

Blood Pressure

- o **Systolic Blood pressure**- Max pressure upon arteries/ measured on the onset of sound.
- o **Diastolic Blood pressure**- Minimum pressure on arteries/ measured at complete disappearance of sound. Indicates relaxation of the heart.

- o **BP measured at great artery- brachial artery.**
 - o Palpate brachial artery if necessary
 - Brachial artery located in the medial inside of the elbow in upright position.
 - o Try hyper extending elbow to bring artery closer to the skin if artery cannot be found.
 - BP can also be taken at the ankle or inner thigh.
 - o Pump cuff enough to reduce blood flow, once you let go you will be able to hear the sounds.

- o **Measurement-**
 - o Taken against skin. Under armor and other tight shirts may be acceptable, but the best reading is done against the skin.
 - o When exercising, mark where the artery is, so that it is easy to locate where the stethoscope will be places.
 - o Remember*
 - Always place the stethoscope at artery and NOT under the cuff. This may caused pain and pressure for the person.
 - Earpiece of the stethoscope will always point towards the nose.
 - Round to the nearest 2, even.
 - Position monometer at eye level.

- o **Procedures**
 - o Person should be allowed to rest and sit 5-10 prior to taking BP. Factors such as cold weather and rushing in may cause a higher BP reading.
 - o Make sure person has their legs **UNCROSSED** and that they are sitting in an upright position with support for both their back and arms.
 - o Wrap cuff at upper arm
 - (upper arm in order to leave space for the stethoscope and artery)
 - o Align the cuff with brachial artery.
 - o Cuff should circle at least 2/3 of the persons arm (there are different sizes)
 - If a cuff is too tight, higher readings may be a result.
 - o Place stethoscope on artery, NOT under cuff.
 - o Inflate cuff to about 20 mmHg above what it thought to be the systolic BP, if you still hear a beat, keep pumping
 - In a young, healthy individual you shouldn't have to surpass about 160
 - o Release cuff at a rate of 2-5mmHg
 - o Listen for first Korotkoff Sound

- There are a total of 5, but only the first (systolic) and last (diastolic) are the most important.
- o **Variables**
 - o Systolic BP
 - o Diastolic BP
 - o Heart rate
 - Mean arterial pressure (MAP)
 - Pulse pressure (mmHg)
 - Rate Pressure Product
- o **Heart Rate**
 - o When measuring heart rate, place pointer and middle finger on the inner groove at the base of the thumb.
 - DO NOT use your own thumb to measure heart rate; our thumbs have a pulse of their own.
 - Heart rate can also be taken at the carotid artery or the brachial, but easiest is at the radial artery.
 - o If the person is at rest, count beats starting at ZERO (0) for 30 sec or a minute.
 - If only counting for 30 seconds, multiply your answer by 4.
 - o If the person is exercising, count beats starting at ZERO (0) for 15 sec or 30 sec
 - Multiply by 4 if counting for 15 sec.
- o **Equations**
 - o **Pulse Pressure**
 - $= (SBP-DBP)$
 - o **Direct Measure of MAP**
 - $=CO \cdot TPR$
 - CO- Cardiac output which is also (HEART RATE * STROKE VOLUME)
 - TPR- Total Peripheral Resistance
 - o **Indirect measurement of MAP**
 - **When heart rate is below 100**
 - $= (1/3(SBP-DBP)) + DBP$
 - **When heart rate is above or equal to 100**
 - $= (1/2(SBP-DBP)) + DBP$
 - Why add DBP at the end?
 - When our heart is constricting and full circulation of the blood occurs, diastolic takes much longer than systolic. Meaning, it takes longer for blood to exit the heart than it does to enter. Because of this, diastolic has a greater contribution to the measurement and is added.
 - o **Rate Pressure Product**

- $(HR * SBP) / 100$
 - SBP will increase with exercise and diastolic will either remain the same or decrease after a long period of time after exercise.
 - **Cardiac Output**
 - $HR * SV$
 - Heart rate * Stroke Volume.
 - **Fick Equation**
 - $CO * avO_2$ difference
- **Changes in cardiac output with body positions**
 - Blood pressure should remain about the same as you change body positions.
 - Standing up too quickly may result in feeling dizzy or faint; this is usually an indication that your BP has dropped.
 - Heart rate is lowest in the morning while laying down (unless you get scared by the alarm clock)
 - Some fit people may have a heart rate as low as in the 40's or 50's- this could be because of some aerobic training.
 - Stroke volume is lowest while standing because of gravity
 - Simply put, blood will rush to the lower extremities when standing.
 - This is why it is suggested to military and others that stand for a while, to move their toes around so as to cause circulation.
 - When someone is feeling faint, the best solution is to lay them down and put their legs over their heads so that blood can reach the heart and circulate once more.

Pathophysiology- Cardiovascular Disease

- **Sources of injury**
 - Dyslipidemia- abnormal cholesterol
 - Hypertension- High BP
 - Immune responses- some conditions where body may begin to attack itself
 - Smoking- could cause stroke
 - Vasoconstriction substances- air we breath/ inhale. Could cause smooth muscle to constrict around the arteries
 - Viral or bacterial infection
 - Homocysteine- byproducts of eating red meats
 - High levels of glucose- diabetes
 - Loss of estrogen- risks get closer to that of men for women.
- **All sources will cause a dysfunction in epithelial cells and its lining.**
 - Artery may become smaller because of contraction of smooth muscle.
 - Blood cell adhesion, starts to stick to cells.