

Vital Signs Procedures

The Classic 4

- The classic 4 vital **signs** are:
 - Temperature
 - Pulse
 - Respiration
 - Blood Pressure
- The classic vital **statistics** are:
 - Height
 - Weight

What is the value of taking the vitals of a patient?

- What does the temperature tell you?
 - It is a very effective infection assessment
- What does the pulse tell you?
 - It is an effective cardiovascular assessment
- What does respiration tell you?
 - It is an effective respiratory system assessment
- What does the BP tell you?
 - It also is an effective cardiovascular assessment

Measuring Temperature

- Oral temperature
- Rectal
- Axillary
- Tympanic membrane
- Surface (infrared)

Temperature

- Fever is strictly defined as a bodily temperature above 98.6° F (37° C)
- However, this figure is the average of the population, and many patients have bodily temperatures above or below this number
- Therefore, a true fever (practical definition) is an oral temperature above 100.2° F (37.9° C)

Temperature differences

- Rectal temperature is higher than oral temp—usually about 1° F
- Recent ingestion of hot or cold substances can alter the temp
- Patients who are tachypneic (fast breathers, usually through the mouth) usually have lower temperatures

Temperature differences

- Axillary temperatures with mercury thermometers are highly inaccurate and should be avoided if possible
- New technology with infrared is improving the accuracy of this vital sign

Pulse

- Pulse = heart rate
- Normal is 60-100 beats per minute (bpm)
- Below 60 is ...
 - bradycardia
- Above 100 is ...
 - tachycardia

Where can you take the pulse?

- The arteries easiest to palpate are the ones closest to the surface
- Temporal
- Carotid
- Brachial
- Radial
- Femoral
- Popliteal
- Posterior tibial
- Dorsal pedis

Which ones should you palpate?

- The pulse diminishes the farther the vessel is from the heart
- The pulses in the extremities evaluate the sufficiency of the entire arterial circulation
- The proximal pulses are better for evaluating the heart activity

Pulse

- You must evaluate the modifiers/descriptors/characteristics of the beat
 - Rate: (bpm)
 - Rhythm: (regular pattern or irregular pattern)
 - Amplitude: (force, 0-4 on next slide)
 - Contour: (waveform: should be pliable, smooth, domed)

Pulse amplitude

- Pulse amplitude is described on a scale of 0 to 4:
- 4 = bounding
- 3 = full, increased
- 2 = expected
- 1 = diminished, barely palpable
- 0 = absent, not palpable
 - Pulse amplitude is described as expected for **that vessel**, not compared to other vessels

Respiration

- Respiration is the measure of the full respiratory cycle (from inhalation to exhalation)
- We evaluate three (3) components of the respiratory pump:
 - Rate (breaths per minute)
 - Rhythm (regular or irregular pattern)
 - Depth (shallow, moderate, or deep---most subjective)
- Normal adult respiration is 10-20 breaths per minute (not bpm)
 - Book states 12-20 per minute

Blood pressure

- The standard measure of blood pressure is the indirect method, using a sphygmomanometer (sphygmo=pulse, manos=scanty, metron=measurement)
- May be palpatory or auscultatory
- The “Gold Standard” is the direct measurement, using a rigid wall catheter

Proper technique for measuring BP

- The patient should rest for at least 5 minutes prior to the first measurement
- Seat the pt in a calm, quiet environment with feet flat on the floor, back against the chair, and the bared arm resting on the table so that the mid portion of the arm is at heart level

- Palpate the brachial artery and place the cuff so that the midline of the bladder is over the arterial pulsation
- Wrap the cuff snugly around the pt's bare arm
- Avoid the tourniquet effect of rolled sleeves
- Too loose cuff leads to overestimation of the pressure
- The lower edge of the cuff should be 1 inch above the antecubital fossa

- Face the manometer so that it is easily read and so that the tubes are not in the way
- Inflate the cuff rapidly to 70 mmHg and increase by 10 mmHg while palpating the radial pulse
- Note the levels at which the radial pulse:
 - disappears as you inflate the cuff, **and/or**
 - reappears as you deflate the cuff (confirmation)

Palpatory BP

- You've just performed the **palpatory** systolic BP which is necessary for the **auscultatory** BP
- Why not go right to the auscultatory BP? Why do palpatory BP?
 - Avoids under inflation
 - Reveals any auscultatory gaps
 - Allows for patient comfort

Auscultatory BP

- Place the earpieces of the stethoscope into the ear canals, angled forward towards the tympanic membrane
- The bell is best for low frequency sounds, but it is easiest to learn how to perform a BP measurement with the diaphragm (practice with both to determine what sounds best to you)
- Place the diaphragm or bell over the brachial artery pulsation, just above and medial to the antecubital fossa

Auscultatory BP

- Inflate the bladder rapidly and steadily to a pressure approximately 30-40 mmHg above the palpatory reading
- Partially unscrew (open) the valve and deflate the bladder at 2 mmHg/sec while listening for the Korotkoff sounds
- As the pressure falls, note the level of the first appearance of repetitive sounds (Phase I) and when the sounds muffle (Phase IV) and when the sounds disappear (Phase V)

- The appearance of the repetitive sounds is systole (top number)
- The disappearance of the sounds is diastole (bottom number)
- Systolic pressure is that pressure that exists when the ventricles contract
- Diastolic pressure is that pressure that exists when the ventricles relax

Helpful Hints

Vital Signs

Temperature

- Read the instruction manual for your thermometer—all work differently
- Temperature can be artificially influenced by hot or cold liquid or food (oral) or by outside temperatures (infrared)

Pulses

- Pulses
 - To establish distal perfusion/circulation, take the most distal pulses you can
 - To evaluate heart activity (murmurs, fibrillations, rhythm disorders)
 - Compare bilaterally, at the same time; they should be synchronous
 - Compare upper extremity and lower extremity pulses; they should be synchronous
 - Don't be afraid to move around to find the strongest point of the pulse—the pulses will not necessarily be at the same exact point on each extremity (one might be more distal and the other more proximal)

Why take measurements in both upper and lower extremities?

- The pulse should always be palpated bilaterally
- A difference between arm pulses may be a clue to coarctation of the aorta, anatomical variants and alterations to the pulse after surgical or cardiological procedures, such as cardiac catheterization

Respiration

- Attempt to take the respiration while you (pretend to) perform another evaluation, i.e. pulse, temperature, palpation, history
- Asking the patient to sit up straight opens up the thoracic cage and pulls the shoulders back, making it easier to see chest expansion

Blood Pressure

- Perform bilaterally for new patients or when a patient has had a change in his or her cardiovascular status
 - Subsequent checks can be done unilaterally if BP is close to the same in each arm
- BP could also be performed on the radial, femoral, and tibial arteries
- Taking BP would be contraindicated in...?

Evaluating Vital Signs

Temperature: Causes of Pyrexia

- Pyrogens: infections, inflammations (next slide)
 - Adults: cold, flu, gastroenteritis, hepatitis, sinusitis, tonsillitis, otitis media, UTI, measles, roseola, prostatitis, mononucleosis, dental abscess, TB
 - Children: cold, flu, otitis media, strep throat, UTI, roseola
- Diseases of the endocrine system
- Injuries or anomalies of the CNS (hypothalamus)
- Blood clots: inflammation to blood vessels
- Tumors: could make pyrogens, damage hypothalamus, become infected, meds
- Environment: hyperthermia (105° or greater)

Temperature: Pyrogens

- Viruses (MC)
- Bacteria
- Fungi
- Drugs
 - Antibiotics, heart, seizure, excess aspirin or thyroid hormone, antihistamines, some antidepressants, cocaine, amphetamines, preservatives
- Toxins

Causes of a weakened immune system

- Age older than 65
- Diabetes
- Malnutrition
- Heavy alcohol or drug use
- Sarcoidosis, lupus, absent spleen
- Cancer
- Cancer treatment medication
- Organ transplant medication
- Steroid therapy
- HIV

When should an adult with a fever be seen outside your office?

- Refer if any of the following exist:
 - Temperature 104° or greater
 - Temperature lasts for 7 days or more
 - Symptoms get worse
- Emergency if:
 - Confusion or excessive sleepiness
 - Stiff neck
 - Severe headache
 - Sore throat
 - Rash
 - Chest pain
 - Trouble breathing
 - Repeated vomiting
 - Abdominal pain
 - Blood in stool
 - Pain with urination
 - Leg swelling
 - Red, hot, or swollen area

When should a child with a fever be seen outside your office?

- Refer if any of the following exist:
 - Child younger than 6 months of age
 - Unable to control the fever
 - Suspect dehydration (vomiting, diarrhea, not drinking, dry diapers, tented skin)
- Emergency if:
 - Child is now getting worse or new symptoms have developed
 - A seizure occurs
 - Purple or red rash appears
 - Change in consciousness occurs
 - Breathing is shallow, rapid, or difficult
 - Child is younger than 2 months of age
 - Child has a headache that does not remit
 - Repeated vomiting

Descriptions of fevers

- Intermittent: resolves completely daily
- Remittent: lessens but does not resolve
- Hectic: daily, usually afternoon spike, with facial flushing, often seen with TB
- Ephemeral: febrile period of 2-3 days
- Essential fever: FUO (fever of unknown origin); it is a temp of 100.4° F (38° C) for 3 weeks or longer without an identifiable cause

Proper Names of Fevers

- Charcot's fever: spiking fever and chills, jaundice, seen with cholangiitis
- Pel-Ebstein fever: fever, night sweats, weight loss, seen with Hodgkin's lymphoma

Extreme pyrexia

- Hyperpyrexia is a temp greater than 105° F or 40.6° C
- Usually caused by CNS disorders of the thermoregulating centers
- These disorders are usually caused by heat stroke, CVA, brain injury after cardiac arrest
- Infections of the CNS (encephalitis, meningitis) can lead to malignant hyperthermia

Temperatures lower than normal

- Hypothermia is a body temperature below 98.6° F (strictly speaking)
- Temperatures lower than normal can be caused by chronic renal failure and patients receiving antipyretics (acetaminophen) and NSAIDs

Temp and Pulse association/Innate!

- Usually, fever is accompanied by an increase in the pulse
- Why?
- Generally, for every degree of increased temp, the pulse is increased by 10 bpm
- An increase in heart rate may not occur if the fever is a reaction to drugs and in some infections like typhoid fever, legionellosis, mycoplasmal pneumonia

Pulse

- The heart beat is transmitted through two systems
- Arterial system
- Venous system

Arterial Pulse and Pressure

- The arterial pulses are the most palpable and are sometimes visible
- The arteries are tough, have more distensibility, and more tensile strength
- What is the pressure level in arteries (remember, they come right off the heart and aortas) as compared to the pressure level in veins?

Arterial Pulse and Pressure

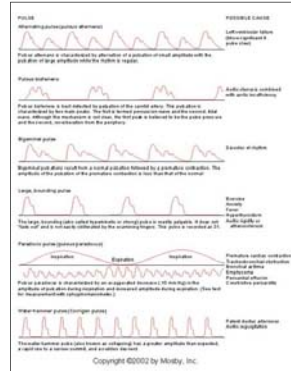
- The arterial pulses are the result of ventricular systole (ejection of blood from the left ventricle into the aorta)
- This produces a pressure wave through all the arteries
- We call this pressure wave a pulse
- $SV \times R$ (heart rate) = CO (cardiac output)
- CO is a measure of the heart's ability to adapt to a changing environment

Arterial Pulse and Pressure

- The pulse is felt as a forceful wave that is smooth and rapid on the ascending portion of the wave
- The pulse becomes domed, less steep, and slower on the descending part of the wave
- The closer the artery to the heart, the more forceful and definitive the pulse
- Which accessible artery is closest to the heart?
- Jugular Venous Pulse and Pressure
 - We'll cover the venous portion during the cardiac section

Abnormalities

- Table 15-2: Arterial pulse abnormalities
- Figure 15-9: Pulse abnormalities (graphic representations)



Respiratory abnormalities

- The major abnormalities are increases or decreases in rate
- Tachypnea
- Bradypnea
- Who gets tachypnea and why is it a big deal?
 - MC in elderly with COPD
 - Its presence is so common that it may not be specific, but...its absence could be diagnostic
 - For example—92% of patients with PE have tachypnea. Without it, PE is unlikely.

Bradypnea

- Is bradypnea as clinically significant as tachypnea?
- May be seen in patients with hypothyroidism (MC) and in CNS lesions, sedative or narcotic use

Pursed-lip breathing

- Commonly observed in patients with COPD, usually emphysema
- Pts. with emphysema have reduced lung elasticity and alveolar hyperinflation
- Therefore, they have higher risk for airway closure and air trapping

- As a result, they use pursed-lip breathing, which increases intra-airway pressure by inducing auto-PEEP (positive end-expiratory pressure)
- This prevents airway closure
- This pattern is often accompanied by audible expiratory sounds like wheezing or grunting

Depth of breathing abnormalities

- Hyperpnea is an increase in the rate and the tidal volume (produces rapid and deep respiration)
- Classic form is Kussmaul breathing, seen in patients with metabolic acidosis (diabetic ketoacidosis)
- Patients attempt to compensate for pH by hyperventilating

Mnemonic for Kussmaul

- **MAKE UP** a List:
- **M**ethanol poisoning
- **A**spirin intoxication
- **K**etoacidosis
- **E**thylene glycol ingestion
- **U**remia
- **P**araldehyde administration
- **L**actic acidosis

Hypopnea

- Hypopnea is characterized by shallow respirations
- It is a hallmark of impending respiratory failure or of obesity-hypoventilation (AKA: Pickwickian syndrome)
- Pickwickian syndrome: obese pt with excessive daytime sleepiness and elevated blood CO₂ (PCO₂)

Apnea

- Apnea is the absence of respiration for at least 20 seconds while the patient is awake or 30 seconds while the patient is asleep
- Seen in pts with neuromuscular dysfunction (central apnea) or airway obstruction interrupting REM sleep (obstructive sleep apnea)

Orthopnea

- Orthopnea means upright respiration (orthos=upright)
- Orthopnea is seen MC in pts with CHF (usually left-sided)
- Sitting upright pools blood in dependent areas, thereby decreasing venous return

BP: Korotkoff sounds

- *Phase 1*: The first appearance of faint, repetitive, clear tapping sounds that gradually increase in intensity for at least two consecutive beats is the **systolic blood pressure**.
- *Phase 2*: A brief period may follow during which the sounds soften and acquire a swishing quality.
- *Auscultatory gap*: In **some** patients, sounds may disappear altogether for a short time.
- *Phase 3*: The return of sharper sounds, which become crisper to regain, or even exceed, the intensity of phase 1 sounds. The clinical significance, if any, of phases 2 and 3 has not been established.
- *Phase 4*: The distinct, muffling sounds, which become soft and blowing in quality (**mid-diastolic pressure**)
- *Phase 5*: The point at which all sounds finally disappear completely is the **diastolic blood pressure** (**end-diastolic pressure**)

The auscultatory gap

- The *silent or auscultatory gap* occurs when the sounds disappear between the systolic and diastolic pressures. The importance of the gap is that unless the systolic pressure is palpated first, it may be **underestimated**.
- The presence of a silent gap should be recorded on the case sheet or blood pressure chart.
- For example: 124/94/82 (AG from 110 to 99)

What does the systolic number measure?

- Systole occurs when the ventricles contract and the tricuspid and mitral (AV) valves close
- It is a measure of cardiac output and how hard the heart is working to eject the blood (stroke volume)

What does the diastolic number measure?

- Diastole occurs when the ventricles relax and the tricuspid and mitral valves open
- Diastolic pressure is a measure of the peripheral vascular resistance (resting resistance)

Normal BP ranges

- The “classic” BP is 120/80
- But, when you measured the BP of your partners, what did you find?

BP ranges

- We consider normal systolic **range** to be:
 - 100-140 mmHg
- We consider normal diastolic **range** to be:
 - 60-90 mmHg
- You need to evaluate the possibilities that both could be high, both could be low, one could be high, one could be low

At what point do we consider it “hypertension”?

- A BP measurement greater than 140 systolic **and/or** greater than 90 diastolic is considered hypertension
- But, we shouldn’t give the diagnosis (DX) of hypertension based on the first measurement only

Guidelines for diagnosing hypertension

- You should not diagnose hypertension based on one measurement of the BP
- There are several factors that affect the BP in addition to what we’ve already mentioned
 - “White coat hypertension”: higher BP
 - Defense mechanism: higher BP due to anxiety
 - Blood pressure varies in individuals according to the time of day, meals, smoking, anxiety, temperature, and the season of the year. It is usually at its lowest during sleep

Which number is “more important” in determining hypertension?

- Previously, the diastolic number was considered the more significant #
- It was thought that the “resting peripheral resistance” was a better indicator of CVD
- In May, 2003, the coordinating committee of the National High Blood Pressure Education Program, which is part of the National Heart, Lung and Blood Institute, developed a document stating the new recommendations and guidelines (published in Hypertension)

- Specifically, the new recommendations are:
- **Systolic blood pressure** should become the principal clinical endpoint for detection, evaluation and treatment of hypertension, especially in middle-aged and older Americans
- Blood pressure should be maintained below 140/90 mmHg throughout one's lifetime; above this level, early therapy is essential to protect against organ and vessel damage.
- More stringent blood-pressure control is necessary in persons with high-risk conditions: hypertensive patients with diabetes should keep their blood below 135/85 mmHg and persons with renal or heart failure should reduce their blood pressure to the lowest level possible.
- Age-adjusted blood-pressure targets are inappropriate, including the unsubstantiated but persistent clinical folklore that “100-+-your-age” is an acceptable systolic blood-pressure level.

- **Systolic hypertension is the most prevalent risk factor in heart failure, stroke and kidney failure.** It is clear that lowering systolic pressure is associated with better outcomes in cardiovascular and renal disease
- Systolic hypertension interacts with other major risk factors, such as high cholesterol and diabetes, which also increase with age, to **amplify the age-related risk of cardiovascular events**

- When the systolic pressure is 140 mm Hg or higher, but the diastolic pressure remains below 90 mm Hg, the condition is known as **isolated systolic hypertension**
- Isolated systolic hypertension is the dominant form of uncontrolled high blood pressure in people over the age of 50. **Among study participants, over 80 percent of individuals in this age group who have hypertension have uncontrolled isolated systolic hypertension.** Among those over the age of 60, the number is even higher

Hypotension

- Hypotension is classically considered BP under 90/60
- But, what may be low for some, could be normal for others

Causes of hypotension

- When the blood pressure is too low, there is inadequate blood flow to the heart, brain, and other vital organs.
- Medications used for surgery
- Anti-anxiety agents
- Treatment for high blood pressure
- Diuretics
- Heart medicines
- Some antidepressants
- Narcotic analgesics
- Alcohol
- Fatigue
- Anxiety
- Depression
- Dehydration
- Heart failure
- Heart attack
- Changes in heart rhythm (arrhythmias)
- Fainting
- Anaphylaxis (a life-threatening allergic response)
- Shock (from severe infection, stroke, anaphylaxis, major trauma, or heart attack)
- Advanced diabetes

Pulse pressure

- The pulse pressure is the difference between the systolic and the diastolic pressures
- For example 120/80 would give a pulse pressure of 40 (120-80)
- The normal pulse pressure range is 30-40 mmHg

Widened (high) pulse pressure (>40 mmHg)

- Pathophysiology
 - Suggests reduced large artery vascular compliance
 - Best blood pressure marker for cardiovascular risk
- Causes
 - Isolated systolic hypertension
 - Aortic Regurgitation
 - Thyrotoxicosis
 - Patent Ductus Arteriosus
 - Arteriovenous fistula
 - Beriberi heart
 - Aortic Coarctation
 - Anemia
 - Emotional state

Narrowed pulse pressure (<30 mmHg)

- Causes
 - Tachycardia
 - Severe aortic stenosis
 - Constrictive pericarditis
 - Pericardial effusion
 - Ascites

Summary of blood pressure measurement

- **Palpatory estimation of systolic pressure**
 - Palpate radial artery pulsation
 - Inflate cuff until pulsation vanishes and note that number (or note at what number the pulse reappears upon deflation of the cuff)
 - Deflate cuff
 - Estimate systolic pressure (**usually** within 20-30 mmHg, so add 40 mmHg to be certain)

• Auscultatory measurement of systolic and diastolic pressure

- Place stethoscope over point of maximal pulsation of brachial artery
- Inflate cuff to 40 mm Hg above estimated systolic pressure
- Reduce pressure at rate of 2-3 mm Hg per second or per pulse beat
- Take reading of systolic pressure when repetitive, clear tapping sounds appear for two consecutive beats (Phase I)
- Take reading of diastolic pressure when repetitive sounds muffle (Phase IV) and when they disappear (Phase V)

How frequently should you take the BP?

- At the initial visit, you should take both the palpatory and auscultatory BP in both arms
 - On subsequent checks, unless a cardiovascular or stroke event is suspected, usually an auscultatory measurement will do
- If the BP is elevated above 140/90, a second reading should be taken after 1-2 minutes
- For patients in whom sustained increases of blood pressure are being assessed, a number of measurements should be made on different occasions before definite diagnostic or management decisions are made (3 consecutive visits)

Sustained blood pressure elevation

- Repeat measurement at least once at each visit on the same arm
- Make several measurements at different visits
- Make each measurement carefully
- Deliver your care and consider referral to a cardiovascular specialist and counseling for lifestyle and diet modifications

Differences in BP in both arms

- You should allow a variation of **up to 10 mmHg** from right arm to left arm
- Congenital conditions in the differential diagnosis include coarctation of the aorta and thinning (effacement) of one of the subclavian, axillary, or brachial arteries
- Acquired arterial conditions include aortic dissection, atheroma, thrombus, embolus, and extrinsic compression (as might be seen in association with a mass in the upper chest)

Vertebrobasilar Screening

Vertebrobasilar Stroke (VBS)

- Since VBS is the most serious complication of spinal manipulative therapy (SMT), it is expected that all practitioners would be knowledgeable of:
- The warning signs and symptoms that indicate caution should be exercised in caring for particular patients
- Techniques that appear to carry the greatest risk
- Warning signs during treatment that would indicate that the treatment should stop
- Pathology and diagnosis of arterial trauma
- Implementation of appropriate emergency procedures, should signs of VBS occur

4 Components of Vertebrobasilar Screening Test

1. Patient history
2. Review of specific symptoms
3. Physical evaluation
4. Provocative functional test

Presenting Complaint

- The CC of pts who suffered a VBI (vertebrobasilar incident) or VBS (vertebrobasilar stroke) following SMT was given in 192 of 255 cases (75%)
- 42.7% (82) had neck pain and/or stiffness
- 18.2% (35) had above + HA
- 13.6% (26) had HA
- 6.3% (12) had torticollis

Patient History

- In the history, look for **risk factors** for VBI/VBS:
 - High blood pressure
 - Atherosclerosis
 - Diabetes (accelerates the atherosclerosis)
 - Vascular anomalies (congenital and acquired)
 - Heart surgery
 - Osteophyte formation (posterolateral)
 - CAD injuries (cervical acceleration-deceleration)
 - Family history
 - Females on contraceptives (+ smoking)
 - Smoking
 - Certain medications (Coumadin, Heparin, other anti-coagulants)

Patient History

- A positive answer to any of the screening questions does **NOT** indicate that the patient **WILL** have a stroke
- Positive answers indicate that the clinician needs to look for correlating information

Review of Systems (ROS)

- A proper ROS may uncover problems in:
 - Cardiovascular system (stroke, TIAs, atherosclerosis)
 - Pulmonary system
 - GI or GU system
 - Drugs/Medications
 - Physical trauma
 - Dizziness (may be a symptom of VBI)
 - Previous hospitalizations

- “The chiropractor’s thoroughness, the reasonableness of the diagnosis or working hypothesis, as well as the appropriateness of care will all be examined by the reference to a good history”
- “Details in a good history help to ascertain the possibility of an existing or developing arterial dissection”

TIAs in the ROS

- When TIA (transient ischemic attack) symptoms are revealed in the ROS, care must be taken by the DC in administering high velocity adjustments
- Symptoms of a TIA are **immediately** referable for medical care

Physical Examination

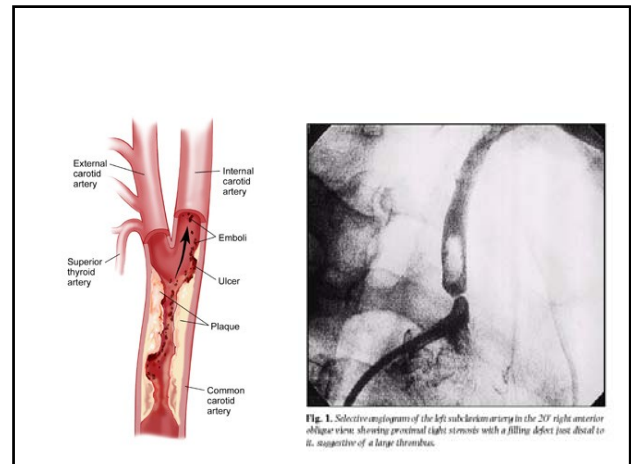
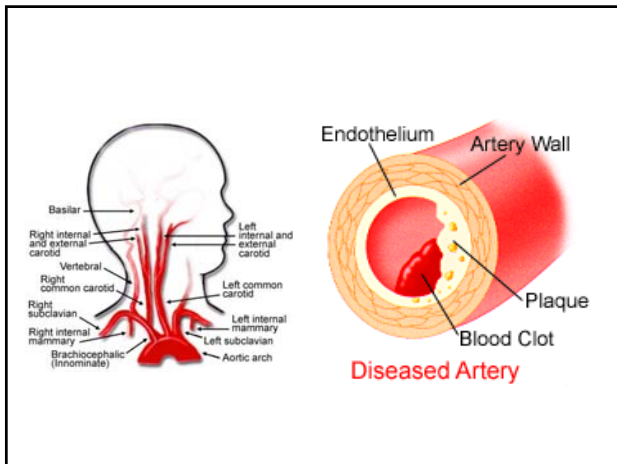
- Because of the possibility of post-SMT stroke syndromes, three major tests (plus the history) have been advocated as being able to detect at-risk patients:
 - 1. History
 - 2. Blood pressure measurement
 - 3. Neck (carotid and subclavian) auscultation
 - 4. Functional vascular tests (**must be performed last—most invasive exam**)

Blood pressure measurement

- In studies of vertebral artery dissection (VAD), 48% and 53% of patients had hypertension
- In contrast, patients with post-SMT VBS cases are often young without hypotension or hypertension

Neck auscultation

- Carotid bruits heard when auscultating may be incidental or may rarely be associated with cardiovascular pathology
- However, clinical correlation is suggested as 65% of bruits are associated with stenotic lesions
- The reliability of auscultation is in question as stenotic lesions may go undetected



Bruits

- It should be remembered that:
 - The presence of cervical bruits is normal in children under the age of 5
 - Cervical bruits in patients younger than 4 rarely originate from arterial disease
 - A false-positive bruit may be the result of compression of a normal artery by the stethoscope bell

Functional Vascular Tests

- There are many variations of the vertebral artery (VA) patency tests
 1. Maigne's Test or Smith and Estridge's Maneuver (maintain pre-SMT position)
 2. DeKleyn's Test (max. ext. and rotation)
 3. Reclination Test (seated, max. ext. & rot.)
 4. Hautant's Test (seated, arms up)
 5. George's Test (MC, ext., rotate, count)

Positive test signs

- When performing any of the functional vascular tests, it is important to look for positive signs and ask for reports of symptoms
- Positive symptoms include:
 - Dizziness
 - Vertigo
 - Nystagmus (sign)

The 5 Ds and 3 Ns of a VBI

- Dizziness/vertigo/giddiness/light headedness
- Drop attacks/loss of consciousness (LOC)
- Diplopia (or other visual problems/amaurosis fugax)
- Dysarthria (speech difficulties)
- Dysphagia
- Ataxia of gait/incoordination of extremities
- Nausea (with possible vomiting)
- Numbness on one side of the face or body
- Nystagmus

The problems with functional tests

- 1. False-negative test results
- 2. False-positive test results
- 3. The performance of the test could lead to an actual VBI incident

Risk factors during treatment

- 1. Rotational SMT
- 2. Continued treatment of a patient after signs of arterial damage are evident