

# Neurologic Exam Sequence

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The following represents a typical screening exam for patients with neurologic problems. More detailed testing may be appropriate depending upon the patient's symptoms and other exam findings.

## SECTION

### Test

What to do.

What to say.

What to observe.

## MENTAL STATUS

"I'm first going to ask some standard questions to check your attention and memory."

### Orientation

"First, please tell me the complete date and day of week. Where are we right now? Which floor? Can you tell me the street and city?"

### Recall

Pick your favorite 3 items.

"Please repeat these 3 items back to me: \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_."

Note how many times it took them to register the 3 objects.

### Attention

"Starting with the current month, please go through the months backwards for an entire year."

Time them, noting perseveration, impersistence, or getting stuck-in-set. Redirect and encourage if stuck for several seconds.

### Long-term memory

"Please tell me the current president. Now, can you recite the presidents backwards until I say stop."

### Calculations

"I'm going to have you add-up some change. What does two quarters, a nickel, and two pennies equal? How about one quarter, one dime, one nickel, and one penny?"

### Short-term memory

"Please tell me those 3 objects I asked you to remember earlier."

Other tests of cognition may be appropriate, but the above are appropriate screening checks for the hospitalized patient.

## POSITIONING TIPS

Best position is sitting-up, patient seated slightly higher. If they have truncal stability, they can sit on the edge of the bed with feet hanging over.

You can sit for testing reflexes, sensation, and muscles lower than the iliopsoas.

## CRANIAL NERVES

### Visual acuity

Best acuity with good light, glasses or pinhole if not 20/20, each eye individually, 14 inch Snellen card or equivalent phone app.

"Please read the numbers on this line. And the next..."

Have them read until 2 errors on a line, encourage 'guessing' if they won't try. Be sure card is below bifocal line.

### Scotoma screen

Check ~3 feet in front, at same level.

“I’d like to make sure you don’t have any blind spots or grayed-out areas across your vision. Cover your left eye, keep both eyes open. While looking at my nose, are all other parts of my face and head clear to you? Now let’s check the other eye.”

### **Visual fields**

Check ~3 feet in front, at same level. Depending upon alertness and level of detail needed, introduce red colored tip object, count fingers in each quadrant, wiggling finger. Test compared to self.

“Cover your left eye, keep both eyes open. Tell me as soon as you can see \_\_\_\_.”

### **Fundi**

“I am going to look in the back of your eye with this scope.” Darken room. “Please fix your gaze over at the \_\_\_\_.”

Check disc color, border, cup size, and venous pulsations. Follow upper and lower vessels to macula for vessel caliber and hemorrhages.

### **Pupils**

Use sufficiently bright light (otoscope base bulb works well) in a darkened room, looking into distance. Compare resting pupil size with indirect light from below the chin, illuminating just the anterior chamber. Check right and allow to re-dilate, then left and re-dilate, then swing side-to-side.

“I am going to check your pupil reaction with this bright light. I apologize in advance if it is uncomfortable. Please keep looking over at the \_\_\_\_, and try to keep your eyes open.”

Look for anisocoria, roundness, note dilated size. Check constriction speed and size. Look for convincing and reproducible unilateral dilation with swinging-flashlight test. Don’t mistake hippus (bilateral undulating pupil due to variances in sympathetic/parasympathetic tone) or pupillary escape (bilateral slight redilation a moment after constriction) for an APD.

### **EOM**

Starting at about 3 feet from center, move in a arcing ‘H’, pausing at center and lateral gaze, and finishing with convergence.

Look closely for nystagmus in primary gaze. Note whether smooth pursuits are smooth or choppy, and whether they are symmetric from left to right. Scrutinize for nystagmus with extreme lateral gaze. See if there is pupillary constriction with convergence (may be difficult to see).

### **Saccades**

Have them alternate gaze between your nose and a laterally positioned finger, first to the left, then to the right. Keep your nose and finger in the same horizontal and vertical plane. Have them next go back and forth from each lateral finger and watch for any adductor lag.

“I’m now going to check how your eyes move between two objects. First, look at my nose...now my finger...nose...finger... Now let’s check the other side. Nose...finger...nose...finger...nose. Now let’s go finger to finger. Left...right....left...right...”

After 1-2 practice runs, see if eyes hit the target in one movement. Check that eyes movements are conjugate.

### **Facial Sensation**

Quick screen: Lightly touch above the eyebrows, on the cheeks, and below the lateral corners of the mouth. “Does everything feel normal? Any diminished or altered sensations?”

Detailed testing: Use a pin very lightly to check any areas of reported numbness. Can perform now, or later during sensory testing. A corneal reflex can help corroborate facial numbness in unclear cases or when cooperation is not ideal.

“I am going to touch you very lightly with a pin to make sure you have good sensation. Do these 6 areas all feel sharp?”

Have them quantify by a reference of 100% or one dollar of sharpness. You can also have them close their eyes, tell them to report whenever they feel sharp/dull, and randomly flip the safety pin for the

blunt or sharp part. Determine whether pin is intact but reduced, cannot discriminate sharp/dull, or touch is not perceived.

### **Facial Strength**

Quick screen: "Show me a big, toothy smile. Squeeze your eyes shut, as tightly as you can. Lift both eyebrows"

Observe nasolabial fold, facial movements, number of teeth on each side with smile. Make sure they bury their eyelashes when squeezing eyes shut.

Detailed testing with suspected peripheral nervous system disease or facial diplegia: "Hold your lips very tight together, don't let me pull them apart", "Puff out your cheeks and hold your lips tight, don't let me push the air out", "I'm going to see if your eyelids close tight. Squeeze your eyes shut and don't let pull them open",

Neck flexors and extensors can be weak with bifacial weakness from peripheral nerve disorders. Can check now or when doing motor testing.

"Put your chin to your chest, hold it strong, and don't let me push your head back. Now, bring your head back and hold it strong. Don't let me push your head forward."

### **Hearing**

Quick screen: Hold your hand out of view, 3 feet from each ear. Alternately gently rub a finger and ask which side.

"Close your eyes so I can check your hearing. Which side do you hear the finger rub?"

### **Palate**

"Open your mouth real wide so I can see your throat, and say ahh."

Ensure that both sides of palate elevate symmetrically and with good excursion. Can do gag if they have impaired cooperation, complain of dysphagia, or palate doesn't seem to move.

### **Tongue Movements**

Demonstrate wiggling your tongue while you are instructing.

"Stick out your tongue. Wiggle it side-to-side real fast (demonstrate)".

Look for symmetry of movements, good speed, and lack of tongue/jaw synkinesis.

### **Accessory Nerve**

Demonstrate shrugging your shoulders while you are instructing.

"Shrug your shoulders so I can check your strength".

Push down on shoulders while observing, and palpating trapezius muscles with index fingers.

## **UPPER EXTREMITIES CEREBELLUM AND MOTOR**

### **Pronator drift**

Determine whether there is asymmetric pronation of the outstretched hand. Look for any abnormal tremors. Demonstrate the position while you are instructing.

"Extend your arms in front of you, palms up, like you are holding a large tray.. Keep your arms steady and close your eyes."

Look to see if the thumb turns-up (pronator drift), or the arm floats about (parietal or proprioceptive drift). Also check for postural tremor in hands/fingers. Pronate hands and bend wrists back if looking for myoclonus.

"Keep your eyes closed. With your right pinky finger, touch the tip of your nose. Now do the same with your left pinky finger."

Check that the movement is accurate and without tremor.

### **Fine finger movements**

Have them hold their hand in front of them with elbow unsupported. Demonstrate the movement. Do one hand at a time. Look for big, fast, fluid movements. Note any pain, contractures, or structural limitations. Compare symmetry (dominant likely faster). If Parkinsonism suspected, next have them

completely open and close their hand fast, and turn wrist back and forth with maximal amplitude movement.

“While looking at your right hand, touch each finger to your thumb, back and forth, with big and fast movements. Now your left hand.”

Look for speed to each finger and between each finger. Note amplitude. Encourage them to go big and fast by demonstration.

### **Toe tapping**

Demonstrate the maneuver.

“With your heel touching the step/floor/my hand, tap with your right foot as fast and big as you can go. Make a loud noise with your foot with each tap. And now the same with your left foot.”

Encourage big/fast/loud movements, compare for symmetry. Heel touching surface makes it harder.

Dominant side is usually a bit faster.

### **Finger-to-nose**

Hold your finger so they need to reach and lean. Start near center, and move finger slowly so they reach across their body. Make sure they alternate finger and nose at a good speed – encourage them to go faster if self-selected speed is overly cautious.

“With your right index finger, touch the tip of my finger...now touch your nose...finger...nose...finger...go back and forth quickly. Now, same thing with your left index finger...nose...”

Watch for intention tremor (oscillation increases when approaching target), past-pointing (does not hit the target), dysmetria (trajectory is not accurate) dysynergia (reach is not smooth).

### **Rapid-alternating movements**

Arms in front, elbows unsupported. Have them do big and fast movements onto their palm with loud clapping sound. Have them self-select hand position and adjust if upper arm is not clear. Demonstrate.

“Hold your arms out in front. Keep your left hand steady, and alternate the front and back of your right hand onto the left palm, with big and loud movements.

Watch and listen to the rhythm and speed. Compare for symmetry (dominant likely better). Encourage them to go fast.

### **Heel-knee-shin**

This test may be optional if examining someone as an outpatient, if you are assessing gait and tandem. Inpatients should stand and walk whenever it is safe to do so. There is not a good way to assess truncal ataxia or postural instability in bed.

“I’m going to check the coordination in your legs. First, raise the right leg and tap your heel 3 times onto the left knee cap.”, “As steady and accurately as you can, run the heel up-and-down your left shin.”,

“Now with the left leg, tap the right knee 3 times....and run the heel all the way up-and-down the shin.”

Watch for tremor and dysmetria.

### **Tremor**

Have them rest their arms and hands on their lap, with hands open, slightly supinated.

“Please rest your hands in your lap, with your hands open, relaxed, and thumbs on top.”

### **Tone**

Check with slow, rotating movements at the wrist, elbow, and shoulder. Start on right, then left. Then, check with quick arm extension and flexion using full excursion. Start slow and increase speed.

“I’m going to see how relaxed you can make your muscles. Keep real loose while I slowly move your wrist and arm.”, “Now, I am going to move your arm more quickly...please stay relaxed.”

Check for leaden rigidity and cogwheeling. Then, assess for a ‘catch’ with quick movements.

For lower extremities, extend and flex the knee, with quick and full movements. For the hips, extend the leg and give a quick movement left and right. If patient is in bed, hold behind the knee with both hands, and see if their heel rises off the bed when a quick upward movement is applied.

“I’m going to check that your legs are able to relax. Keep your hands on the table for support, and stay loose. First, I’m going to move the knee back and forth.”, “Now, I am going to move the entire leg at the hip.”

Check for increased tone or a “catch”.

### **Strength**

Use clear and concise instruction with good volume and eye contact for encouragement. Test each muscle through the point of failure to detect subtle asymmetry.

#### *Deltoids*

Stand over top, so you can press directly down on the elbows with up to your full body weight. Note pain or limited movement. Check with elbows at sides or arms in front. Demonstrate

“I want to test the strength of all your muscles. Bend your elbows and raise them up at your side. Be real strong and don’t let me push them down.”

This one can be done bilaterally, but specifically check that each side begins to give at the same pressure.

#### *Biceps*

Start with the arm extended to 90 degrees. Pull at the wrists or hands for maximal leverage. Check each side individually. Place one hand on bicep to assess bulk and effort. Demonstrate.

“Hold your right arm in front of you (demonstrate). Pull in.”, “Now pull in with the left arm.”

#### *Triceps*

Start with the arm totally flexed. Pull at the wrists or hands for maximal leverage. Check each side individually. Place one hand on tricep to assess bulk and effort.

“Now, keep your arms up and bent. Push out, towards me.”, “Now with the other side, push out towards me.”

#### *Finger extensors*

“Keep your fingers straight and strong, don’t let me push them down.”

#### *Finger abductors*

Check 1<sup>st</sup> and 5<sup>th</sup> digit. If hand weakness is a concern, check 5<sup>th</sup> finger flexion, APB, 5<sup>th</sup> finger and thumb opponens.

“Spread your fingers apart. Don’t let me push them together.”

Also, assess for atrophy or wasting in the hands at this time, at interossei, APB, and ulnar palm.

## **LOWER EXTREMITIES MOTOR AND CEREBELLUM**

### **Strength**

#### *Iliopsoas*

Place hand on the back, to support trunk and isolate iliopsoas from compensatory trunk muscles.

“Put both hands on the table to brace yourself. Raise your right knee off the table, keep your leg bent. Don’t let me push you down.”, “Now, with the other leg.”

#### *Hamstrings*

Point with finger to demonstrate the direction you want the patient to pull. Pull at the ankle with the other.

“Pull your leg in, towards the table.”, “Now, the other side.”

#### *Quadriceps*

Start with the leg bent, to put muscle at mechanical disadvantage. Apply your pressure at the ankle.

“Now, straighten your right knee, slow and strong.”, “Same thing with your left.”

#### *Plantar extensors*

Demonstrate the movement with your hands.

“Raise your foot and toes. Don’t let me push them down.”, “Now, the other side.”

## **REFLEXES**

Reflexes are best obtained with the person sitting in front of you, arms and hands relaxed on lap with patient’s palms up and fingers held loosely. Always move side-to-side for each reflex. Generate

momentum by letting the weight of the hammer fall, using a flick of the wrist while allowing the handle to rotate or pivot slightly between the thumb and index finger. Use consistent movements. Strike as though you are going “through” the joint. Let the hammer strike naturally, without a “pecking” or pulling back motion.

### *Biceps*

Apply a little tension onto the biceps tendon with your thumb. Let the hammer fall onto your thumb. Make sure the reflex response is consistently the same three times in a row.

“Now, I am going to check your reflexes. This is a part of the exam where you can just relax and stay loose.”

Feel the reflex under your thumb while watching the biceps contract.

### *Brachioradialis*

Tap on the radial side of the anterior forearm, where the brachioradialis tendon inserts to mediate radial wrist flexion.

Watch for elbow to flex. Watch for spread into other parts of the arm or excessive finger flexion.

### *Triceps*

While you are still seated, reach around with the patient’s arms in the lap. Tap on the broad insertion of the triceps. If the reflex is not apparent, you can suspend the arm at a right angle by holding the upper arm and having the patient relax.

### *Knee*

Feel the spongy part of the tendon below the patella where you will strike. Stabilize at patient’s the ankle. Get a consistent reflex three times in a row.

### *Ankle*

A little downward pressure can help accentuate a reticent ankle jerk. Keep the ankle at 90 degrees.

“Give a little pressure on my fingers with your foot.”

## **SENSORY**

### **Vibration**

Begin in the patient’s pronated hand. Slightly bend the distal phalynx at the DIP joint. Place your own index finger underneath to feel the transmitted vibration. Apply a 128 hz fork. Start with a light tap, as a screen. Strike more firmly if they don’t feel the vibration.

“Please take your shoes and socks off. What type of sensation do you feel on your finger? Please pay close attention, and tell me as soon as it is no longer humming.”

If vibration is important or attention less than perfect, perform several trials to determine consistency. There is no perfect way to grade vibration with a 128hz fork. The following might be considered a general guide. The fingers are more sensitive than toes by approximately a 5-10 second difference in normal people.

Minimal: You can feel for 5-10 seconds longer than patient.

Mild: You can feel for 10-15 seconds longer than patient.

Moderate: You can feel for 15-20 seconds longer than patient.

Severe: You can feel for 20+ seconds longer than patient

Absent: The patient can’t tell after maximal strike.

### **Babinski sign**

The leg, ankle, and toes need to be very relaxed. This can be done lying down or with the leg supported on your leg.

Hold the foot slightly in plantar extension. Use the tines of the tuning fork, placing one underneath the foot, the other along the lateral aspect of the foot. With light pressure, give a steady stroke from the heel, coming across and below the toes over approximately 5 seconds. Use more pressure if no response. If abnormal, make sure it is reproducible.

“I’m going to check a reflex by rubbing on the bottom of your foot. Please keep your leg, foot, and toes very loose and relaxed.”

Look for fanning of the little toes, a slow and reproducible upward movement of the big toe, and contraction of the tensor fascia lata. A quick movement is due to withdrawal. If no movement, try a firmer pressure, after assessing patient’s comfort.

### **Proprioception**

Start with very small movements. In the hands, use 2-3 degree movements, in the feet start with 3-5 degree movements. Hold the sides of the finger and toe between your thumb and index finger. Make larger movements or move to the next more proximal joint if they cannot feel it. Do about 8 trials on each extremity.

“I’m going to move your finger either upward or downward (demonstrate). Now close your eyes, and tell me which direction every time you feel it move.”

### **Pin**

Roll sleeves above elbow and pants above knees. Open the safety pin to 90 degrees to form a handle. Touch at a rate of about 1 per second. For each leg and arm, start distal medial on right, and work your way proximal. Then, distal medial on left, working proximal. Then lateral, distal to proximal, first right then left. Check either side of lower back for trunk sensation. If myelopathy is a consideration, check spinal level by marching up paraspinal muscles on sides from L2 through C2 on right, then left.

“I’m going to check your sensation by carefully touching you with this safety pin. First, I’ll need your sleeves and pants rolled-up. Please tell me if all the points feel sharp and normal. Are there any difference as we move up the arm? How about right vs. left? How about on the outer side of the arms? And now the legs: all sharp, even in the feet?”

Have them quantify by a reference of 100% or one dollar. You can also have them close their eyes and have them report whenever they feel sharp/dull, as you randomly flip the safety pin for the blunt or sharp side. Determine whether pin is intact but reduced (mild), have impaired sharp/dull (moderate), absent sharp/dull (severe), or pin is not felt (anesthetic).

### **STATION AND GAIT**

#### **Rise and Stance**

Observe how they stand, including speed, strategy, and support. See if they can stand without assistance before asking if you can help. For stance, feet should be touching together front and back, arms at their sides. Rate stability with eyes open for about 10 seconds, before assessing with eyes closed for 10-20 seconds. Keep your arms out in case they start to fall. Often it is easier with shoes off.

“Now, stand-up, and put your feet touching together...next, close your eyes.”

Watch the toes and feet for small movements which represent normal proprioceptive adjustments.

Watch for movement at ankles, knees, hips. Careful - most people with proprioceptive loss do not know they are falling until it is too late.

#### **Gait**

Watch them walk for about 25 feet. Have them turn several times to assess for ataxia and Parkinsonism.

“Please walk down the hallway until I tell you to turn around.”

Observe the width of support, the length of excursion for each leg, excessive lateral or upward movement in the hips, stiffness of one or both legs, difficulty lifting leg both proximally and distally, knee hyperextension as they step through, veering, arm movements, and stability/steps through turns.

#### **Tandem walk**

“Looking at your feet, walk 8 steps with one foot touching in front of the next (demonstrate).”

Count how many steps before stepping-out. Stay close for support. Often easier with shoes off.

#### **Walk on heels and toes**

“Walk a couple steps on your tip toes, keeping your heels high up off the ground...now walk on your heels, keeping your toes up high.”

Watch for sinking with each step.

**Hop on each foot**

Excellent test for subtle asymmetry or progression over time. If weakness is detected, start with the more normal leg. If they are young, ask them to hop fast and high.

“Finally, hop 10 times on your right leg (demonstrate). Now on your left leg (demonstrate).”

If they need to hold on for balance, mention in your note.