

Lecture Notes

Clinical Skills: Neurological Examination
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Clinical Skills: Neurological Examination

Objectives:

1. Demonstrate assessment of cranial nerves I - XII.
2. Demonstrate technique for assessing the motor system, including tone, muscle bulk, and strength (deltoid, biceps, triceps, finger abduction, hip flexion/extension/abduction, knee extension/flexion, ankle dorsiflexion/plantar flexion, toe dorsiflexion).
3. Demonstrate testing of muscle stretch reflexes (biceps, triceps, knee, ankle) and plantar reflex.
4. Demonstrate assessment of sensory system for light touch, pain, vibration, and position sense (including Romberg testing).
5. Demonstrate techniques for testing coordination (fine finger movements, rapid alternating movements, finger-nose-finger, heel-knee-shin).
6. Demonstrate techniques for testing gait and stance.

Reading:

The Bates neurology section and any on-line video references.

CoursePlace.

Go to the website

<http://notesplace.wustl.edu/QuickPlace/pom1/Main.nsf?Login&RedirectTo=%2FQuickPlace%2Fpom1%2FMain.nsf%3FOpenDatabase>

Sign in with your 'Username' and 'Password'.

Click "Log In".

Click on "Physical Exam Web-sites, Tips and Summaries".

Click on the appropriate 'Review Sheet'.

Bates.

Bates' website is <http://vlrc.fitne.net>

Equipment needed:

Reflex hammer (preferably Troemner or heavy round head, not the tomahawk style).

128-Hz tuning fork.

Ophthalmoscope.

Pocket eye chart (for near vision testing)

(Cotton swabs, tongue blades, and safety pins will be provided for you).

General Considerations

The neurological exam should be incorporated into the rest of your physical exam. Although it can be intimidating to those just learning it and although it will inevitably take you a long time to do at first, practice will certainly allow you to become proficient. Your job at this stage is to work on accuracy and thoroughness, not speed. In practice, the neurological exam is tailored to the patient's symptoms and to your hypothesis about lesion localization. The screening neurological exam for the asymptomatic patient undergoing a routine physical is very different from the focused exam for the patient with a specific neurological complaint, which is very different from the "complete" neurological exam. Obviously for those of you who do not choose a career in neurology or neurosurgery, you will be primarily performing screening neurological exams with some focused exams and rarely if ever a complete exam. That being said, it is important at this stage for you to learn the proper way to do all parts of the neurological exam so that when the occasion arises for you to need to do a specific test, you not only know how to do it, but what the normal range of variability in responses should be. In today's lecture and in the rest of this handout, I will be going over a relatively complete neurological exam, but will point out which parts are applicable to the screening exam.

The neurological exam can be organized into 7 categories: (1) mental status, (2) cranial nerves, (3) motor system, (4) reflexes, (5) sensory system, (6) coordination, and (7) station and gait. You should approach the exam systematically and establish a routine so as not to leave anything out. During the course of the exam it is important to look for the distribution of abnormalities (e.g., proximal vs. distal, arms vs. legs, left vs. right). For sensory testing in particular, it is important to let patients know what you are going to do and what you expect of them.

Mental Status:

In addition to its value in localization, mental status testing is used to establish the reliability of the rest of the neuro exam. You can assess much of patients' mental status via simple observation and through their answers to your questions during history taking. For a screening exam, you are done if the patient makes appropriate eye contact and does not drift off or need things repeated, is able to converse normally with you, and answers questions about medical history and recent events in a consistent manner. Obviously, if the patient's spouse or child is sitting there shaking his or her head, repeatedly correcting the patient, or giving you a completely different account of historical or recent events, you will need to do a more formal assessment. Seven areas of mental status need to be considered:

1. Level of awareness.
2. Attentiveness: Is the patient paying attention to you and your questions or is he distractible and requiring re-focusing?
3. Orientation: to self, place, time. Disorientation to time typically occurs before disorientation to place or person. Disorientation to self is typically a sign of psychiatric disease.
4. Speech & language: includes fluency, repetition, comprehension, reading, writing, naming.
5. Memory: includes registration and retention.
6. Higher intellectual function: includes general knowledge, abstraction, judgment, insight, reasoning.
7. Mood and affect: The primary purpose of assessing mood and affect in the neurological exam is to determine if psychiatric disease may be interfering with the neurological assessment. We're not looking for a DSM-IV psychiatric diagnosis.

Cranial Nerves

The cranial nerves consist of nerves that exit through foramina in the skull, not necessarily nerves that originate in the brain (though most do). The following table lists the various testable functions of each of the cranial nerves. The functions in bold are those that should be tested in a screening exam. I cannot stress enough the importance of the fundoscopic exam in all patients from the standpoint of both the general physical exam and the neurological exam. Visual acuity is certainly a vital part of the general exam, but I did not include it as vital in the screening neurological exam because the vast majority of impairment in visual acuity is due to refractive errors rather than optic nerve dysfunction.

	Examination
I	Smell (use coffee, lemon, vanilla, etc; avoid peppermint, menthol, and ammonia since they may stimulate taste buds or trigeminal nerve endings and do not specifically test smell)
II	Visual fields, ocular fundi , visual acuity (Snellen chart)
III, IV, VI	Eye movements, pupillary reaction to light and accommodation, convergence
V	Facial sensation , jaw movements, corneal reflex (afferent limb)
VII	Facial movements-both spontaneous and to command (raising eyebrows, closing eyes, smiling), taste (e.g., salt, sugar, lemon)
VIII	Hearing (finger rub or whisper-not tuning fork)
IX, X	Palate movement , pharyngeal sensation, voice, swallowing; gag not usually necessary
XI	Shrugging shoulders, turning head against resistance
XII	Tongue position and movements

Please note that while the above table lists the various testable functions of each of the cranial nerves, some of the tests are rarely performed in routine practice because 1) their absence does not necessarily provide useful information (e.g., sense of smell and taste may be absent or reduced in the

setting of an upper respiratory infection; gag reflex is absent in many hospitalized patients as well as normal elderly patients) or 2) testing multiple functions of a particular cranial nerve may not add new information (e.g., if pupillary reaction to light is present, then assessing pupillary reaction to accommodation does not give any new information). Again, though, you need to know *how* to perform these tests in the event that they are relevant to the patient's complaints or illness. Olfaction *must* be assessed if the patient complains of a disturbance in taste or smell or if a lesion of the olfactory groove is suspected. Similarly, taste should be assessed when there is a pertinent complaint (though the complaint usually turns out to be due to loss of smell). Pupillary response to accommodation *must* be assessed if the pupils do not react to light. Corneal reflex *must* be tested if the patient complains of sensory disturbance in the face (because it is an objective indication of trigeminal nerve dysfunction whereas sensory complaints are subjective) or if the patient is comatose (because you cannot ask the patient if facial sensation is symmetric).

Motor Exam

The motor exam is affected not only by muscle strength, but also by effort, coordination, and extrapyramidal function. Tests of dexterity and coordination are most sensitive to picking up upper motor neuron and cerebellar abnormalities, whereas direct strength testing is more sensitive to lower motor neuron dysfunction. Other aspects of the motor exam include (1) patterns of muscle atrophy or hypertrophy, (2) assessment of muscle tone (e.g., spastic or clasp knife, rigid or lead pipe, flaccid) with passive movement of joints by the examiner, (3) disturbances of movement (e.g., the slowness and reduced spontaneity of movement in parkinsonism), (4) endurance of the motor response (e.g., the fatigability of myasthenia gravis), and (5) whether any spontaneous movements are present (e.g., fasciculations or brief twitches within the muscle).

Strength of proximal and distal muscles in all limbs should be assessed. For the screening exam, specific muscle testing in the lower extremities is not necessary for patients who are able to walk normally (including on the toes and heels) and to get out of a chair without using their arms to push themselves up.

When testing individual muscle strength, be sure to (1) position the limb in such a way as to permit the muscle being examined to act directly and to minimize the recruitment of other muscles having similar function and (2) always give yourself the advantage. For example, test the iliopsoas by pushing down on the *foot* of the outstretched leg rather than on the *thigh*. Be aware of normal variability in strength based on age, sex, handedness (i.e., the muscles on the dominant side may be stronger), and muscle (e.g., in a patient with normal strength, you should never be able to overcome the ankle plantar flexors but you will likely be able to overcome the abductor digiti minimi).

Reflexes

Reflex testing is the most objective part of the neurological exam and is the least dependent on cooperation (but note that reflexes can be reinforced or decreased voluntarily to some extent, as occurs in guarding). The muscle stretch reflexes (a.k.a. “deep tendon reflexes,” which is incorrect terminology since it is the indirect stretching of the muscle that elicits the reflex; the tendon just happens to be conveniently located to apply the stimulus to) are obtained by placing the muscle in a state of slight tension and then quickly tapping either the tendon or the periosteum to which the muscle is attached and observing the vigor and briskness of the response. The muscle contraction should be seen and felt and compared side-to-side. If reflexes are diminished or absent, try reinforcing the reflex by distracting the patient or having the patient contract other muscles (e.g., clench teeth). Note, however, that symmetrically brisk, diminished, or even absent reflexes may be found in normal people. The muscle stretch reflexes that are the most clinically relevant and that you should know how to obtain include the biceps, triceps, knee, and ankle. The superficial (cutaneous) reflexes are elicited by applying a scratching stimulus to the skin. The only superficial reflex that you need to know other than the corneal is the plantar reflex. An abnormal plantar reflex (extension of the great toe with fanning out of the other toes upon stimulation of the plantar surface of the foot) is a specific indicator of corticospinal tract dysfunction and may be the only sign of ongoing disease or the only residual sign of previous disease.

Sensation

The sensory exam can be frustrating at times because of its subjective nature and reliance on cooperation. It is prudent to test sensation early in your exam if you anticipate poor cooperation to be a factor. Explain to your patients what you are going to do and what you expect of them, then have them close their eyes for the testing. Be aware of the fact that patients may report differences in sensation in the presence of normal sensory function because of actual differences in the stimulus intensity applied—you are not a machine and cannot apply identical pressure each time you poke with a pin.

Both superficial and deep sensation should be tested in all four limbs. Always compare side-to-side, asking, “Are these about the same?” rather than leading questions like, “Is this sharp?” or “Which is stronger?” Remember that thresholds for detecting a stimulus are very low in distal or hair-covered areas and higher over thick skin. Superficial sensation (pain and temperature) is mediated by unmyelinated and small myelinated nerve fibers via the spinothalamic tract. Pain sensation can be tested with a safety pin or the broken end of a cotton swab; temperature sensation can be tested with a cool metal object (like a tuning fork). In the patient complaining of sensory symptoms, demonstrate what the pin/temperature should feel like in an uninvolved area. Since the boundary between “dull” and “sharp” or “warm” and “cool” is usually more readily perceived by the patient if you move your stimulus from the abnormal area to the normal area rather than vice versa, asking the patient to report when the stimulus begins to feel stronger is the best way to identify the margins of a hypesthetic area. Sometimes it is useful to apply the stimulus to an uninvolved part of the body and say, “If this sharpness/coolness is worth \$1, how much is this worth?” and then apply the pin/cool object elsewhere. Deep sensation (pressure, position sense, and vibration) is mediated by large fibers via the dorsal and lateral columns. Vibration and position sense (proprioception) should be tested at the most distal joint of the limb. If sensation at this joint is impaired, increase the intensity of the stimulus and/or move proximally. Emphasis should be on the toes and feet, where the longest, large myelinated fibers are most likely to be impaired. The appropriate tuning fork to use in testing vibration is 128-Hz. You should know your own tuning fork perception and the usual time it takes to fade away. But there are no absolutes for how long a normal person should be able to feel a vibratory stimulus at a particular joint because this is dependent on how hard you strike the tuning fork, the patient’s age, etc. It is most important to compare side-to-side perception. For position sense testing, stabilize the joint with one hand and avoid a push-pull stimulus that lets the patient cheat. For example, in the great toe, steady the interphalangeal joint with one hand and hold the sides of the

distal phalanx with the other to move it up and down. Make sure the patient understands the only choices are up or down—there is no sideways or middle. Normal thresholds should be no more than 2 or 3 degrees. There is a third category of sensation, integrative sensation, which requires higher level processing of the above primary sensory modalities and includes such functions as stereognosis (ability to recognize objects by touch), graphesthesia (ability to recognize letters or numbers drawn on the finger or palm), 2-point discrimination (ability to detect two sharp stimuli that are presented simultaneously at decreasing distance on the skin), double simultaneous stimulation (ability to detect two stimuli applied simultaneously to opposite sides of the body), and constructional ability (copying simple and complex forms, drawing a clock). You will learn more about integrative sensation next year and in your third year clerkship.

The *Romberg test* is another maneuver that is used to detect impaired sensory input. The patient is first asked to stand with the feet together and eyes open and then to close the eyes. An abnormal response (“positive Romberg sign”) is for the patient to be able to stand upright when the eyes are open, but to sway/fall when the eyes are closed. Contrary to popular belief, a positive Romberg sign is not an indication of cerebellar disease—the patient with cerebellar or other motor dysfunction will have a hard time maintaining an upright posture with the feet together regardless of whether the eyes are open or closed. Rather, it is an indication of either impaired proprioception or vestibular dysfunction. There are three sensory inputs to maintain truncal stability—vision, proprioception, and vestibular function. Patients with impairment of one of these systems are usually able to compensate and maintain truncal stability. They cannot usually compensate when a second system (vision, when the eyes are closed) is removed.

For the screening sensory exam, you should perform one test of superficial sensation (pain or temperature) and one of deep sensation (proprioception is more useful than vibration since distal vibratory sense is lost in otherwise healthy elderly patients) in each limb. Since the majority of asymptomatic sensory deficits you will pick up are neuropathies and the majority of these begin distally, testing at the most distal aspect of the limb is usually sufficient.

Coordination and Gait

Test coordination at rest and with action, in the trunk (e.g., ability to maintain an erect posture), and in the limbs. Impairment of coordination may be detected through simple observation of the patient performing routine acts such as signing his name, reaching for objects, or getting onto the examination table. Specific tests to look for impaired coordination in the limbs include finger-to-nose (patient alternately touches your outstretched finger and his nose), heel-knee-shin (patient runs the heel of one foot down the shin of the other), rapid alternating movements (patient alternately taps the dorsal and plantar surface of one hand onto the other hand), and finger or toe tapping. In all cases, you should be looking at rhythm, steadiness, speed, and precision of movements. Loss of the ability to judge and control distance, speed, and power of a motor act is termed *dysmetria*.

Since walking requires proper functioning of the cerebellum and motor, sensory, and vestibular systems as well as a whole host of reflexes, assessment of gait can provide important information to guide the focus of the rest of the neurological exam. It is for this reason that many physicians like to watch the patient walk at the very beginning of the exam. The specific aspects of gait for you to pay attention to include body and extremity posture; length, speed, and rhythm of steps; base of gait (how far apart are the legs); arm swing; steadiness; and turning. Testing tandem gait (walking heel to toe) can be helpful, though many otherwise normal elderly patients cannot perform the task. The screening exam must include an assessment of gait.

Meningeal Signs

Neck stiffness often accompanies the meningeal irritation of meningitis or subarachnoid hemorrhage. This can be assessed by observing for palpable stiffness on either active or passive flexion and extension at the neck. There are a couple of other meningeal signs (Brudzinski's and Kernig's) that you may hear mentioned at some point in your career, but since they do not provide any additional information beyond simple testing for neck stiffness, you do not need to know them. Testing for meningeal signs is not necessary in a screening exam.

The Screening Neurological Examination

The screening neuro examination aims to detect potential neurological abnormalities in the asymptomatic individual and should be incorporated into the general exam in all patients. If you wouldn't consider skipping the heart and lung exam in your routine physical exam, then the same should go for the neuro exam. The problem is that there are many parts of the nervous system with many derangements possible, which translates into many possible tests that can be done. This can overwhelm non-neurologists, creating the tendency for them to throw up their hands and either skip the neuro exam altogether or simply tap on their patients' knees with their tomahawk hammer and declare the neuro exam "nonfocal."

In an effort to bring the neuro exam back into the general exam, I am going to break from standard teaching in what I am about to propose that you include in the screening exam. You must recognize that this is opinion, without hard data to back it up. On the other hand, hard data are lacking in support of the standard screening exam as it is typically taught. Deciding what screening tests to do in any field depends on a number of factors related to the test and the disease being screened. Test-related factors include its sensitivity, specificity, safety, ease of use, and cost. Disease-related factors include the prevalence, seriousness, and treatability as well as the importance of early diagnosis. Although you can do virtually all parts of the neuro exam safely, easily, and at no financial cost (other than the patient's and your time), sensitivity and specificity are rarely vigorously tested. More worrisome to me is that if you are told you need to specifically test every cranial nerve and every major muscle group and dermatome, you will either get bogged down and lose sight of the most important and most common findings to seek or worse yet reserve the neuro exam for only the occasional patient when you happen to have the time to spend on it.

So what follows is my take on the essential screening neurological exam. Because you will inevitably run into at least one neurologist in the future who will think it is blasphemy that I am leaving out this or that test (and will rant about it for as long as you will listen), I will include at the end of this document a more generally accepted screening neurological exam, which though longer, can still be accomplished in just 5 minutes. Of course suspicion of a specific neurological condition or the finding of deficits on the screening exam warrants additional focused examination.

A couple notes: It is universally held that the history is the most important part of the neurological exam because it will determine whether anything beyond the screening exam is required and because it usually suffices for evaluating mental status. Parts of the neurological exam can be assessed by simple observation of patients during history taking and as they move about the exam room (see below). If the patient is already in the exam room seated on the exam table and your interview consists of your looking down and writing in your patient's chart the whole time, you will need to do more formal testing to assess these neurological functions. Other parts of the neurological exam overlap with parts of the general exam. For example, while you are doing fundoscopy to screen for vascular changes associated with diabetes and hypertension, you should also assess for signs of increased intracranial pressure. And tests of visual acuity and hearing satisfy both the general and neurological exam.

The essential screening neurological exam for adults and older children

Mental status (tested through history taking).

Observation of eyes, face, voice, and coordination during history taking and as patient moves about the exam room. Look for extraneous movements.

Gait including arising from chair without hands, walking on toes, heels, and heel to toe (tandem).

Visual fields.

Fine finger movements and toe tapping.

Reflexes — ankles (may need to compare to patellar), plantar.

Sensation: vibration in toes; pinprick in feet; Romberg or proprioception in feet.

(Tests in italics can be omitted in children.)

Aims of each test and what you should look for

Mental status

Consider attentiveness, orientation, speech and language, memory, and mood and affect. If the patient makes appropriate eye contact and does not drift off or need things repeated, is able to converse normally with you, and answers questions about medical history and recent events in a consistent manner, you are done. Obviously, if the patient's spouse or child is sitting there shaking his or her head, repeatedly correcting the patient, or giving you a completely different account of historical or recent events, you will need to do a more formal assessment.

II. Observation during history taking and as patient moves about the exam room

You may be surprised to realize how much of neurologic function can be screened through simple observation. This is where you will check off most of the cranial nerves and parts of the motor and coordination exam. Note whether the eyelids are droopy, particularly if asymmetric (CN III). Are both eyes looking straight ahead and do they move conjugately as the patient looks around (CN III, IV, VI)? Are forehead creases, nasolabial folds, blinking, and facial movement symmetric (CN VII)? Is the voice nasal, breathy, or hoarse (CN IX, X)? Is there decreased use or inattention of a limb (motor or sensory deficits or neglect)? Does the patient bump into objects on one side (CN II—visual field cut or neglect)? Assess coordination by watching the patient perform routine acts such as reaching for objects or getting onto the examination table. Pay attention to the patient's ability to control distance, speed, and rhythm of motor acts. Is there wasting of muscles (neuropathy or anterior horn cell disease)? Are there any extraneous movements like fasciculations (muscle twitches suggestive of motor neuron disease) or tremor of the head or limbs when reaching for objects (essential tremor) or at rest (parkinsonism)?

III. Gait

Since walking requires integration of motor, sensory, cerebellar, vestibular, and extrapyramidal function, assessment of gait can provide important information to guide the focus of the rest of the exam and can obviate the need for specific testing. It is for this reason that many physicians like to watch the patient walk at the very beginning of the exam. Pay attention to 1) posture of body and limbs (Is the patient stooped over or leaning to one side? Is a limb held in a funny position?); 2) symmetry of arm swing (Is one side decreased?); 3) length, speed, and rhythm of steps (Does the patient lurch? Are the legs stiff and scissoring?); 4) base of gait (Are the legs held far apart because the patient is unstable?); 5) steadiness; and 6) turns (How many steps does the patient take to turn?). More informative still is if the patient can run and hop on one foot. This should be part of every pediatric exam and the adult exam, when possible. You will always want to observe the patient arise from a chair. Pay attention to whether there is difficulty getting started, e.g., needing to rock back and forth a few times, which would suggest bradykinesia/parkinsonism. If the patient can get out of the chair without using hands, you have sufficiently tested proximal lower extremity strength. Walking on heels and toes specifically tests distal leg strength. Tandem gait (walking heel to toe in a straight line) tests coordination, though note that many otherwise normal elderly patients cannot perform this task. Children may be asked to skip, kick a ball, and play catch.

IV. Visual fields

Screen for an unsuspected visual field deficit by holding your hands laterally midway between you and the patient, wiggling a finger on one hand alternately in both upper and lower temporal quadrants, and asking the patient to indicate where the movement is. (Note: this screen will miss the rare isolated nasal field cut.) If an abnormality is found on the screening test, test all 4 quadrants of each eye individually.

V. Fine finger movements (finger tapping) and toe tapping

Have the patient tap the thumb and index finger together rapidly, first on one side and then on the other. Have the patient tap your hand with the ball of each foot as fast as possible. In each case, observe the rhythm, speed, and precision of movements. The ability to perform these tasks requires properly functioning pyramidal (corticospinal) and extrapyramidal tracts, sensation, and coordination.

If you detect asymmetry or if movements are slow, indistinct, clumsy, or arrhythmic, you will need to follow up with more detailed testing of these pathways. Normal functioning on these tests along with normal gait and ability to arise from a chair obviate the need for individual muscle testing.

VI. Reflexes

Reflex testing is the most objective way to test corticospinal function and it is so strongly associated in people's minds with the neurological exam that patients may feel deprived if you omit it. However in asymptomatic individuals with a normal gait, the yield of reflex testing is quite low (with the exception of ankle jerks as a screen for peripheral neuropathy in older adults or those with diabetes or alcoholism). This is because many normal people have symmetrically brisk, diminished, or even absent reflexes. So if you are running low on time and your patient has no complaints of neck/back/limb pain, bladder difficulties, gait problems, or numbness or weakness, you can skip the other muscle stretch reflexes. The plantar reflex is tested by firmly scraping along the lateral aspect of the plantar surface of the foot with a key or broken tongue depressor. Start at the heel moving towards the toes and then across the foot medially just below the toes. An abnormal plantar response (extension of the great toe with fanning out of the other toes) may be the only sign of ongoing corticospinal dysfunction or the only residual sign of previous disease.

VII. Sensation

For the screening sensory exam, perform one test of superficial sensation (pain or temperature) and one of deep sensation (proprioception or vibration). Eyes should always be closed for sensory testing. Since the majority of asymptomatic sensory deficits you will pick up are neuropathies and the majority of these begin distally, testing at the most distal aspect of the limb, particularly in the foot, is usually sufficient. Test vibration by striking a tuning fork as hard as you can on your hand and placing the base on the distal joint of the patient's great toe. Ask the patient what she feels. In the screening exam of asymptomatic patients, it is good enough to have this be an all-or-nothing test (yes I feel vibration/no I don't). Test pain sensation by poking the patient's dorsal foot with the point of a safety pin (apply the pin firmly but not hard enough to draw blood) and asking the patient what she feels. Have the patient compare the sensation to pinprick applied to the shin and to the opposite foot, asking if they are "about the same." Romberg testing is most easily accomplished at the time of gait testing as long as you recognize that you are actually testing the integrity of proprioception and vestibular function. Have the patient stand with the feet together and eyes open, then close the eyes. A bit of wavering followed by righting can be normal; falling is not. Detailed sensory testing in a normal child is unlikely to be very informative and can be skipped. If you do pursue it, substitute temperature (e.g., cold tuning fork) for pinprick.

The screening neurological exam for infants, toddlers, and pre-schoolers

The essential screening neurological exam for young children

Mental status (tested through observation and with specific questions for language development).

Observation of eyes, face, voice, limb movement, and coordination during history taking and as patient moves about in parent's lap or on exam table. Look for extraneous movements.

Gait including walking and running; tandem gait and skipping, if possible.

Head circumference; palpate fontanel in infants.

Vision/eye movements — tracking object, look for strabismus (misalignment of eyes).

Hearing.

Coordination — manipulate an object, throw and catch a ball.

Tone (ventral suspension and resistance to passive movement) in infants.

Primitive reflexes (Moro, rooting, placing) in infants.

Your observation of the young child should include note of whether the child is able to sit still and pay attention. Make sure all limbs are being used equally. Pre-school children should be asked age-appropriate questions to assess language development. Ask them to name objects and colors and ensure that they can comprehend simple tasks (without nonverbal cues). Head circumference should be measured in all young children and plotted on a chart. Note if head shape is normal. Fontanel should be palpated in infants. (The anterior fontanel closes between about 7 and 19 months; the posterior fontanel may be closed at birth.) Vision is tested in young children by verifying that they follow a small object moved across their visual field. Hearing is tested by looking for a behavioral response to a loud sound. I omitted reflexes as essential in the examination of normal young children, but note the same caveat as above: parents may feel deprived if you omit this test. If you opt to check the plantar reflex, be aware that it changes over the first year of life. Almost all mainstream clinicians believe that the normal plantar response in infants is extensor. Test tone in infants by assessing for resistance to passive movement and holding the infant in ventral suspension. Healthy newborns and young infants have a number of reflexes that become inhibited when the cerebral cortex matures. These should be tested because their absence suggests global injury and their persistence beyond the newborn period suggests lack of normal brain maturation. The Moro reflex is symmetric abduction followed by adduction of both arms elicited by supporting the infant in a supine position and gently allowing the back of the head to drop. This normally disappears by 4-6 months. The rooting reflex is turning of the head towards a stimulus applied to the side of the mouth with latching on and sucking. The placing response is elevation and moving forward of the foot upon touching of the dorsal surface of the foot, which results in the appearance of attempting to stand and take steps. This response disappears by 5-6 weeks.

The Traditional Screening Neurological Exam

What follows is a more traditional screening neurological exam. Although it looks quite long, there are tricks to performing it efficiently that are best learned through observation. It can be easily accomplished in 5 minutes with a little practice.

The traditional screening neurological exam

Mental status (tested through history taking).

Gait, including walking on toes and heels, tandem, and running, if possible.

Visual acuity (using a pocket Snellen acuity card).

Visual fields to confrontation.

Fundoscopy.

Pupillary response to light (direct and consensual).

Eye movements.

Smooth pursuit on up gaze and lateral gaze.

Saccades — rapidly looking to a target on the left and right.

Facial sensation to pinprick on forehead, cheek, and chin bilaterally.

Facial movement — close eyes tightly, show teeth.

Hearing — finger rub at arm's length.

Palate — say Ahh.

Tongue — stick out your tongue.

Motor

Look for wasting and extraneous movement (e.g., fasciculations or tremor).

Test tone in wrists, elbows, and knees.

Strength: shoulder, abduction, elbow flexion/extension, wrist extension, finger abduction, thumb abduction, hip flexion, knee flexion/extension, ankle dorsiflexion/plantar flexion.

Fine finger movements (tap thumb and index finger rapidly, first on one hand, then the other).

Barre sign/pronator drift (hold arms out to the front with palms up and eyes closed — look for pronation and downward drift).

Reflexes — biceps, triceps, knees, ankles, plantar.

Sensation.

Vibration or joint position sense in toes and fingers.

Pinprick or temperature in hands and feet.

Coordination — finger-nose-finger and heel-knee-shin.

Sample Normal Screening Neurological Exam

Despite the fact that the number of specific tests is reduced in the essential screening neurological exam, if you are observant during history taking and the gait exam and know what you are looking for, you will still end up with important information on almost all aspects of neurological function. This is apparent from the following sample normal screening exam. (*The findings in italics apply only to the commonly accepted screening neurological exam*)

Mental status: alert, attentive, and oriented; speech clear & fluent with normal comprehension; able to provide clear account of historical and recent events.

Cranial nerves:

- II corrected visual acuity 20/20 bilaterally*; visual fields full; optic discs sharp with venous pulsations present bilaterally.
- III, IV, VI pupils 4 mm and reactive to light; extraocular movements intact; no ptosis.
- V facial sensation equal to pinprick in all 3 divisions bilaterally.
- VII face symmetric with normal eye closure and smile.
- VIII hearing normal to rubbing fingers*.
- IX, X palate elevates symmetrically; phonation normal.
- XII tongue midline with good movements.

Motor: normal bulk, *tone*, and strength bilaterally; *no pronator drift*.

Sensory: vibration felt in toes *and fingers* bilaterally; pinprick intact in feet without distal gradient.

Reflexes: 2+ and symmetric at *biceps, triceps, knees, and ankles*; plantar responses flexor bilaterally.

Coordination: normal fine finger movements, *finger-nose-finger, and heel-knee-shin*.

Gait: steady with normal steps, base, arm swing, and turning; normal heel, toe, and tandem walking.

*tested as part of general exam

One last reminder: the screening neurological exam discussed above, particularly the essential screening exam, is intended for use in the **asymptomatic** patient in whom you have no particular suspicion of neurological disease (e.g., yearly physical exam). It is not sufficient for anybody with neurological complaints (including headache or back pain) or those at high risk for neurological disease.

Step-by-Step Guide to the Neurological Examination

I. Mental Status.

A. Level of consciousness.

1. Note if awake and alert.
2. If not, describe what level of stimulation is needed to arouse and keep patient awake. E.g., "opens eyes to noxious stimuli; falls back asleep if not continuously stimulated."

B. Attentiveness.

1. Patient is attentive if able to attend to you and the examination without getting easily distracted.
2. Have patient spell WORLD backwards or count backwards or say the months of the year backwards.

C. Orientation.

1. Ask patient full name, location, and full date.
2. Patient is "oriented x 3" if all 3 are entirely correct.
3. If not oriented x 3, write out patient's responses. Do not say "oriented x 2 (or 1)".

D. Speech and language.

Listen to patient's verbal output: motor ability to produce words, quantity of spontaneous speech, rate of speech production, sentence structure, accuracy/appropriateness of words used, and ability to repeat a sentence, follow commands, and come up with the right words for things.

1. Fluency is normal if patient speaks in complete sentences without hesitancy between words.
2. Comprehension is normal if patient is able to answer your questions appropriately and follow exam instructions.
 - a. "Do what I say: Look to the door and then look to the window."
 - b. If not done perfectly, give simpler command: "Show me your thumb."
3. Repetition.
 - a. "Repeat after me: I went to the store and forgot my wallet."
4. Naming.
 - a. Point to objects around room, asking what they are: watch, pen, telephone.
 - b. If done well, ask more difficult ones: (watch) band, (pen) cap, (telephone) receiver.
5. Reading.
 - a. Have patient read and follow a written command: Close Your Eyes.
6. Writing.
 - a. Have patient write a complete sentence of their choosing.

E. Memory.

1. Registration: "Repeat these words after me: apple, table, penny." Do not proceed to memory testing until patient says them all correctly.
2. Immediate Recall: 1-3 minutes later, "What were those 3 words I asked you to remember?"
3. Recent memory: "What did you have for breakfast this morning?"
4. Remote memory: "Where did you grow up/go to school? When was your wedding/child born/military service?"

F. Higher intellectual function.

1. General knowledge: "Who is the U.S. president/Missouri governor? What is the capital of Illinois?"
2. Abstraction: "What does 'People in glass houses shouldn't throw stones' mean?"
3. Judgment: "What would you do if you found a sealed, stamped, addressed envelope lying on the ground?"
4. Insight: "Why did your daughter bring you to the hospital?"
5. Reasoning: "How do a lie and a mistake differ?"

Note: the examples of commands and questions used in assessing mental status that are provided in the preceding section are merely examples, not specific instructions you are expected to follow.

II. Cranial Nerves.

A. CN I Olfactory.

1. Have patient close eyes.
2. Occlude one nostril and test other using nonirritating substances (e.g., vanilla, cloves, coffee). Avoid those that stimulate trigeminal nerve endings or taste buds (e.g., peppermint, menthol, ammonia, alcohol swabs).
3. Compare 2 sides.

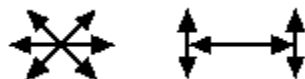
B. CN II Optic.

1. Visual acuity.
 - a. Hold Snellen chart at comfortable reading distance (about 14 inches).
 - b. Cover 1 eye and have patient read chart.
 - c. For each eye, record smallest line patient can read.
 - d. Glasses should be left on (looking for optic nerve lesion, not refractive error).
2. Visual fields.
 - a. Stand directly in front of patient and have patient look you in both eyes.
 - b. Hold your hands midway between you and the patient far enough laterally that you can barely see them out of the corner of your eyes.
 - c. Wiggle a finger on one hand.
 - d. Ask patient to indicate on which side the finger is moving.
 - e. Repeat in upper and lower temporal quadrants.

- f. If abnormality is suspected or is found on screening test above, test all 4 quadrants of each eye individually.
 - i. Have patient close one eye; you should close your own eye that is opposite the patient's closed eye, since you will be serving as the normal control.
 - ii. Move a finger or penlight into the periphery of each visual quadrant (upper and lower temporal and nasal), asking patient to indicate when movement is detected. It should be seen by you and patient at the same time.
3. Fundoscopy.
- a. Have patient focus on distant wall.
 - b. Be sure your head is not obstructing patient's view of that target.
 - c. View optic disc using ophthalmoscope.
 - d. Note disc color and presence of venous pulsations, papilledema (disc hyperemia, blurred margins, absent venous pulsation), or hemorrhages.
4. Pupillary function (CN II and CN III).
- a. Test pupillary reaction to light.
 - i. Dim room lights as necessary.
 - ii. Ask patient to look into distance to avoid effect of accommodation.
 - iii. Shine bright light obliquely into each pupil.
 - iv. Look for both direct (same eye) and consensual (other eye) constriction.
 - v. Record pupil size in mm (normal is about 2-5 mm) and any asymmetry or irregularity.
 - b. If light reflex is abnormal, test pupillary reaction to accommodation.
 - i. Hold finger 10 cm from patient's nose.
 - ii. Have patient alternate looking into distance and at finger.
 - iii. Observe pupillary response.

C. CN III, IV, VI Oculomotor, Trochlear, Abducens.

- 1. Visual inspection.
 - a. Look at ocular alignment at rest (primary gaze). Does the reflection of light hit at same location in each eye? Is one eye deviated in, down and out, or up?
 - b. Observe for ptosis (lid droopiness).
- 2. 6 cardinal directions of gaze.
 - a. Stand 3-6 feet in front of patient.
 - b. Ask patient to follow your finger with the eyes without moving the head. Place your hand on top of head to keep it still if necessary.
 - c. Move your finger in the six cardinal directions and observe whether movements are full in each eye.



3. Convergence.
 - a. Ask patient to follow your finger with the eyes without moving the head. Hold lids up if necessary.
 - b. Move your finger toward bridge of patient's nose and observe eye movements.
4. Smooth pursuits (smooth following movements).
 - a. Steadily move your finger horizontally and then vertically as in testing individual extraocular muscles, but this time, look at smoothness of following movements.
5. Saccades (discrete, rapid movements from one object to another).
 - a. Hold up your hands in front of patient (with each hand held a few inches lateral to the eye).
 - b. Have patient alternate looking from one hand to the other.
 - c. Observe accuracy with which eyes reach target. Do they consistently undershoot or overshoot the target? Is there oscillation before hitting the target?
6. Nystagmus.
 - a. Observe for involuntary horizontal, vertical, or rotary oscillation of the eyeballs at primary gaze (looking straight ahead) and on sustained horizontal and vertical gaze.
 - b. If present, note direction of movement and whether movement persists or fatigues.
 - c. (a few beats of nystagmus at extremes of gaze is a normal finding).
7. Pupillary light response. (see CN II)

D. CN V Trigeminal.

1. Facial sensation.
 - a. Explain to patient what you intend to do.
 - b. Use sharp end of a broken cotton swab or a pin to test pain sensation on forehead, cheek, and jaw of each side of face.
 - c. Ask patient to tell you whether it feels about the same on both sides.
 - d. If not, map out where abnormality is to see if it conforms to distribution of trigeminal nerve. Specifically, march stimulus from forehead back past hairline, from cheek to tragus of the ear, and from jaw to neck. (V1 extends far back to the top of the skull—it does not end at the hairline. V3 ends just above the jaw line inferiorly and just before the ear laterally.)



2. Corneal reflex (CN V and CN VII).
 - a. Lightly touch peripheral aspect of cornea from the side with fine wisp of cotton.
 - b. Look for normal blink reaction of both eyes.
 - c. Repeat on other side.
 - d. If response is less than brisk, touch cornea more centrally.
3. Temporalis and masseter strength.
 - a. Ask patient to open mouth and clench teeth.
 - b. Palpate temporalis and masseter muscles.

E. CN VII Facial.

1. Observe for any facial asymmetry at rest in forehead wrinkles, palpebral fissure width, nasolabial folds, or corner of mouth.
2. Ask patient to do the following and note any lag, weakness, or asymmetry:
 - a. Smile.
 - b. Puff out cheeks.
 - c. Close both lips and resist your attempt to open them.
 - d. Close both eyes and resist your attempt to open them.
 - e. Raise eyebrows.
3. Corneal reflex (see CN V).

F. CN VIII Acoustic.

1. Screen hearing.
 - a. Face patient and hold out your arms with your fingers near each ear.
 - b. Rub your fingers together on one side.
 - c. Ask patient to tell you when and on which side the rubbing is.
 - d. Increase intensity as needed.
 - e. Note any asymmetry.

G. CN IX & X Glossopharyngeal & Vagus.

1. Listen to patient's voice. Note any hoarseness, nasal, or breathy quality.
2. Ask patient to say "Ah" and watch movement of soft palate and pharynx. (Do not pay attention to uvula, which can deviate to one side or another in the normal person.)
 - a. Note any asymmetry of palate elevation.
3. Ask patient to swallow and to cough.
4. In the unconscious or uncooperative patient, test gag reflex.
 - a. Stimulate back of throat with a cotton swab on each side.
 - b. Look for gagging after each stimulus.

H. CN XI Spinal Accessory.

1. Trapezius.
 - a. From behind patient, look for atrophy or asymmetry of trapezii.
 - b. Ask patient to shrug shoulders against resistance and note strength.
 - c. Ask patient to push head back against resistance and note strength.
2. Sternocleidomastoid.
 - a. Place hand on lower face and ask patient to turn head towards that side against resistance.
 - b. Observe contraction of opposite sternocleidomastoid.

I. CN XII Hypoglossal.

1. Note tongue position at rest in the mouth and on protrusion. Does tongue deviate in either position?
2. Ask patient to stick out tongue and move it from side to side. Note strength and rapidity of movements.
3. Have patient push tongue into each cheek while you push from the outside. Note strength.

III. Motor System.

A. Visual inspection.

1. Note muscle bulk. Look for generalized or focal muscle wasting or hypertrophy.
2. Look for extraneous movements, e.g., tremor (At rest? With action?), fasciculation (muscle twitching).
3. Note speed of movement, e.g., slow to initiate (bradykinesia).

B. Tone (muscle tension at rest).

1. Ask patient to relax.
2. Flex and extend patient's wrists, elbows, ankles, and knees.
3. Look for resistance that is decreased (hypotonia) or increased (throughout range of motion=rigidity; spring-like=spasticity).

C. Strength and Endurance.

1. Isolate muscle you are testing so patient can't use strong muscles that have similar function to compensate for weak one being tested.
2. Fix proximal joint when testing distally. E.g., if testing pronation, fix the humerus, so patient can't use shoulder to compensate for weak pronation.
3. Give yourself the advantage. E.g., when testing deltoid, press on outstretched hand rather than on elbow.
4. Have patient walk on heels and toes and do deep knee bend or get out of chair without using arms.

5. Test at least the following muscles on both sides:
 - a. Deltoid: abduction (elevation) of upper arm (C5-6; axillary nerve).
 - b. Biceps: flexion of forearm at elbow (C5-6; musculocutaneous nerve).
 - c. Triceps: extension of forearm at elbow (C6-8; radial nerve).
 - d. Extensor carpi radialis: dorsiflexion of hand at wrist (C5-6; radial nerve).
 - e. Abductor pollicis brevis: palmar abduction of thumb with thumb at right angle to palm (C8-T1; median nerve).
 - f. Interossei: finger abduction (dorsal) and adduction (palmar) (C8-T1; ulnar nerve).
 - g. Iliopsoas: hip flexion (L1-3; femoral nerve).
 - h. Quadriceps: knee extension (L2-4; femoral nerve).
 - i. Hamstrings: knee flexion (L5-S2; sciatic nerve).
 - j. Tibialis anterior: foot dorsiflexion (L4-5; deep peroneal nerve).
 - k. Gastrocnemius/soleus: foot plantar flexion (S1-2; tibial nerve).

6. Assign score of 0-5 for each muscle based on Medical Research Council scale.

Grade	Description
0/5	No muscular contraction
1/5	Visible muscle contraction, but no movement at the joint
2/5	Movement at the joint, but not against gravity
3/5	Movement against gravity, but not against added resistance
4/5	Movement against resistance, but less than full
5/5	Movement against full resistance; normal strength

7. Note if strength fatigues after sustained muscle contraction.

IV. Reflexes.

A. Muscle stretch reflexes.

1. Position limb and place muscle in slight tension.
2. Quickly tap the tendon/periosteum to which muscle is attached.
3. Observe vigor and briskness of response and compare side-to-side.
4. If reflexes are diminished or absent, try reinforcing the reflex by distraction or via isometric contraction of other muscles (clenched teeth).

5. Test at least the following reflexes: (spinal nerve root in bold is the predominant contributor).
 - a. Biceps (C5, **C6**; musculocutaneous nerve).
 - i. Patient's arm should be partially flexed at the elbow with palm down.
 - ii. Place your thumb or finger firmly on biceps tendon.
 - iii. Strike your finger with reflex hammer.
 - iv. You should feel the response even if you can't see it.
 - b. Triceps (C6, **C7**; radial nerve) .
 - i. If patient is seated: support upper arm and let forearm hang free.
 - ii. If patient is lying down, flex arm at elbow and hold it close to chest.
 - iii. Strike the triceps tendon above the elbow.
 - c. Knee (L2, L3, **L4**; femoral nerve).
 - i. Have patient sit or lie down with knee flexed.
 - ii. Strike patellar tendon just below patella.
 - iii. Note contraction of the quadriceps and extension of the knee.
 - d. Ankle (**S1**, S2; tibial nerve).
 - i. Dorsiflex foot at ankle.
 - ii. Strike Achilles tendon.
 - iii. Watch and feel for plantar flexion at the ankle.
6. Test for clonus (rhythmic oscillations of flexion/extension) at the ankle.
 - i. Support knee in a partly flexed position.
 - ii. With patient relaxed, quickly dorsiflex foot.
 - iii. Observe for rhythmic oscillations.
7. Assign grade on scale of 0-4.

Grade	Description
0	Absent
1	Hypoactive
2	Normal
3	Brisk/hyperactive
4	Markedly hyperactive with clonus and/or spreading

B. Plantar response (L4-S2, especially S1; tibial nerve).

1. Using the end of a reflex hammer, a broken tongue blade, or a key, stroke lateral aspect of the sole of each foot from heel to toes, then drag the stimulus across the foot just beneath the toes.
2. Note movement of toes.
3. If no response, increase pressure of stroking.
4. If patient ticklish or withdrawing whole foot, either have patient stroke own foot or apply stimulus along lateral aspect of foot only.
5. Flexion of all toes (downgoing toe) is a normal response. Extension of the great toe (upgoing toe; positive Babinski) with fanning of the other toes is abnormal.



V. Sensory System.

A. General points.

1. Explain each test before you do it.
2. Unless otherwise specified, the patient's eyes should be closed during testing.
3. Test all 4 extremities.
4. Compare side to side and ask if the two sides are about the same. Avoid leading questions like "Is this sharp?"
5. Compare distal and proximal areas of the extremities.
6. When you detect an area of sensory loss, map out its boundaries in detail.

B. Vibration.

1. Use a 128-Hz (low-pitched) tuning fork.
2. Lightly strike tines against your hand and place stem of the fork over most distal joint of patient's great toe.
3. Ask whether patient feels anything and what the sensation is.
4. If vibration is felt, ask when it goes away. Count number of seconds.
5. Repeat on other side, being sure to strike the fork with about equal force, and compare duration vibration is felt.
6. If vibration sense is impaired, move proximally one joint at a time until it is felt.
7. Test the fingers in a similar fashion.

C. Joint position sense.

1. Grasp patient's great toe on sides of distal phalanx and hold it away from other toes to avoid friction.
2. Demonstrate to patient what "up" and "down" feel like and tell patient you will move the toe in one of these two directions only.
3. Move toe a few degrees and ask patient to identify direction in which toe was moved.
4. If position sense is impaired, increase stimulus intensity (move toe a greater distance); if still impaired, test at more proximal joint (ankle-->knee-->hip).
5. Test fingers in a similar fashion.

D. Pain.

1. Use a safety pin or sharp end of a broken cotton swab.
2. Test for a distal gradient of sensory loss in leg by applying stimulus at toes and marching your way up to knee.
 - a. Ask patient if the sensation is "about the same" or if it changes as you move up the leg.
3. Test for sensory loss in most commonly affected nerve and nerve root distributions.
 - a. Test the following areas:
 - i. Palmar aspect of index finger (median nerve).
 - ii. Palmar aspect of 5th finger (ulnar nerve).
 - iii. Web space between thumb and index finger on dorsal surface of hand (radial nerve).
 - iv. Web space between great toe and 2nd toe on dorsal surface of foot (L5).
 - v. Lateral surface of foot (S1).
 - b. Apply stimulus to one and then another of these locations in the upper or lower extremity, asking patient if the two areas are "about the same."
4. In the patient complaining of sensory symptoms, move stimulus from abnormal area to normal area, asking patient to report when stimulus begins to feel stronger.
 - a. Another technique is to apply stimulus to an uninvolved part of the body and say, "If this sharpness/coolness is worth \$1, how much is this worth?" and then apply stimulus to the involved part.

E. Temperature.

1. Testing of temperature is usually reserved for the patient in whom testing of pain sensation is abnormal.
2. Press a cold tuning fork against the skin to make sure there is temperature loss in same distribution as pain loss.

F. Light touch.

1. Touch the skin lightly with your fingers.
2. Ask patient to respond whenever a touch is felt (e.g., "left arm").
3. Test face, arms, and legs in random order.

G. Double simultaneous stimulation (test for extinction/tactile neglect).

1. Can be performed only when light touch is intact.
2. Touch both sides of patient's face or body simultaneously.
3. Ask patient to indicate whether touch is felt on the left, right, or both.

H. Graphesthesia (integrative sensation).

1. Can be performed only when light touch is intact.
2. Using a pen cap, paper clip, or your finger, draw a number in patient's palm or, for more sensitivity, on index finger.
3. Ask patient to identify the number.

I. Stereognosis (integrative sensation).

1. Can be performed only when light touch and position sense are intact.
2. Place a familiar object (e.g., coin, paper clip, key) in patient's hand.
3. Ask patient to move it around using fingers and to identify it.

J. Romberg.

1. Have patient stand with feet together and eyes open.
2. Have patient close eyes.
3. Hold your arms out to steady/catch patient if necessary.
4. Watch for development of swaying or falling when eyes are closed ("positive Romberg")—indicates either impaired proprioception or vestibular dysfunction.

VI. Coordination.

A. Truncal stability.

1. Observe patient sitting on a chair or side of bed with hands in lap. (Make sure if sitting on side of bed that bed is reclined flat.)
2. Note any leaning towards one side or falling backwards.

B. Fine finger movements (finger tapping).

1. Have patient tap distal joint of thumb with tip of index finger as fast as possible.
2. Observe rhythm, speed, and precision of movements.
3. Repeat on other side.

C. Toe tapping.

1. Have patient tap your hand with ball of each foot as fast as possible.
2. Observe rhythm, speed, and precision of movements.
3. Repeat on other side.

D. Finger-nose-finger.

1. Have patient alternately touch your outstretched finger and own nose.
2. Be sure your finger is far enough away that patient's arm must fully extend to reach it.
3. Observe speed, and precision of movements. Note any oscillation, especially one that worsens as patient's finger nears the target. Note if patient consistently passes (overshoots), fails to reach (undershoots), or is off to left or right of target.
4. Repeat on other side.

E. Heel-knee-shin.

1. Patient should be lying down on exam table/bed. Place heel of one foot just below knee of the other leg.
2. Have patient run that heel up and down shin of other leg.
3. Observe speed, and precision of movements. Note any wavering.
4. Repeat on other side.

F. Rapid Alternating Movements.

1. Have patient alternately tap dorsal and plantar surface of one hand onto other hand, the thigh, or the bed (as fast as possible).
2. Observe rhythm, speed, and precision of movements.

VII. Station and Gait.

A. Observe the patient do the following:

1. Rise from a seated position.
2. Walk across room, turn, and come back.
3. Walk on toes.
4. Walk on heels.
5. Walk heel to toe (tandem gait) in a straight line. (Many otherwise normal elderly people cannot perform this task.)

B. Be prepared to catch the patient if necessary. If there is any doubt in your mind as to whether the patient may fall, get assistance (nurse, patient care technician, resident) before testing gait. Do not use this doubt as a reason not to test gait, however.

C. Pay attention to the following:

1. Posture of body and extremities (e.g., leaning or pulling towards one side or backwards, twisting or holding back one arm).
2. Length, speed, and rhythm of steps.
3. Base of gait (how far apart are the legs).
4. Arm swing (is it reduced unilaterally or bilaterally).
5. Steadiness.
6. Turning (steadiness of turns and number of steps required to complete the turn).

VIII. Meningeal Signs.

- A.** Ask patient to flex and extend neck.
- B.** Passively flex and extend patient's neck.

- C.** Observe for palpable stiffness on either active or passive movement.

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