST)**

a. Tap your thigh in alternation
b. Rapid-rhythmic alternation movements
c. Observe for lagging: dysdiadokinesia

III. **HEEL TO KNEE TO SHIN TEST**

a. Slide the heel up & down the front of the shin to the knee
b. Look for side to side tremor or buckling
c. Test R: put the R heel over the L shin, then move leg going up, going down
d. Movement should be in straight line
e. Test both legs

Lower limb coordination
- Heel tapping
- Heel sliding
BALANCE/EQUILIBRIUM

IV. ROMBERG’S TEST
   a. Feet together, look straight ahead with eyes open: steady or excessive sway?
   b. Eyes closed: steady or excessive sway?
   c. To further evaluate balance, have the patient stand with feet slightly apart. Push the shoulders with enough effort to throw patient off balance. (Be ready to catch patient if necessary.)
   • Sensory Ataxia – The moment the patient closes the eyes, the patient will sway excessively
   • Cerebellar Ataxia – The patient will sway excessively even with eyes open or closed

![Romberg test demonstration]

V. TANDEM GAIT
   d. Ask patient to walk in a straight line
   e. In an ataxic patient, feet cannot be close together

![Figure: Romberg’s test demonstration]

3. CRANIAL NERVES

- **CN I (Olfactory)**
  Sensory - skill usually not tested but student should narrate how it is done
  o Usually neglected/omitted
  o Close both eyes and one naris
  o Ask patient to sniff and identify a mild stimulus (e.g. coffee, cigarette)
  o Allow a short rest period between the different odors
  o Inferior frontal lobe disease (e.g. meningioma) may compress the olfactory tract
  o Significant if unilateral anosmia (loss of sense of smell) is detected

- **CN II (Optic)**
  Sensory – see assessment of visual acuity, confrontation test and funduscopy
  ➔ Visual acuity – Snellen’s and Jaeger’s
  ➔ Visual fields – Confrontation testing (temporal, nasal)
  ➔ Funduscopy – ROR, fundus
  o Check visual acuity using Snellen’s chart
  o Optic disk should be examined
  o Test visual fields by confrontation
  o Further tests:
    - Perimetry
    - Tangent screen
    - Visual evoke potential

![Figure: Funduscopy and Confrontation Testing]

- **CN III, IV, VI (Oculomotor, Trochlear, Abducens)**
  III-Oculomotor – motor – see testing of extraocular muscles (EOM) and papillary testing
  ➔ Pupillary light reflex (Direct and Consensual)
  ➔ *sensory component of the light reflex is the OPTIC nerve
  IV, VI-TROCHLEAR and ABDUCENS – motor – testing of EOM muscles LR6S04
  o Describe size and shape of pupils
  o Check reactivity of pupils to light and accommodation
  o Check extraocular movements and observe for any paresis and nystagmus
  o Cardinal gazes (EOM)
    - Report as “full and equal”
  o Trace the letter “H”
o Lateral rectus – Abducens
o Superior oblique – Trochlear
o Opening the eyes – Oculomotor
o Closing the eyes – Facial

Figure: Testing of Extraocular Muscles (EOM). Trace the letter “H” for the cardinal gazes

- CN V (Trigeminal)
  Mixed
  ➔ Sensory – Face (student may opt to do the corneal reflex)
  ➔ Motor – Muscles of Mastication – masseter and temporalis

- Sensory testing to sharp, dull, light touch & temperature/ or pain involving:
  ▪ Ophthalmic (V1)
  ▪ Maxillary (V2)
  ▪ Mandibular (V3)

- Motor testing – Jaw clench
  ▪ Observe face for muscle atrophy, deviation of jaw to one side, and fasciculations
  ▪ Muscles of mastication
    • Masseter
    • Temporalis

- Corneal reflex is done if patient is unable to follow commands or has altered sensorium
  ▪ (+) symmetric blink reflex

* MOSBY’S NOTES

**EVALUATING TASTE**
- Sensory function of CN VII and IX
- Have available the 4 solutions, applicators, and a card listing the tastes
- Ask patient to protrude the tongue
- Apply one solution at a time to the lateral side of the tongue
- Offer a sip of water after each stimulus
- Patient should identify each side bilaterally when placed correctly on the tongue surface

Figure: In general, taste is perceived better on the more posterior aspects (CN IX) of the tongue, palate and pharynx rather than on the anterior (CN VII).
- **CN VIII (Vestibulocochlear)**
  - **Sensory – Hearing Acuity Test**
    - Check ability to hear a finger rub or whispered voice with each ear
    - Rinne’s (air vs. bone conduction)
      - Ratio of air:bone must be 2:1
    - Weber’s (laterality of lesion)
    - Further test: Audiometry
    - Vestibular function: Romberg’s test

- **CN IX, X (Glossopharyngeal & Vagus)**
  - **CN IX**
    - Sensory: Posterior 1/3
    - Motor: say “ah” examine mouth and oropharynx, Gag reflex
  - **CN X –mixed**
    - Sensory: External ear
    - Motor: same as IX
  - But normally, gag reflex is tested for both CN IX, X
  - Position & symmetry of palate & uvula at rest and with phonation
  - Gag reflex is checked by stimulating posterior pharyngeal wall on each side
  - Gag reflex is may be absent in normal individuals
  - The uvula should remain in the midline, and no drooping or absence of arch on either side of soft palate should be noted.
  - Speech: note any hoarseness, nasal quality, or difficulty with guttural sounds

- **CN XI (Spinal Accessory)**
  - **Motor-SHOULDER RAISING TURN FACE AGAINST RESISTANCE**
    - Shoulder shrug (trapezius)
    - Shrug, then give resistance
  - Head rotation to each side against resistance (sternocleidomastoid)
  - Test L SCM: ask patient to turn to the R, offer resistance on the R cheek only after the patient has completely turned to R
  - You will see the L SCM becoming more prominent

- **CN XII (Hypoglossal)**
  - See examination of mouth and oropharynx (PART OF HEENT EXAM)
    - Motor: Glossal muscles
    - Tongue atrophy or fasciculation
    - Position with protrusion
    - Strength when extended against inner surface of the cheek on each side
    - Tongue mediated to R or L
4. MOTOR SYSTEM

TESTING OF BULK

- **Atrophy:** Diminished muscle bulk, most marked with lower motor neuron disease, but also seen with chronic upper motor neuron disease
- **Fasciculations:** Seen with lower motor neuron disease and amyotrophic lateral sclerosis

Figure: (1) Typical “stork legs” and (2) “pes cavus” in Charcot Marie Tooth Disease (HSMN or Hereditary Sensory-Motor Neuropathy Type I).

TESTING OF TONE

- **Spasticity:** *initial resistance* to quick movement of a joint which then diminishes by the end of the movement
- **Rigidity:** *steady resistance* through the entire movement of a joint
- **Flaccidity:** markedly *diminished tone*; suggests lower motor neuron disease, but may be observed acutely following upper motor neuron disease, such as stroke

ABNORMAL MOVEMENTS

a. **Tremors:** *unintentional rhythmic movements*
   - Enhanced physiologic tremor – drug/alcohol withdrawal, hyperthyroidism, hypoglycemia, drug toxicity
   - Essential tremor – inherited
   - Intention tremor – seen in intentional movements, cause: Multiple sclerosis
   - Resting tremor – seen when limb is at rest; cause: Parkinson disease

b. **Athetosis:** slow, sinuous, writhing movements in distal limbs

c. **Chorea:** semipurposeful, flowing movements that flit from one part of the body to another; quick involuntary incoordinated performance of willed movements

d. **Hemiballismus:** wild flinging/flailing movements that represent large amplitude proximal movement; damage to subthalamic nucleus of Luys

e. **Dystonia:** sustained contractions of both agonist and antagonist muscles, frequently causing twisting and repetitive movements or abnormal postures, more on trunk muscles

f. **Myoclonus:** brief, sudden shock-like jerk

MANUAL MUSCLE TESTING/GRADING

Always compare L and R

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<th>MANUAL MUSCLE TESTING</th>
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<tr>
<td><strong>Level</strong></td>
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<tr>
<td>C5</td>
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<tr>
<td>C6</td>
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<tr>
<td>C7</td>
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<tr>
<td>C8</td>
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5. SENSORY SYSTEM

- Ask patient whether he can feel light touch, temp. of cool object, pin prick in each distal extremity
- Vibration and position sense
- Check double simultaneous stimulation using light touch on the hands, face, legs
- Most difficult & unreliable due to subjectivity
- Loss of sensory modalities: Peripheral neuropathy
- Symmetric sensory loss: Polyneuropathy

Sensory Testing

- Pain and temperature
- Light touch and pressure
- Joint position and vibration
- Special sensory testing
  - 2-point discrimination
  - Stereognosis
  - Recognition of digits drawn in the palm

MOSBY’S NOTES

PRIMARY SENSORY FUNCTIONS

<table>
<thead>
<tr>
<th>Primary Sensory Function</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Superficial Touch</td>
<td>Cotton wisp or with fingertip. Use light strokes. Have patient point area touched.</td>
</tr>
<tr>
<td>Superficial Pain</td>
<td>Sharp and smooth edges of broken tongue blade or hub of sterile needle. Allow 2 seconds between each stimulus to prevent summative effect.</td>
</tr>
<tr>
<td>Temperature and Deep Pressure</td>
<td>Tested only when superficial pain is not intact. Roll hot and cold test tubes on skin. Ask patient which temp. is perceived. Deep pressure is tested by squeezing trapezius, calf or biceps muscle.</td>
</tr>
<tr>
<td>Vibration</td>
<td>Stem of vibrating tuning fork (lower Hz). Place against bony prominence (toe, finger, sternum, elbow, wrist, shin and ankle). Ask patient when and where vibration is felt.</td>
</tr>
<tr>
<td>Position</td>
<td>Hold the joint to be tested by lateral aspects to avoid giving clue about direction being moved</td>
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</tbody>
</table>

CORTICAL SENSORY FUNCTION

<table>
<thead>
<tr>
<th>Cortical Sensory Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stereognosis</td>
<td>Familiar object (coin, key) Tactile agnosia (inability to recognize objects by touch) - parietal lobe lesion</td>
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<tr>
<td>2-Point Discrimination</td>
<td>Two sterile needles Alternately touch the patient’s skin over various points. Find the distance at which the patient can no longer distinguish the two points, ranging between 2 and 75 mm.</td>
</tr>
<tr>
<td>Extinction Phenomenon</td>
<td>Simultaneously touch two areas on each side of the body. Ask patient how many stimuli are there and where they are.</td>
</tr>
<tr>
<td>Graphesthesia</td>
<td>Blunt pen or applicator stick. Draw a letter on palm of patient.</td>
</tr>
<tr>
<td>Point Location</td>
<td>Touch an area on patient’s skin and withdraw the stimulus. Ask patient to point the area touched.</td>
</tr>
</tbody>
</table>

For OSCE:

- Make sure that students test L against R side of the body
- Students should demo the following:
  - Light touch
  - Pain
  - Temperature
  - Vibration
  - Position
6. REFLEXES

DEEP TENDON REFLEXES (student should always compare L and R)

<table>
<thead>
<tr>
<th>REFLEX GRADING</th>
<th>Grades</th>
</tr>
</thead>
<tbody>
<tr>
<td>Areflexia (absent)</td>
<td>0</td>
</tr>
<tr>
<td>Hyporeflexia</td>
<td>+1</td>
</tr>
<tr>
<td>Normal</td>
<td>+2</td>
</tr>
<tr>
<td>Hyperactive (normal)</td>
<td>+3</td>
</tr>
<tr>
<td>Hyperactive (unsustained clonus)</td>
<td>+4</td>
</tr>
<tr>
<td>Hyperactive (sustained clonus)</td>
<td>+5</td>
</tr>
</tbody>
</table>

COMMON REFLEXES

<table>
<thead>
<tr>
<th>Reflex</th>
<th>Segments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biceps</td>
<td>C5 – C6</td>
</tr>
<tr>
<td>Brachioradialis</td>
<td>C5 – C6</td>
</tr>
<tr>
<td>Triceps</td>
<td>C6 – C7</td>
</tr>
<tr>
<td>Patellar/Knee</td>
<td>L2, L3 and L4</td>
</tr>
<tr>
<td>Ankle/Achilles</td>
<td>S1, S2</td>
</tr>
</tbody>
</table>

HOW A REFLEX WORKS:

MOSBY’S NOTES

SUPERFICIAL REFLEXES

<table>
<thead>
<tr>
<th>Reflex</th>
<th>Spinal Level Evaluated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal</td>
<td>T8, T9 and T10</td>
</tr>
<tr>
<td>Cremasteric</td>
<td>T12, L1 and L2</td>
</tr>
<tr>
<td>Plantar</td>
<td>L5, S1 and S2</td>
</tr>
</tbody>
</table>

DEEP TENDON REFLEXES

<table>
<thead>
<tr>
<th>Reflex</th>
<th>Spinal Level Evaluated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biceps (superficial)</td>
<td>C5, C6</td>
</tr>
<tr>
<td>Brachioradialis (superficial)</td>
<td>C5, C6</td>
</tr>
<tr>
<td>Triceps (superficial)</td>
<td>C6, C7 and C8</td>
</tr>
<tr>
<td>Patellar (superficial)</td>
<td>L2, L3 and L4</td>
</tr>
<tr>
<td>Achilles (superficial)</td>
<td>S1 and S2</td>
</tr>
</tbody>
</table>

MOSBY’S NOTES

SUPERFICIAL AND DEEP TENDON REFLEXES

<table>
<thead>
<tr>
<th>Reflex</th>
<th>Spinal Level Evaluated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper abdominal</td>
<td>T8, T9 and T10</td>
</tr>
<tr>
<td>Lower abdominal</td>
<td>T10, T11 and T12</td>
</tr>
<tr>
<td>Cremasteric</td>
<td>T12, L1 and L2</td>
</tr>
<tr>
<td>Plantar</td>
<td>L5, S1 and S2</td>
</tr>
<tr>
<td>Biceps (deep)</td>
<td>C5, C6</td>
</tr>
<tr>
<td>Brachioradialis (deep)</td>
<td>C5, C6</td>
</tr>
<tr>
<td>Triceps (deep)</td>
<td>C6, C7 and C8</td>
</tr>
<tr>
<td>Patellar (deep)</td>
<td>L2, L3 and L4</td>
</tr>
<tr>
<td>Achilles (deep)</td>
<td>S1 and S2</td>
</tr>
</tbody>
</table>
### MOSBY’S NOTES

#### DEEP TENDON REFLEXES

<table>
<thead>
<tr>
<th>Reflex</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Biceps reflex</strong></td>
<td>Flex patient’s arm 45° at the elbow. Palpate biceps tendon at the antecubital fossa. Place thumb over tendon and fingers under the elbow. Strike your thumb (rather than the tendon directly), with the reflex hammer. (+) – Flexion of elbow</td>
</tr>
<tr>
<td><strong>Brachioradial reflex</strong></td>
<td>Flex patient’s arm 45° at the elbow. Rest his forearm on your arm with hand slightly pronated. Strike brachioradial tendon (about 1 to 2 inches above the wrist) directly with reflex hammer. (+) – Pronation of forearm and flexion of elbow</td>
</tr>
<tr>
<td><strong>Triceps reflex</strong></td>
<td>Flex patient’s arm up to 90°, supporting the arm proximal to the antecubital fossa. Strike triceps tendon. (+) – Extension of the elbow</td>
</tr>
<tr>
<td><strong>Patellar reflex</strong></td>
<td>Flex patient’s knee to 90° Support upper leg with your hand and allow lower leg to hang loosely. Strike patellar tendon just below the patella. (+) – Contraction of quadriceps, Extension of lower leg</td>
</tr>
<tr>
<td><strong>Achilles reflex</strong></td>
<td>Flex knee to 90° and keep ankle in neutral position, holding foot in your hand. (Alternatively, patient may kneel on a chair with toes pointing towards floor.) Strike Achilles tendon at the level of the ankle malleol. (+) – Contraction of gastrocnemius, Plantar flexion of the foot</td>
</tr>
<tr>
<td><strong>Ankle Clonus</strong></td>
<td>Support patient’s knee in partially flexed position and briskly dorsiflex the foot with your other hand, maintaining foot in flexion. No rhythmic oscillating movements between dorsiflexion and plantar flexion should be palpated. (+) sustained clonus – UMN disease</td>
</tr>
</tbody>
</table>

#### MENINGEAL SIGNS

A stiff neck, or nuchal rigidity, is a sign that may be associated with meningitis and intracranial hemorrhage.

- **Symptoms**
  - Disturbance of consciousness
  - Nausea, vomiting
  - Headache
  - Pain and resistance to neck motion
- **Kernig’s sign** – There is resistance against passive extension at the knee joint with the patient in supine position and knee flexed
- **Brudzinski sign** – Flexing the neck brings about about involuntary flexion of both hip and knee joints

“A physician is obliged to consider more than a diseased organ, more even the whole man – he must view the man in his world.”

- Harvey Cushing, 1869-1932