

## Nursing Assessment

1. Part of Nursing Process
2. Nurses use physical assessment skills to:
  - a) Develop (obtain baseline data) and expand the data base from which subsequent phases of the nursing process can evolve
  - b) To identify and manage a variety of patient problems (actual and potential)
  - c) Evaluate the effectiveness of nursing care
  - d) Enhance the nurse-patient relationship
  - e) Make clinical judgments

## Gathering Data

Subjective data - Said by the client (S)

Objective data - Observed by the nurse (O)

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Assessment Techniques: **The order of techniques is as follows (A-D) except for the abdomen where you inspect then auscultate**

### A. Inspection - critical observation

1. Take time to “observe” with eyes, ears, nose (all senses)
2. Use good lighting
3. Look at color, shape, symmetry, position
4. Odors from skin, breath, wound
5. Develop and use nursing instincts
6. Inspection is done alone and in combination with other assessment techniques

### B. Palpation - light and deep touch

1. **Back of hand (dorsal aspect) to assess skin temperature**
2. Fingers to assess texture, moisture, areas of tenderness
3. Assess size, shape, and consistency of lesions

### C. Percussion - sounds produced by striking body surface

1. Produces different notes depending on underlying mass (dull, resonant, flat, tympani)
2. Used to determine size and shape of underlying structures by establishing their borders and indicates if tissue is air-filled, fluid-filled, or solid

### D. Auscultation - listening to sounds produced by the body

1. Direct auscultation – sounds are audible without stethoscope
2. Indirect auscultation – uses stethoscope
3. Know how to use stethoscope properly (practice)
4. Fine-tune your ears to pick up subtle changes (practice)

5. Describe sound characteristics (frequency, pitch intensity, duration, quality) (practice)
6. Flat diaphragm picks up high-pitched respiratory sounds best
7. Bell picks up low pitched sounds such as heart murmurs
8. Practice using BOTH diaphragms

**General Assessment**

A general survey is an overall review or first impression a nurse has of a person’s well being. This is done head to toe, or cephalo-caudal, lateral to lateral, proximal to distal, and front to back. General surveying is visual observation and encompasses the following.

Appearance	appears to be reported age; sexual development appropriate; alert & oriented; facial features symmetric; no signs of acute distress
Body structure/mobility	weight and height within normal range (refer to Center for Disease Control and Prevention (CDC) Body Mass Index (BMI) [adult] or BMI-for-age and gender forms [children]); body parts equal bilaterally; stands erect, sits comfortably; gait is coordinated; walk is smooth and well balanced; full mobility of joints
Behavior	maintains eye contact with appropriate expressions; comfortable and cooperative; speech clear; clothing appropriate to climate; looks clean and fit; appears clean and well-groomed

Deviations from what would generally be considered to be normal or expected should be documented and may require further evaluation or action, including a report and/or referral.

Standardized and routine screening such as audiometric screening, scoliosis and vision screening using the Snellen Test are usually discussed in General Survey areas.

\*\*\*When taking the exam—there are questions about what should cause concern—think about the nurse action being incorrect

## Health History

A patient history should be done as indicated by the age specific prevention guidelines, usually set forth by Center for Disease Control and Prevention, American Medical Association, American Association of Pediatrics, and National Association of Pediatric Nurse Practitioners. The Healthy People website ([www.healthypeople.gov](http://www.healthypeople.gov)) provides an excellent source to determine benchmarks for healthy living across the life span.

A comprehensive history, including chief complaint or reason for the visit, a complete review of systems, and a complete past family and/or social history should be obtained on the first encounter with a patient, regardless of setting and by a registered nurse. The history should be age and sex appropriate and include all the necessary questions to enable an adequate delivery of services according to prevention guidelines, scope of practice, patient need, visit requirement, and/or request. Usually, completing a provider based Health History and Physical Examination Form will assist in the assessment of the patient's past and current health and behavior risk status. Certain health problems, which may be identified on a health history, are more common in specific age groups and gender.

An interval history (including an update of complaints, reason for visit, review of systems and past family and/or social history) should be done. Usually family health histories are completed across three generations looking specifically for patterns in genetic issues that negatively impact quality of life.

The health history gives picture of the patient's current health and behavior risk status. Additional information than what is on a form may be required depending on the specialized service(s) to be provided or if the person presents with special needs or conditions. So a health history maybe may be problem focused, expanded problem focused, detailed, or comprehensive. Regardless, documentation must be completed for each visit and/or assessment.

## Physical Examination

A comprehensive physical examination should be performed according to age specific preventive health guidelines. American Medical Association clinical practice guidelines recognize the following body areas and organ systems for purpose of the examination:

**Body Areas:** Head (including the face); Neck; Chest (including breasts and axillae); Abdomen; genitalia, groin, buttocks; Back (including spine); and each extremity.

**Organ Systems:** Constitutional (vital signs, general appearance), Eyes, Ear, Nose, Throat; Cardiovascular; Gastrointestinal; Genitourinary; Musculoskeletal; Dermatological; Neurological; Psychiatric; Hematological/lymphatic/immunological

**Integumentary:** Both overall body and organ systems should have skin assessments integrated into them. Integument includes skin, hair and nails.

**Inspect:** skin color and uniformity of color, moisture, hair pattern, rashes, lesions, pallor, edema

**Palpate:** temperature, turgor, lesions, edema

**Percussion and auscultation:** rarely used on skin

**Terminology:** pallor, cyanosis, edema, ecchymosis, macule, papule, cyanosis, jaundice, types of edema, vitiligo, hirsutism, alopecia, etc.

Normal and abnormal findings should be recorded on a health history and physical examination form.

## Measurements

Body measurements include length or height, weight, and head circumference for children from birth to 36 months of age. Thereafter, body measurements include height and weight. The assessment of hearing, speech and vision are also measurements of an individual's function in these areas. The Denver Development Screening Test measures an infant's and young child's gross motor, language, fine motor-adaptive and personal-social development milestones. If developmental delay is suspected based on an assessment of a parent's development/behavior concern or if delays are suspected after a screening of development benchmarks, a written referral to a physician or pediatric nurse practitioner is imperative.

A patient's measurements can be compared with a standard, expected, or predictable measurement for age and gender. Deviation from standards helps identify significant conditions requiring close monitoring or referral to a physician or pediatric nurse practitioner.

The significance of measurements and actions to take when they deviate from normal expectations are age-specific.

## Procedures for Measuring

**Height.** Obtain height by measuring the recumbent length of children less than 2 years of age and children between 2 and 3 who cannot stand unassisted. A measuring board with a stationary headboard and a sliding vertical foot piece is ideal, but a tape measure can also be used. Lay the child flat against the center of the board. The head should be held against the headboard by the parent or an assistant and the knees held so that the hips and knees are extended. The foot piece is moved until it is firmly against the child's heels. Read and record the measurement to the nearest 1/8 inch. A modified technique in home settings is to lay the child flat and straight where the head should be held by the parent and the knees held so that the hips and knees are extended, mark the flat surface at the top of the head and tip of the heels. Move child and measure the distance between the marks with a tape measure. Read and record the measurement to the nearest 1/8 inch.

Obtain a standing height on children greater than 2 to 3 years of age, adolescents, and adults, using a portable stadiometer. The patient is to be wearing only socks or be bare foot. Have the patient stand with head, shoulder blades, buttocks, and heels touching the wall. The knees are to be straight and feet flat on the floor, and the patient is asked to look straight ahead. The flat surface of the stadiometer is lowered until it touches the crown of the head, compress the hair. A measuring rod attached to a weight scale should not be used.

Under some conditions a recumbent length can be obtained for a two year old. If so it should be plotted on the birth to 36 months growth chart. In other situations a standing height may be obtained for a two year old. Under this condition, plot the finding on the CDC for BMI for age and gender, 2 to 18 year growth chart. After plotting measurements for children on age and gender specific growth charts, evaluate, educate and refer according to findings.

**Weight.** Balance beam or digital scales should be used to weigh patients of all ages. Spring type scales are not acceptable. CDC recommends that all scales should be zero balanced and calibrated. Scales must be checked for accuracy on an annual basis and calibrated in accordance with manufacturer's instructions. Prior to obtaining weight measurements, make sure the scale is "zeroed". Weigh infants wearing only a dry diaper or light undergarments. Weigh children after removing outer clothing and shoes. Weigh adolescents and adults with the patient wearing minimal clothing. Place the patient in the middle of the scale. Read the measurement and record results immediately. Scales should be calibrated annually. Plot measurements on age and gender specific growth charts and evaluate accordingly

**Body Mass Index.** The Body Mass Index (BMI) is a measure that can help determine if a person is at risk for a weight-related illness. Instructions for obtaining the BMI are included within the chart in this section for adults. To calculate BMI for children, see BMI Tables for Children and Adolescents for guidance.

**Head Circumference.** Obtain head circumference measurement on children from birth to 36 months of age by extending a non-stretchable measuring tape around the broadest part of the child's head. For greatest accuracy, the tape is placed three times, with a reading taken at the right side, at the left side, and at the mid-forehead, and the greatest circumference is plotted. The tape should be pulled to adequately compress the hair.

**Vital Signs.** Vital signs, generally described as the measurement of temperature, pulse, respirations and blood pressure, give an immediate picture of a person's current state of health and well being. Normal and abnormal ranges with management guidelines follow for children and adults.

### Equipment Needed

- A Stethoscope
- A Blood Pressure Cuff
- A Watch Displaying Seconds
- A Thermometer

### General Considerations

- The patient should **not** have had alcohol, tobacco, caffeine, or performed vigorous exercise within 30 minutes of the exam.
- Ideally the patient should be sitting with feet on the floor and their back supported. The examination room should be quiet and the patient comfortable.
- History of hypertension, slow or rapid pulse, and current medications should always be obtained.

### Temperature

Temperature can be measured in several different ways:

- **Oral** with a glass, paper, or electronic thermometer (normal 98.6F/37C)
- **Axillary** with a glass or electronic thermometer (normal 97.6F/36.3C)
- **Rectal** or "core" with a glass or electronic thermometer (normal 99.6F/37.7C)
- **Aural** (the ear) with an electronic thermometer (normal 99.6F/37.7C)

Of these, axillary is the least and rectal is the most accurate.

### Respiration

1. Best done immediately after taking the patient's pulse. Do **not** announce that you are measuring respirations
2. Without letting go of the patient's wrist begin to observe the patient's breathing. Is it normal or labored?
3. Count breaths for 15 seconds and multiply this number by 4 to yield the breaths per minute.
4. In adults, normal resting respiratory rate is between 14-20 breaths/minute. Rapid respiration is called tachypnea.

## Pulse

1. Sit or stand facing your patient.
2. Grasp the patient's wrist with your free (non-watch bearing) hand (patient's right with your right or patient's left with your left). There is no reason for the patient's arm to be in an awkward position, just imagine you're shaking hands.
3. Compress the radial artery with your index and middle fingers.

Note whether the pulse is regular or irregular:

**Regular** - evenly spaced beats, may vary slightly with respiration

**Regularly Irregular** - regular pattern overall with "skipped" beats

**Irregularly Irregular** - chaotic, no real pattern, very difficult to measure rate accurately

- Count the pulse for 15 seconds and multiply by 4.
- Always count for a full minute if the pulse is irregular.
- Record the rate and rhythm.

## Interpretation

1. A normal adult heart rate is between 60 and 100 beats per minute (see below for children).
2. A pulse greater than 100 beats/minute is defined to be tachycardia. Pulse less than 60 beats/minute is defined to be bradycardia. Tachycardia and bradycardia are not necessarily abnormal. Athletes tend to be bradycardic at rest (superior conditioning). Tachycardia is a normal response to stress or exercise.

**Blood Pressure.** Blood pressure (BP) is the pressure by circulating blood on the walls of blood vessels. Arterial refers systemic circulation. During each heartbeat, blood pressure varies between a maximum systolic and a minimum diastolic pressure. The blood pressure in the circulation is principally due to the pumping action of the heart. Differences in mean blood pressure are responsible for blood flow from one location to another during circulation. The rate of mean blood flow depends on the resistance to flow presented by the blood vessels. Mean blood pressure decreases as the circulating blood moves away from the heart through arteries, capillaries and veins due to viscous losses of energy. Mean blood pressure drops over the whole circulation, although most of the fall occurs along the small arteries and arterioles. Gravity affects blood pressure via hydrostatic forces (e.g., during standing) and valves in veins, breathing, and pumping from contraction of skeletal muscles also influence blood pressure in veins.

The measurement blood pressure without further specification usually refers to the systemic arterial pressure measured at a person's upper arm and is a measure of the pressure in the brachial artery, major artery in the upper arm. A person's blood pressure is usually expressed in terms of the systolic pressure over diastolic pressure and is measured in millimetres of mercury (mmHg).

## Interpretation

- Higher blood pressures are normal during exertion or other stress. Systolic blood pressures below 80 may be a sign of serious illness or shock.
- Blood pressure should be taken in both arms on the first encounter. If there is more than 10 mmHg difference between the two arms, use the arm with the higher reading for subsequent measurements. It is frequently helpful to retake the blood pressure near the end of the visit. Earlier pressures may be higher due to the "white coat" effect.
- Always recheck "unexpected" blood pressures yourself.
- It is frequently helpful to retake the blood pressure near the end of the visit. Earlier pressures may be higher due to the "white coat" effect.

- Always recheck "unexpected" blood pressures yourself.
- In children, pulse and blood pressure vary with the age. The following table should serve as a rough guide:

<b>Average Pulse and Blood Pressure in Normal Children</b>							
<b>Age</b>	<b>Birth</b>	<b>6mo</b>	<b>1yr</b>	<b>2yr</b>	<b>6yr</b>	<b>8yr</b>	<b>10yr</b>
<b>Pulse</b>	140	130	115	110	103	100	95
<b>Systolic BP</b>	70	90	90	92	95	100	105

### The Physical Exam

1. Head and Neck Exam
2. Eye Exam
3. Chest and Lung Exam
4. Cardiovascular Exam
5. Abdominal Exam
6. Back and Extremity Exam
7. Neurologic Exam

#### 1. Examination of the Head and Neck

##### Equipment Needed

- An otoscope
- Tongue blades
- Cotton tipped applicators
- Non-latex exam gloves

##### General Considerations

The head and neck exam is not a single, fixed sequence. Different portions are included depending on the examiner and the situation.

##### Head

1. Look for scars, lumps, rashes, hair loss, or other lesions.
2. Look for facial asymmetry, involuntary movements, or edema.
3. Palpate to identify any areas of tenderness or deformity.

##### Ears

1. Inspect the auricles and move them around gently. Ask the patient if this is painful.
2. Palpate the mastoid process for tenderness or deformity.
3. Hold the otoscope with your thumb and fingers so that the ulnar aspect of your hand makes contact with the patient.

## Nose

It is often convenient to examine the nose immediately after the ears using the same speculum.

1. Tilt the patient's head back slightly. Ask them to hold their breath for the next few seconds.
2. Insert the otoscope into the nostril, avoiding contact with the septum.
3. Inspect the visible nasal structures and note any swelling, redness, drainage, or deformity.
4. Repeat for the other side.
5. Turbinates should be pink and moist
6. Frontal sinuses are below eyebrows
7. Maxillary sinuses are below zygomatic arch

## Throat

It is often convenient to examine the throat using the otoscope with the speculum removed.

1. Ask the patient to open their mouth.
2. Using a wooden tongue blade and a good light source, inspect the inside of the patients mouth including the buccal folds and under the tongue. Note any ulcers, white patches (leucoplakia), or other lesions.
3. If abnormalities are discovered, use a gloved finger to palpate the anterior structures and floor of the mouth.
4. Inspect the posterior oropharynx by depressing the tongue and asking the patient to say "Ah." Note any tonsillar enlargement, redness, or discharge.

## Ears

1. Pull the ear upwards and backwards to straighten the canal. For children pull down and back
2. The largest speculum that will fit comfortably.
3. Inspect the ear canal and middle ear structures noting any redness, drainage, or deformity.
4. Insufflate the ear and watch for movement of the tympanic membrane.
5. Repeat for the other ear.

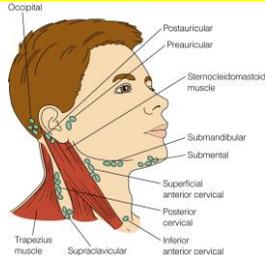
## Neck

1. Inspect the neck for asymmetry, scars, or other lesions.
2. Palpate the neck to detect areas of tenderness, deformity, or masses.

## Lymph Nodes

1. Systematically palpate with the pads of your index and middle fingers for the various lymph node groups.
2. Preauricular - In front of the ear
3. Postauricular - Behind the ear
4. Occipital - At the base of the skull
5. Tonsillar - At the angle of the jaw
6. Submandibular - Under the jaw on the side
7. Submental - Under the jaw in the midline
8. Superficial (Anterior) Cervical - Over and in front of the sternomastoid muscle
9. Supraclavicular - In the angle of the sternomastoid and the clavicle

10. The **deep cervical** chain of lymph nodes lies below the sternomastoid and cannot be palpated without getting underneath the muscle: Inform the patient that **this procedure will cause some discomfort.**
11. Hook your fingers under the anterior edge of the sternomastoid muscle.
12. Ask the patient to bend their neck **toward** the side you are examining.
13. Move the muscle backward and palpate for the deep nodes underneath.
14. **Note the size and location of any palpable nodes and whether they were soft or hard, non-tender or tender, and mobile or fixed**



### Thyroid Gland

1. Inspect the neck looking for the thyroid gland. Note whether it is visible and symmetrical. A visibly enlarged thyroid gland is called a **goiter**.
2. Move to a position behind the patient.
3. Identify the **cricoid cartilage** with the fingers of both hands.
4. Move downward two or three tracheal rings while palpating for the isthmus.
5. Move laterally from the midline while palpating for the lobes of the thyroid.
6. Note the size, symmetry, and position of the lobes, as well as the presence of any nodules. The normal gland is often not palpable.

### Special Tests

#### A. Facial Tenderness

1. Ask the patient to tell you if these maneuvers causes excessive discomfort or pain.
2. Press upward under both eyebrows with your thumbs.
3. Press upward under both maxilla with your thumbs.
4. Excessive discomfort on one side or significant pain suggests sinusitis.

#### B. Sinus Transillumination

1. Darken the room as much as possible.
2. Place a bright otoscope or other point light source on the maxilla.
3. Ask the patient to open their mouth and look for an orange glow on the hard palate.
4. A decreased or absent glow suggests that the sinus is filled with something other than air.

#### C. Temporomandibular Joint

1. Place the tips of your index fingers directly in front of the tragus of each ear.

2. Ask the patient to open and close their mouth.
3. Note any decreased range of motion, tenderness, or swelling.

## 2. Examination of the Eye

### Equipment Needed

- A Snellen Eye Chart or Pocket Vision Card
- An Ophthalmoscope

### Visual Acuity

In cases of eye pain, injury, or visual loss, always check visual acuity **before** before proceeding with the rest of the exam or putting medications in your patients eyes.

1. Allow the patient to use their glasses or contact lens if available. You are interested in the patient's best **corrected** vision.
2. Position the patient 20 feet in front of the Snellen eye chart (or hold a Rosenbaum pocket card at a 14 inch "reading" distance).
3. Have the patient cover one eye at a time with a card.
4. Ask the patient to read progressively smaller letters until they can go no further.
5. Record the smallest line the patient read successfully (20/20, 20/30, etc.)
6. Repeat with the other eye.
7. Unexpected/unexplained loss of acuity is a sign of serious ocular pathology.

### Inspection

1. Observe the patient for ptosis, exophthalmos, lesions, deformities, or asymmetry.
2. Ask the patient to look up and pull down both lower eyelids to inspect the conjunctiva and sclera.
3. Next spread each eye open with your thumb and index finger. Ask the patient to look to each side and downward to expose the entire bulbar surface.
4. Note any discoloration, redness, discharge, or lesions. Note any deformity of the iris or lesion cornea.
5. If you suspect the patient has conjunctivitis, be sure to **wash your hands** immediately. Viral conjunctivitis is very contagious, so protect your self!

### Visual Fields

#### Screen Visual Fields by Confrontation

1. Stand two feet in front of the patient and have them look into your eyes.
2. Hold your hands to the side half way between you and the patient.
3. Wiggle the fingers on one hand.
4. Ask the patient to indicate which side they see your fingers move.
5. Repeat two or three times to test both temporal fields.
6. If an abnormality is suspected, test the four quadrants of each eye while asking the patient to cover the opposite eye with a card.

## Extraocular Muscles

### A. Corneal Reflections

1. Shine a light from directly in front of the patient.
2. The corneal reflections should be centered over the pupils.
3. Asymmetry suggests extraocular muscle pathology.

### B. Extraocular Movement (EOMs)

1. Stand or sit 3 to 6 feet in front of the patient.
2. Ask the patient to follow your finger with their eyes without moving their head.
3. Check gaze in the six cardinal directions using a cross or "H" pattern.
4. Check convergence by moving your finger toward the bridge of the patient's nose.
5. Tests CN 3, 4, and 6

### C. Pupillary Reactions

1. Pupils equal, round & reactive to light & accommodation (PERRLA).
2. Direct and consensual responses (In a normal response the eye which the light is shined has pupillary constriction (direct reflex) AND the contralateral [other] pupil also constricts (indirect or consensual reflex). An abnormal response (no pupillary constriction) can help to localize the lesion, particularly when interpreted with the result of vision testing. While observing the pupillary light response one should also check that the pupils are the same size.)

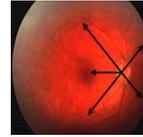
### D. Light

1. Dim the room lights as necessary.
2. Ask the patient to look into the distance.
3. Shine a bright light obliquely into each pupil in turn.
4. Look for both the direct (same eye) and consensual (other eye) reactions.
5. Record pupil size in mm and any asymmetry or irregularity.

### E. Accommodation

If the pupillary reactions to light are diminished or absent, check the reaction to accommodation (near reaction):

1. Hold your finger about 10cm from the patient's nose.
2. Ask them to alternate looking into the distance and at your finger.
3. Observe the pupillary response in each eye.



## Ophthalmoscopic Exam

1. Darken the room as much as possible.
2. Adjust the ophthalmoscope so that the light is **no brighter than necessary**. Adjust the aperture to a plain white circle. Set the diopter dial to zero unless you have determined a better setting for your eyes.
3. Use your **left** hand and **left** eye to examine the patient's **left** eye. Use your **right** hand and **right** eye to examine the patient's **right** eye. Place your free hand on the patient's shoulder for better control.
4. Ask the patient to stare at a point on the wall or corner of the room.
5. Look through the ophthalmoscope and shine the light into the patient's eye from about two feet away. You should see the retina as a "red reflex." Follow the red color to move within a few inches of the patient's eye.
6. Adjust the diopter dial to bring the retina into focus. Find a blood vessel and follow it to the optic disk. Use this as a point of reference.
7. Inspect outward from the optic disk in at least four quadrants and note any abnormalities.
8. Move nasally from the disk to observe the macula.
9. Repeat for the other eye.

## Notes

1. Visual acuity is reported as a pair of numbers (20/20) where the first number is how far the patient is from the chart and the second number is the distance from which the "normal" eye can read a line of letters. For example, 20/40 means that at 20 feet the patient can only read letters a "normal" person can read from twice that distance.
2. You may, instead of wiggling a finger, raise one or two fingers (unilaterally or bilaterally) and have the patient state how many fingers (total, both sides) they see. To test for **neglect**, on some trials wiggle your right and left fingers simultaneously. The patient should see movement in both hands.
3. PERRLA is a common abbreviation that stands for "Pupils Equal Round Reactive to Light and Accommodation." The use of this term is so routine that it is often used incorrectly. If you did not specifically check the accommodation reaction use the term PERRL. Pupils with a diminished response to light but a normal response to accommodation (Argyll-Robertson Pupils) are a sign of neurosyphilis.
4. Diopters are used to measure the power of a lens. The ophthalmoscope actually has a series of small lens of different strengths on a wheel (positive diopters are labeled in green, negative in red). When you focus on the retina you "dial-in" the correct number of diopters to compensate for **both** the patient's and your own vision.

### 3. Examination of the Chest and Lungs

#### Equipment Needed

- A Stethoscope
- A Peak Flow Meter

#### General Considerations

1. The patient **must** be properly undressed and gowned for this examination.
2. Ideally the patient should be sitting on the end of an exam table.
3. The examination room **must** be quiet to perform adequate percussion and auscultation.
4. Observe the patient for general signs of respiratory disease (finger clubbing, cyanosis, air hunger, etc.).
5. Try to visualize the underlying anatomy as you examine the patient.

#### Inspection

Observe the rate, rhythm, depth, and effort of breathing. Note whether the expiratory phase is prolonged.

1. Listen for obvious abnormal sounds with breathing such as wheezes.
2. Observe for retractions and use of accessory muscles (sternomastoids, abdominals).
3. Observe the chest for asymmetry, deformity, or increased anterior-posterior (AP) diameter.
4. Confirm that the trachea is near the midline?

#### Palpation

1. Identify any areas of tenderness or deformity by palpating the ribs and sternum.
2. Assess expansion and symmetry of the chest by placing your hands on the patient's back, thumbs together at the midline, and ask them to breathe deeply.
3. Check for tactile fremitus.

#### Percussion

##### Proper Technique

1. Hyperextend the middle finger of one hand and place the distal interphalangeal joint **firmly** against the patient's chest.
2. With the end (not the pad) of the opposite middle finger, use a quick flick of the wrist to strike first finger.
3. Categorize what you hear as normal, dull, or hyperresonant.
4. Practice your technique until you can consistently produce a "normal" percussion note on your (presumably normal) partner before you work with patients.



### Posterior Chest

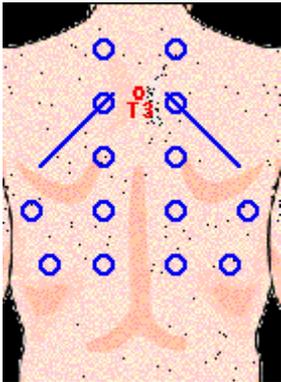
1. Percuss from side to side and top to bottom using the pattern shown in the illustration. Omit the areas covered by the scapulae.
2. Compare one side to the other looking for asymmetry.
3. Note the location and quality of the percussion sounds you hear.
4. Find the level of the diaphragmatic dullness on both sides.

### Diaphragmatic Excursion

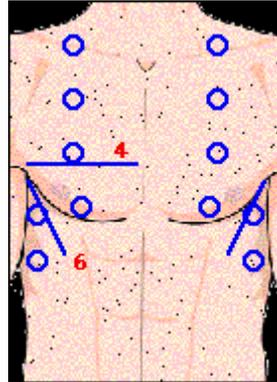
Find the level of the diaphragmatic dullness on both sides.

Ask the patient to inspire deeply.

The level of dullness (diaphragmatic excursion) should go down 3-5cm **symmetrically**.



Posterior Chest



Anterior Chest

### Anterior Chest

1. Percuss from side to side and top to bottom using the pattern shown in the illustration.
2. Compare one side to the other looking for asymmetry.
3. Note the location and quality of the percussion sounds you hear.

**Interpretation**

Percussion Notes and Their Meaning	
Flat or Dull	Pleural Effusion or Lobar Pneumonia
Normal	Healthy Lung or Bronchitis
Hyperresonant	Emphysema or Pneumothorax

**Auscultation**

Use the diaphragm of the stethoscope to auscultate breath sounds.

**Posterior Chest**

1. Auscultate from side to side and top to bottom using the pattern shown in the illustration. Omit the areas covered by the scapulae.
2. Compare one side to the other looking for asymmetry.
3. Note the location and quality of the sounds you hear.

**Anterior Chest**

1. Auscultate from side to side and top to bottom using the pattern shown in the illustration.
2. Compare one side to the other looking for asymmetry.
3. Note the location and quality of the sounds you hear.

**Interpretation**

Breath sounds are produced by turbulent air flow. They are categorized by the size of the airways that transmit them to the chest wall (and your stethoscope). The general rule is, the larger the airway, the louder and higher pitched the sound. Vesicular breath sounds are low pitched and normally heard over most lung fields. Tracheal breath sounds are heard over the trachea. Bronchovesicular and bronchial sounds are heard in between. Inspiration is normally longer than expiration (I > E).

Breath sounds are **decreased** when normal lung is displaced by air (emphysema or pneumothorax) or fluid (pleural effusion). Breath sounds **shift from vesicular to bronchial** when there is fluid in the lung itself (pneumonia). Extra sounds that originate in the lungs and airways are referred to as "adventitious" and are always abnormal (but not always significant).

**Adventitious (Extra) Lung Sounds**

<b>Crackles</b>	These are high pitched, discontinuous sounds similar to the sound produced by rubbing your hair between your fingers. (Also known as Rales)
<b>Wheezes</b>	These are generally high pitched and "musical" in quality. Stridor is an inspiratory wheeze associated with upper airway obstruction (croup).
<b>Rhonchi</b>	These often have a "snoring" or "gurgling" quality. Any extra sound that is not a crackle or a wheeze is probably a rhonchi.

## Special Tests

### Peak Flow Monitoring

Peak flow meters are inexpensive, hand-held devices used to monitor pulmonary function in patients with asthma. The peak flow roughly correlates with the FEV1

1. Ask the patient to take a deep breath.
2. Then ask them to exhale **as fast as they can** through the peak flow meter.
3. Repeat the measurement 3 times and report the average.

### Voice Transmission Tests

These tests are only used in special situations. This part of the physical exam has largely been replaced by the chest x-ray. All these tests become abnormal when the lungs become filled with fluid (referred to as **consolidation**).

### Tactile Fremitus

1. Ask the patient to say "ninety-nine" several times in a normal voice
2. Palpate using the ball of your hand.
3. You should feel the vibrations transmitted through the airways to the lung.
4. Increased tactile fremitus suggests consolidation of the underlying lung tissues.

### Bronchophony

1. Ask the patient to say "ninety-nine" several times in a normal voice.
2. Auscultate several symmetrical areas over each lung.
3. The sounds you hear should be muffled and indistinct. Louder, clearer sounds are called bronchophony.

### Whispered Pectoriloquy

1. Ask the patient to whisper "ninety-nine" several times.
2. Auscultate several symmetrical areas over each lung.
3. You should hear only faint sounds or nothing at all. If you hear the sounds clearly this is referred to as whispered pectoriloquy.

### Egophony

1. Ask the patient to say "ee" continuously.
2. Auscultate several symmetrical areas over each lung.
3. You should hear a muffled "ee" sound. If you hear an "ay" sound this is referred to as "E -> A" or egophony.

#### 4. Cardiovascular Examination

##### General Considerations

- The patient **must** be properly undressed and in a gown for this examination.
- The examination room **must** be quiet to perform adequate auscultation.
- Observe the patient for general signs of cardiovascular disease (finger clubbing, cyanosis, edema, etc.).

##### Arterial Pulses

###### Rate and Rhythm

1. Compress the radial artery with your index and middle fingers.
2. Note whether the pulse is regular or irregular.
3. Count the pulse for 15 seconds and multiply by 4.
4. Count for a full minute if the pulse is irregular.
5. Record the rate and rhythm.

###### Pulse Classification in Adults (At Rest)

###### Normal

60 to 100 bpm

###### Bradycardia

less than 60 bpm

###### Tachycardia

more than 100

###### Regular

Evenly spaced beats, may vary slightly with respiration

###### Regularly Irregular

Regular pattern overall with "skipped" beats

###### Irregularly Irregular

Chaotic, no real pattern, very difficult to measure rate accurately

###### Amplitude and Contour

1. Observe for carotid pulsations.
2. Place your fingers behind the patient's neck and compress the carotid artery on one side with your thumb **at or below** the level of the cricoid cartilage. Press firmly but not to the point of discomfort.
3. Assess the following: The amplitude of the pulse. The contour of the pulse wave. Variations in amplitude from beat to beat or with respiration.
4. Repeat on the opposite side.

###### Auscultation for Bruits

If the patient is late middle aged or older, you should auscultate for bruits. A bruit is often, but not always, a sign of arterial narrowing and risk of a stroke.

1. Place the **bell** of the stethoscope over each carotid artery in turn. You may use the diaphragm if the patient's neck is highly contoured.
2. Ask the patient to stop breathing momentarily.
3. Listen for a blowing or rushing sound--a bruit. Do not be confused by heart sounds or murmurs transmitted from the chest.

**Blood Pressure**

The patient should not have eaten, smoked, taken caffeine, or engaged in vigorous exercise within the last 30 minutes. The room should be quiet and the patient comfortable.

1. Position the patient's arm so the antecubital fold is level with the heart.
2. Center the bladder of the cuff over the brachial artery approximately 2 cm above the antecubital fold. **Proper cuff size is essential** to obtain an accurate reading. Be sure the index line falls between the size marks when you apply the cuff. Position the patient's arm so it is slightly flexed at the elbow.
3. Palpate the radial pulse and inflate the cuff until the pulse disappears. This is a rough estimate of the systolic pressure.
4. Place the stethoscope over the brachial artery.
5. Inflate the cuff 20 to 30 mmHg above the estimated systolic pressure.
6. Release the pressure slowly, no greater than 5 mmHg per second.
7. The level at which you consistently hear beats is the systolic pressure
8. Continue to lower the pressure until the sounds muffle and disappear. This is the diastolic pressure.
9. Record the blood pressure as systolic over diastolic (120/70).
10. Blood pressure should be taken in both arms on the first encounter.

**Interpretation**

**Blood Pressure Classification in Adults**

Category	Systolic	Diastolic
Normal	<130	<85
High Normal	130-139	85-89
Mild	140-159	90-99
Hypertension		
Moderate	160-179	100-109
Hypertension		
Severe	180-209	110-119
Hypertension		
Crisis	>210	>120
Hypertension		

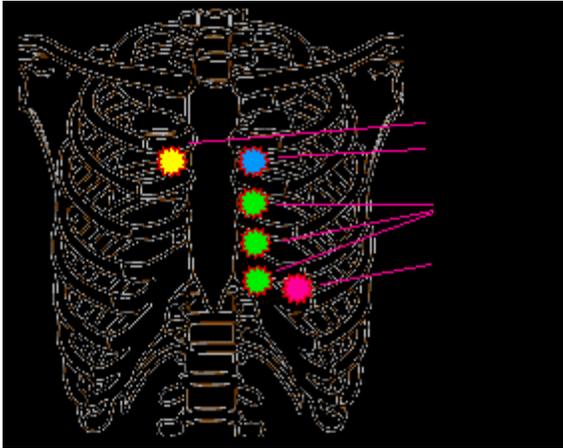
**Jugular Venous Pressure**

1. Position the patient supine with the head of the table elevated 30 degrees.
2. Use tangential, side lighting to observe for venous pulsations in the neck.
3. Look for a rapid, double (sometimes triple) wave with each heart beat. Use light pressure just above the sternal end of the clavicle to eliminate the pulsations and rule out a carotid origin.
4. Adjust the angle of table elevation to bring out the venous pulsation.
5. Identify the highest point of pulsation. Using a horizontal line from this point, measure vertically from the sternal angle.
6. This measurement should be less than 4 cm in a normal healthy adult.

### Precordial Movement

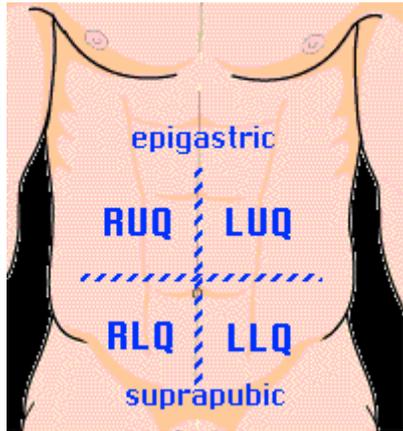
1. Position the patient supine with the head of the table slightly elevated.
2. Always examine from the patient's right side.
3. Inspect for precordial movement. Tangential lighting will make movements more visible.
4. Palpate for precordial activity in general. You may feel "extras" such as thrills or exaggerated ventricular impulses.
5. Palpate for the point of maximal impulse (PMI or apical pulse). It is normally located in the 4th or 5th intercostal space just medial to the midclavicular line and is less than the size of a quarter.
6. Note the location, size, and quality of the impulse.

### Auscultation



1. Position the patient supine with the head of the table slightly elevated.
2. Always examine from the patient's right side. A quiet room is essential.
3. Listen with the diaphragm at the right 2nd interspace near the sternum (aortic area).
4. Listen with the diaphragm at the left 2nd interspace near the sternum (pulmonic area).
5. Listen with the diaphragm at the left 3rd, 4th, and 5th interspaces near the sternum (tricuspid area).
6. Listen with the diaphragm at the apex (PMI) (mitral area).
7. Listen with the **bell** at the apex.
8. Listen with the **bell** at the left 4th and 5th interspace near the sternum
9. Have the patient roll on their left side. Listen with the **bell** at the apex. This position brings out S3 and mitral murmurs.
10. Have the patient sit up, lean forward, and hold their breath in exhalation. Listen with the diaphragm at the left 3rd and 4th interspace near the sternum. This position brings out aortic murmurs.
11. Record S1, S2, (S3), (S4), as well as the grade and configuration of any murmurs ("two over six" or "2/6", "pansystolic" or "crescendo").

## 5. Examination of the Abdomen



### Equipment Needed

- A Stethoscope-- When assessing start in RLQ over ileocecal valve

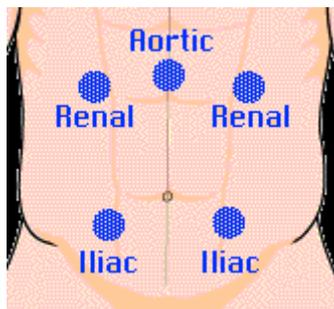
### General Considerations

1. The patient should have an **empty bladder**.
2. The patient should be lying supine on the exam table and appropriately draped.
3. The examination room **must** be quiet to perform adequate auscultation and percussion.
4. **Watch the patient's face** for signs of discomfort during the examination.
5. Use the appropriate terminology to locate your findings: Right Upper Quadrant (RUQ)
6. Right Lower Quadrant (RLQ)
7. Left Upper Quadrant (LUQ)
8. Left Lower Quadrant (LLQ)
9. Midline: n Epigastric
10. Periumbilical
11. Suprapubic

Disorders in the chest will often manifest with abdominal symptoms. It is always wise to examine the chest when evaluating an abdominal complaint. Consider the inguinal/rectal examination in males. Consider the pelvic/rectal examination in females.

### Inspection

1. Look for scars, striae, hernias, vascular changes, lesions, or rashes.
2. Look for movement associated with peristalsis or pulsations.
3. Note the abdominal contour. Is it flat, scaphoid, or protuberant?



### Auscultation

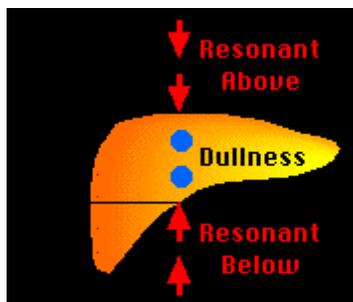
1. Place the diaphragm of your stethoscope lightly on the abdomen.
2. Listen for bowel sounds. Are they normal, increased, decreased, or absent?
3. Listen for bruits over the renal arteries, iliac arteries, and aorta.

### Percussion

1. Percuss in all four quadrants using proper technique.
2. Categorize what you hear as tympanic or dull. Tympany is normally present over most of the abdomen in the supine position. Unusual dullness may be a clue to an underlying abdominal mass.

### Liver Span

1. Percuss **downward** from the chest in the **right midclavicular line** until you detect the top edge of liver dullness.
2. Percuss **upward** from the abdomen in the same line until you detect the bottom edge of liver dullness.
3. Measure the liver span between these two points. This measurement should be 6-12 cm in a normal adult.



### Splenic Dullness

1. Percuss the lowest costal interspace in the **left anterior axillary line**. This area is normally tympanitic.
2. Ask the patient to take a deep breath and percuss this area again. Dullness in this area is a sign of splenic enlargement.



### Palpation

#### General Palpation

1. Begin with **light palpation**. At this point you are mostly looking for areas of tenderness. The most sensitive indicator of tenderness is the patient's facial expression (so watch the patient's face, not your hands). Voluntary or involuntary guarding may also be present.
2. Proceed to **deep palpation** after surveying the abdomen lightly. Try to identify abdominal masses or areas of deep tenderness.

#### Palpation of the Liver

##### Standard Method

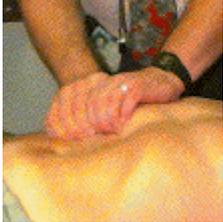
1. Place your fingers just below the right costal margin and press firmly.
2. Ask the patient to take a deep breath.
3. You may feel the edge of the liver press against your fingers. Or it may slide under your hand as the patient exhales. A normal liver is **not** tender.



### Alternate Method

This method is useful when the patient is obese or when the examiner is small compared to the patient.

1. Stand by the patient's chest.
2. "Hook" your fingers just below the costal margin and press firmly.
3. Ask the patient to take a deep breath.
4. You may feel the edge of the liver press against your fingers.



### Palpation of the Aorta

1. Press down deeply in the midline above the umbilicus.
2. The aortic pulsation is easily felt on most individuals.
3. A well defined, pulsatile mass, greater than 3 cm across, suggests an aortic aneurysm.

### Palpation of the Spleen

1. Use your left hand to lift the lower rib cage and flank.
2. Press down just below the left costal margin with your right hand.
3. Ask the patient to take a deep breath.
4. The spleen is **not** normally palpable on most individuals.

### Special Tests

#### Rebound Tenderness

This is a test for peritoneal irritation. Warn the patient what you are about to do.

1. Press deeply on the abdomen with your hand.
2. After a moment, quickly release pressure.
3. If it hurts more when you release, the patient has rebound tenderness.

### Costovertebral Tenderness

CVA tenderness is often associated with renal disease.

1. Warn the patient what you are about to do.
2. Have the patient sit up on the exam table.
3. Use the heel of your closed fist to strike the patient firmly over the costovertebral angles.
4. Compare left and right sides

### Shifting Dullness

This is a test for peritoneal fluid (ascites).

Percuss the patient's abdomen to outline areas of dullness and tympany.

1. Have the patient roll away from you.
2. Percuss and again outline areas of dullness and tympany. If the dullness has shifted to areas of prior tympany, the patient may have excess peritoneal fluid.

### Psoas Sign

This is a test for appendicitis.

1. Place your hand above the patient's right knee.
2. Ask the patient to flex the right hip against resistance.
3. Increased abdominal pain indicates a positive psoas sign.

### Obturator Sign

This is a test for appendicitis.

1. Raise the patient's right leg with the knee flexed.
2. Rotate the leg internally at the hip.
3. Increased abdominal pain indicates a positive obturator sign.

## 6. Musculoskeletal and Peripheral Vascular Examination

### General Considerations

1. The patient should be undressed and gowned as needed for this examination.
2. Some portions of the examination may not be appropriate depending on the clinical situation (performing range of motion on a fractured leg for example).
3. The musculoskeletal exam is all about **anatomy**. Think of the underlying anatomy as you obtain the history and examine the patient.
4. When taking a history for an acute problem always inquire about the **mechanism of injury**, loss of function, onset of swelling (< 24 hours), and initial treatment.
5. When taking a history for a chronic problem always inquire about past injuries, past treatments, effect on function, and current symptoms.
6. The cardinal signs of musculoskeletal disease are pain, redness (erythema), swelling, increased warmth, deformity, and loss of function.
7. **Always begin with inspection, palpation and range of motion**, regardless of the region you are examining (not abdomen). Specialized tests are often omitted unless a specific abnormality is suspected. A complete evaluation will include a focused neurologic exam of the effected area.

**Regional Considerations**

1. Remember that the **clavicle** is part of the shoulder. Be sure to include it in your examination.
2. The **patella** is much easier to examine if the leg is extended and relaxed.
3. Be sure to palpate over the **spinous process** of each vertebrae.
4. It is always helpful to observe the patient **standing and walking**.
5. Always consider **referred pain**, from the neck or chest to the shoulder, from the back or pelvis to the hip, and from the hip to the knee.
6. Pain with, or limitation of, **rotation** is often the first sign of hip disease.
7. Diagnostic hints based on **location** of pain:

<b>Back</b>	<b>Side</b>	<b>Front</b>	
<b>Shoulder Pain</b>	Muscle Spasm	Bursitis or Rotator Cuff	Glenohumeral Joint
<b>Hip Pain</b>	Sciatica	Bursitis	Hip Joint

**Inspection**

1. Look for scars, rashes, or other lesions.
2. Look for asymmetry, deformity, or atrophy.
3. Always compare with the other side.

**Palpation**

1. Examine each major joint and muscle group in turn.
2. Identify any areas of tenderness.
3. Identify any areas of deformity.
4. Always compare with the other side.

**Range of Motion**

Start by asking the patient to move through an active range of motion (joints moved by patient). Proceed to passive range of motion (joints moved by examiner) if active range of motion is abnormal.

**Active Range of Motion**

1. Ask the patient to move each joint through a full range of motion.
2. Note the degree and type (pain, weakness, etc.) of any limitations.
3. Note any increased range of motion or instability.
4. Always compare with the other side.
5. Proceed to passive range of motion if abnormalities are found.

### Passive Range of Motion

1. Ask the patient to relax and allow you to support the extremity to be examined.
2. Gently move each joint through its full range of motion.
3. Note the degree and type (pain or mechanical) of any limitation.
4. If increased range of motion is detected, perform special tests for instability as appropriate.
5. Always compare with the other side.

### Specific Joints

1. Fingers - flexion/extension; abduction/adduction
2. Thumb - flexion/extension; abduction/adduction; opposition
3. Wrist - flexion/extension; radial/ulnar deviation
4. Forearm - pronation/supination (function of BOTH elbow and wrist)
5. Elbow - flexion/extension
6. Shoulder - flexion/extension; internal/external rotation; abduction/adduction (2/3 glenohumeral joint, 1/3 scapulo-thoracic)
7. Hip - flexion/extension; abduction/adduction; internal/external rotation
8. Knee - flexion/extension
9. Ankle - flexion (plantarflexion)/extension (dorsiflexion)
10. Foot - inversion/eversion
11. Toes - flexion/extension
12. Spine - flexion/extension; right/left bending; right/left rotation

### Vascular

#### Pulses

1. Check the radial pulses on both sides. If the radial pulse is absent or weak, check the brachial pulses.
2. Check the posterior tibial and dorsalis pedis pulses on both sides. If these pulses are absent or weak, check the popliteal and femoral pulses.

#### Capillary Refill

1. Press down firmly on the patient's finger or toe nail so it blanches.
2. Release the pressure and observe how long it takes the nail bed to "pink" up.
3. Capillary refill times greater than 2 to 3 seconds suggest peripheral vascular disease, arterial blockage, heart failure, or shock.

#### Edema, Cyanosis, and Clubbing

1. Check for the presence of edema (swelling) of the feet and lower legs.
2. Check for the presence of cyanosis (blue color) of the feet or hands.
3. Check for the presence of clubbing of the fingers.

### **Lymphatics**

1. Check for the presence of epitrochlear lymph nodes.
2. Check for the presence of axillary lymph nodes.
3. Check for the presence of inguinal lymph nodes.

### **Special Tests**

#### **Upper Extremities**

#### **Snuffbox Tenderness (Scaphoid)**

1. Identify the "anatomic snuffbox" between the extensor pollicis longus and brevis (extending the thumb makes these structures more prominent).
2. Press firmly straight down with your index finger or thumb.
3. Any tenderness in this area is highly suggestive of scaphoid fracture.

#### **Drop Arm Test (Rotator Cuff)**

1. Start with the patient's arm abducted 90 degrees.
2. Ask the patient to **slowly** lower the arm.
3. If the rotator cuff (especially the supraspinatus) is torn, the patient will be unable to lower the arm slowly and smoothly.

#### **Impingement Sign (Rotator Cuff)**

1. Start with the patient's arm relaxed and the shoulder in neutral rotation.
2. Abduct the arm to 90 degrees.
3. Significant shoulder pain as the arm is raised suggests an impingement of the rotator cuff against the acromion.

#### **Flexor Digitorum Superficialis Test**

1. Hold the fingers in extension except the finger being tested.
2. Ask the patient to flex the finger at the proximal interphalangeal joint.
3. If the patient cannot flex the finger, the flexor digitorum superficialis tendon is cut or non-functional.

#### **Flexor Digitorum Profundus Test**

1. Hold the metacarpophalangeal and proximal interphalangeal joints of the finger being tested in extension.
2. Ask the patient to flex the finger at the distal interphalangeal joint.
3. If the patient cannot flex the finger, the flexor digitorum profundus tendon is cut or non-functional.

## Vascular and Neurologic Tests

### Allen Test (Radial/Ulnar Arteries)

1. Ask the patient to make a tight fist.
2. Compress both the ulnar and radial arteries to stop blood flowing to the hand.
3. Ask the patient to open the hand.
4. Release pressure on the ulnar side. The hand should "pink" up in a few seconds unless the ulnar artery is occluded.
5. Repeat the process for the radial artery as indicated.

### Phalen's Test (Median Nerve)

1. Ask the patient to press the backs of the hands together with the wrists fully flexed (backward praying).
2. Have the patient hold this position for 60 seconds and then comment on how the hands feel.
3. Pain, tingling, or other abnormal sensations in the thumb, index, or middle fingers strongly suggest carpal tunnel syndrome.

### Tinel's Sign (Median Nerve)

1. Use your middle finger or a reflex hammer to tap over the carpal tunnel.
2. Pain, tingling, or electric sensations strongly suggest carpal tunnel syndrome.

## Lower Extremities

### Collateral Ligament Testing

1. The patient should be supine with the legs resting on the exam table.
2. Hold the leg to be examined in 20-30 degrees of flexion.
3. Place one hand laterally just below the knee. Grasp the leg near the ankle with your other hand.
4. Gently push with both hands in opposite directions to stress the knee.
5. If the knee joint "opens up" medially, the medial collateral ligament may be torn.
6. Reverse your hands and repeat the stress.
7. If the knee joint "opens up" laterally, the lateral collateral ligament may be torn.
8. Repeat the test using posterior stress.
9. The normal knee has a distinct end point. If the tibia moves back under the femur, the posterior cruciate ligament may be torn.

### Anterior/Posterior Drawer Test (Cruciate Ligaments)

1. Ask the patient to lie supine on the exam table with knees flexed to 90 degrees and feet flat on the table.
2. Sit on or otherwise stabilize the foot of the leg being examined.
3. Grasp the leg just below the knee with both hands and pull forward.
4. If the tibia moves out from under the femur, the anterior cruciate ligament may be torn.
5. Without changing the position of your hands, push the leg backward.
6. If the tibia moves back under the femur, the posterior cruciate ligament may be torn.

**Ballotable Patella (Major Knee Effusion)**

1. Ask the patient to lie supine on the exam table with leg muscles relaxed.
2. Press the patella downward and quickly release it.
3. If the patella visibly rebounds, a large knee effusion (excess fluid in the knee) is present.

**Milking the Knee (Minor Knee Effusion)**

1. Ask the patient to lie supine on the exam table with leg muscles relaxed.
2. Compress the suprapatellar pouch with your thumb, palm, and index finger.
3. "Milk" downward and laterally so that any excess fluid collects on the medial side.
4. Tap gently over the collected fluid and observe the effect on the lateral side, or ballot the patella as outlined above.
5. A fullness on the lateral side indicates that a small knee effusion is present.

**Back**

**Straight Leg Raising (L5/S1 Nerve Roots)**

1. Ask the patient to lie supine on the exam table with knees straight.
2. Grasp the leg near the heel and raise the leg slowly towards the ceiling.
3. Pain in an L5 or S1 distribution suggests nerve root compression or tension (radicular pain).
4. Dorsiflex the foot while maintaining the raised position of the leg.
5. Increased pain strengthens the likelihood of a nerve root problem.
6. Repeat the process with the opposite leg.
7. Increased pain on the **opposite** side indicates that a nerve root problem is almost certain.

**FABER Test (Hips/Sacroiliac Joints)**

FABER stands for **F**lexion, **A**bduction, and **E**xternal **R**otation of the hip. This test is used to distinguish hip or sacroiliac joint pathology from spine problems.

1. Ask the patient to lie supine on the exam table.
2. Place the foot of the effected side on the opposite knee (this flexes, abducts, and externally rotates the hip).
3. Pain in the groin area indicates a problem with the hip and not the spine.
4. Press down gently but firmly on the flexed knee and the opposite anterior superior iliac crest.
5. Pain in the sacroiliac area indicates a problem with the sacroiliac joints.

## 7. Neurologic Examination

### General Considerations

1. Always consider left to right symmetry
2. Consider central vs. peripheral deficits
3. Organize your thinking into seven categories:
  - a. Mental Status
  - b. Cranial Nerves
  - c. Motor
  - d. Coordination and Gait
  - e. Reflexes
  - f. Sensory
  - g. Special Tests

### Cranial Nerves

#### Observation

1. Ptosis (III)
2. Facial Droop or Asymmetry (VII)
3. Hoarse Voice (X)
4. Articulation of Words (V, VII, X, XII)
5. Abnormal Eye Position (III, IV, VI)
6. Abnormal or Asymmetrical Pupils (II, III)

### I - Olfactory

### II - Optic

1. Test Visual Acuity Allow the patient to use their glasses or contact lens if available. You are interested in the patient's best **corrected** vision.
2. Position the patient 20 feet in front of the Snellen eye chart (or hold a Rosenbaum pocket card at a 14 inch "reading" distance).
3. Have the patient cover one eye at a time with a card.
4. Ask the patient to read progressively smaller letters until they can go no further.
5. Record the smallest line the patient read successfully (20/20, 20/30, etc.)
6. Repeat with the other eye.
7. Screen Visual Fields by Confrontation Stand two feet in front of the patient and have them look into your eyes.
8. Hold your hands about one foot away from the patient's ears, and wiggle a finger on one hand.
9. Ask the patient to indicate which side they see the finger move.
10. Repeat two or three times to test both temporal fields.

### III - Oculomotor

Observe for Ptosis

1. Test Extraocular Movements Stand or sit 3 to 6 feet in front of the patient.
2. Ask the patient to follow your finger with their eyes without moving their head.
3. Check gaze in the six cardinal directions using a cross or "H" pattern.
4. Pause during upward and lateral gaze to check for nystagmus.
5. Check convergence by moving your finger toward the bridge of the patient's nose.

Test Pupillary Reactions to Light)

### IV - Trochlear

Test Extraocular Movements (Inward and Down Movement)

### V - Trigeminal

1. Test Temporal and Masseter Muscle Strength Ask patient to both open their mouth and clench their teeth.
2. Palpate the temporal and masseter muscles as they do this.
3. Test the Three Divisions for Pain Sensation Explain what you intend to do.
4. Use a suitable sharp object to test the forehead, cheeks, and jaw on both sides.
5. Substitute a blunt object occasionally and ask the patient to report "sharp" or "dull."
6. If you find an abnormality then: Test the three divisions for temperature sensation with a tuning fork heated or cooled by water.
7. Test the three divisions for sensation to light touch using a wisp of cotton.
8. Test the Corneal Reflex Ask the patient to look up and away.
9. From the other side, touch the cornea lightly with a fine wisp of cotton.
10. Look for the normal blink reaction of **both** eyes.
11. Repeat on the other side.

Use of contact lens may decrease this response.

### VI - Abducens

Test Extraocular Movements (Lateral Movement, See Above)

### VII - Facial

Observe for Any Facial Droop or Asymmetry

1. Ask Patient to do the following, note any lag, weakness, or asymmetry: Raise eyebrows
2. Close both eyes to resistance
3. Smile
4. Frown
5. Show teeth
6. Puff out cheeks

Test the Corneal Reflex (See Above)

### VIII - Acoustic

Face the patient and hold out your arms with your fingers near each ear.

1. Rub your fingers together on one side while moving the fingers noiselessly on the other.
2. Ask the patient to tell you when and on which side they hear the rubbing.
3. Increase intensity as needed and note any asymmetry.
4. If abnormal, proceed with the Weber and Rinne tests.

Test for Lateralization (Weber) Use a 512 Hz or 1024 Hz tuning fork.

1. Start the fork vibrating by tapping it on your opposite hand.
2. Place the base of the tuning fork firmly on top of the patient's head.
3. Ask the patient where the sound appears to be coming from (normally in the midline).

Compare Air and Bone Conduction (Rinne) Use a 512 Hz or 10 Hz tuning fork.

1. Start the fork vibrating by tapping it on your opposite hand.
2. Place the base of the tuning fork against the mastoid bone behind the ear.
3. When the patient no longer hears the sound, hold the end of the fork near the patient's ear (air conduction is normally greater than bone conduction).

### IX – Glossopharyngeal

#### X - Vagus

Listen to the patient's voice, is it hoarse or nasal?

1. Ask Patient to Swallow
2. Ask Patient to Say "Ah" Watch the movements of the soft palate and the pharynx.
3. Test Gag Reflex (Unconscious/Uncooperative Patient) ++ Stimulate the back of the throat on each side.

It is normal to gag after each stimulus.

#### XI - Accessory

1. From behind, look for atrophy or asymmetry of the trapezius muscles.
2. Ask patient to shrug shoulders against resistance.
3. Ask patient to turn their head against resistance. Watch and palpate the sternomastoid muscle on the opposite side.

#### XII - Hypoglossal

1. Listen to the articulation of the patient's words.
2. Observe the tongue as it lies in the mouth
3. Ask patient to: Protrude tongue [10]
4. Move tongue from side to side

**Motor**

**Observation**

**Involuntary Movements**

1. Muscle Symmetry Left to Right
2. Proximal vs. Distal
3. Atrophy
4. Pay particular attention to the hands, shoulders, and thighs.
5. Gait

**Muscle Tone**

1. Ask the patient to relax.
2. Flex and extend the patient's fingers, wrist, and elbow.
3. Flex and extend patient's ankle and knee.
4. There is normally a small, continuous resistance to passive movement.
5. Observe for decreased (flaccid) or increased (rigid/spastic) tone.

**Muscle Strength**

Test strength by having the patient move against your resistance.

Always compare one side to the other.

Grade strength on a scale from 0 to 5 "out of five":

**Grading Motor Strength**

<b>Grade</b>	<b>Description</b>
0/5	No muscle movement
1/5	Visible muscle movement, 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 resist
4/5	Movement against resistance, but less than normal
5/5	Normal strength

Test the following:

1. Flexion at the elbow (C5, C6, biceps)
2. Extension at the elbow (C6, C7, C8, triceps)
3. Extension at the wrist (C6, C7, C8, radial nerve)
4. Squeeze two of your fingers as hard as possible ("grip," C7, C8, T1)
5. Finger abduction (C8, T1, ulnar nerve)
6. Opposition of the thumb (C8, T1, median nerve)
7. Flexion at the hip (L2, L3, L4, iliopsoas)
8. Adduction at the hips (L2, L3, L4, adductors)
9. Abduction at the hips (L4, L5, S1, gluteus medius and minimus)
10. Extension at the hips (S1, gluteus maximus)
11. Extension at the knee (L2, L3, L4, quadriceps)
12. Flexion at the knee (L4, L5, S1, S2, hamstrings)
13. Dorsiflexion at the ankle (L4, L5)
14. Plantar flexion (S1)

### **Pronator Drift**

1. Ask the patient to stand for 20-30 seconds with both arms straight forward, palms up, and eyes closed.
2. Instruct the patient to keep the arms still while you tap them briskly downward.
3. The patient will not be able to maintain extension and supination (and "drift into pronation) with upper motor neuron disease.

### **Coordination and Gait**

#### **Rapid Alternating Movements**

1. Ask the patient to strike one hand on the thigh, raise the hand, turn it over, and then strike it back down as fast as possible.
2. Ask the patient to tap the distal thumb with the tip of the index finger as fast as possible.
3. Ask the patient to tap your hand with the ball of each foot as fast as possible.

#### **Point-to-Point Movements**

1. Ask the patient to touch your index finger and their nose alternately several times. Move your finger about as the patient performs this task.
2. Hold your finger still so that the patient can touch it with one arm and finger outstretched. Ask the patient to move their arm and return to your finger with their eyes closed.
3. Ask the patient to place one heel on the opposite knee and run it down the shin to the big toe. Repeat with the patient's eyes closed.

#### **Romberg**

1. Be prepared to catch the patient if they are unstable.
2. Ask the patient to stand with the feet together and eyes closed for 5-10 seconds without support.
3. The test is said to be positive if the patient becomes unstable (indicating a vestibular or proprioceptive problem).

**Gait**

Ask the patient to:

1. Walk across the room, turn and come back
2. Walk heel-to-toe in a straight line
3. Walk on their toes in a straight line
4. Walk on their heels in a straight line
5. Hop in place on each foot
6. Do a shallow knee bend
7. Rise from a sitting position

**Reflexes**

**Deep Tendon Reflexes**

The patient must be relaxed and positioned properly before starting.

1. Reflex response depends on the force of your stimulus. Use no more force than you need to provoke a definite response.
2. Reflexes can be reinforced by having the patient perform isometric contraction of other muscles (clenched teeth).
3. Reflexes should be graded on a 0 to 4 "plus" scale:

**Tendon Reflex Grading Scale**

Grade	Description
0	Absent
1+ or +	Hypoactive
2+ or ++	"Normal"
3+ or +++	Hyperactive without clonus
4+ or ++++	Hyperactive with clonus

**Biceps (C5, C6)** The patient's arm should be partially flexed at the elbow with the palm down.

Place your thumb or finger firmly on the biceps tendon.

Strike your finger with the reflex hammer.

You should feel the response even if you can't see it.

**Triceps (C6, C7)** Support the upper arm and let the patient's forearm hang free.

Strike the triceps tendon above the elbow with the broad side of the hammer.

If the patient is sitting or lying down, flex the patient's arm at the elbow and hold it close to the chest.

**Brachioradialis (C5, C6)** Have the patient rest the forearm on the abdomen or lap.

Strike the radius about 1-2 inches above the wrist.

Watch for flexion and supination of the forearm.

**Abdominal (T8, T9, T10, T11, T12)** Use a blunt object such as a key or tongue blade.

Stroke the abdomen lightly on each side in an inward and downward direction above (T8, T9, T10) and below the umbilicus (T10, T11, T12).

Note the contraction of the abdominal muscles and deviation of the umbilicus towards the stimulus.

**Knee (L2, L3, L4)** Have the patient sit or lie down with the knee flexed.

Strike the patellar tendon just below the patella.

Note contraction of the quadriceps and extension of the knee.

**Ankle (S1, S2)** Dorsiflex the foot at the ankle.

Strike the Achilles tendon.

Watch and feel for plantar flexion at the ankle.

### Clonus

If the reflexes seem hyperactive, test for ankle clonus:

1. Support the knee in a partly flexed position.
2. With the patient relaxed, quickly dorsiflex the foot.
3. Observe for rhythmic oscillations.

### Plantar Response (Babinski)

Stroke the lateral aspect of the sole of each foot with the end of a reflex hammer or key.

Note movement of the toes, normally flexion (withdrawal).

Extension of the big toe with fanning of the other toes is abnormal. This is referred to as a positive Babinski



## Sensory

### General

1. Explain each test before you do it.
2. Unless otherwise specified, the patient's eyes should be closed during the actual testing.
3. Compare symmetrical areas on the two sides of the body.
4. Also compare distal and proximal areas of the extremities.
5. When you detect an area of sensory loss map out its boundaries in detail.

### Vibration

1. Use a low pitched tuning fork (128Hz). Test with a **non-vibrating** tuning fork first to ensure that the patient is responding to the correct stimulus.
2. Place the stem of the fork over the distal interphalangeal joint of the patient's index fingers and big toes.
3. Ask the patient to tell you if they feel the vibration.

If vibration sense is impaired proceed proximally:

Wrists

1. Elbows
2. Medial malleoli
3. Patellas
4. Anterior superior iliac spines
5. Spinous processes
6. Clavicles

### Subjective Light Touch

Use your fingers to touch the skin lightly on both sides simultaneously.

Test several areas on both the upper and lower extremities.

Ask the patient to tell you if there is difference from side to side or other "strange" sensations.

### Position Sense

Grasp the patient's big toe and hold it away from the other toes to avoid friction.

Show the patient "up" and "down."

With the patient's eyes closed ask the patient to identify the direction you move the toe.

If position sense is impaired move proximally to test the ankle joint.

Test the fingers in a similar fashion.

If indicated move proximally to the metacarpophalangeal joints, wrists, and elbows.

### Dermatomal Testing

If vibration, position sense, and subjective light touch are normal in the fingers and toes you may assume the rest of this exam will be normal.

### **Pain**

Use a suitable sharp object to test "sharp" or "dull" sensation.

Test the following areas: Shoulders (C4)

Inner and outer aspects of the forearms (C6 and T1)

Thumbs and little fingers (C6 and C8)

Front of both thighs (L2)

Medial and lateral aspect of both calves (L4 and L5)

Little toes (S1)

### **Temperature**

Often omitted if pain sensation is normal.

Use a tuning fork heated or cooled by water and ask the patient to identify "hot" or "cold."

Test the following areas:

1. Shoulders (C4)

2. Inner and outer aspects of the forearms (C6 and T1)

3. Thumbs and little fingers (C6 and C8)

4. Front of both thighs (L2)

5. Medial and lateral aspect of both calves (L4 and L5)

6. Little toes (S1)

### **Light Touch**

1. Use a fine whisp of cotton or your fingers to touch the skin lightly.

2. Ask the patient to respond whenever a touch is felt.

3. Test the following areas: Shoulders (C4)

4. Inner and outer aspects of the forearms (C6 and T1)

5. Thumbs and little fingers (C6 and C8)

6. Front of both thighs (L2)

7. Medial and lateral aspect of both calves (L4 and L5)

8. Little toes (S1)

### **Discrimination**

Since these tests are dependent on touch and position sense, they cannot be performed when the tests above are clearly abnormal.

**Graphesthesia** With the blunt end of a pen or pencil, draw a large number in the patient's palm.

Ask the patient to identify the number.

**Stereognosis** Use as an alternative to graphesthesia.

Place a familiar object in the patient's hand (coin, paper clip, pencil, etc.).

Ask the patient to tell you what it is.

**Two Point Discrimination** Use in situations where more quantitative data are needed, such as following the progression of a cortical lesion.

Use an opened paper clip to touch the patient's finger pads in two places simultaneously.

Alternate irregularly with one point touch.

Ask the patient to identify "one" or "two."

Find the minimal distance at which the patient can discriminate