



DETERMINATION OF BLOOD PRESSURE

BY: DR. FARHAN ULLAH AFRIDI

DEMONSTRATOR, KGMC

- It is the pressure of the **flowing blood** on the wall of blood vessels per unit area.
- Closely related to the force and rate of the heartbeat and the diameter and elasticity of the arterial walls.
- Physiologically,

BP = Cardiac Output x Total peripheral Resistance

Cardiac output: Heart rate x Stroke volume

Principal

- **Involves balancing of air pressure (applied via a cuff) against the pressure of blood in Brachial artery, the air pressure being estimated by a Mercury or Air (aneroid) manometer.**

Blood Pressure Determinations

Systolic pressure is the maximum pressure in the arteries during systole.

It indicates:

- a. The extent of work done by the heart
- b. The force with which the heart is working
- c. The degree of pressure which the arterial walls have to withstand.

Diastolic pressure is the minimum pressure at the end of ventricular diastole. It is the measure of constant stretch to which walls of the arteries are subjected. It is more important than systolic pressure because:

- a. It is less fluctuating
- b. It is the constant load against which the heart has to work
- c. It is the pressure of peripheral resistance and depends mainly on the tone of the arteries.

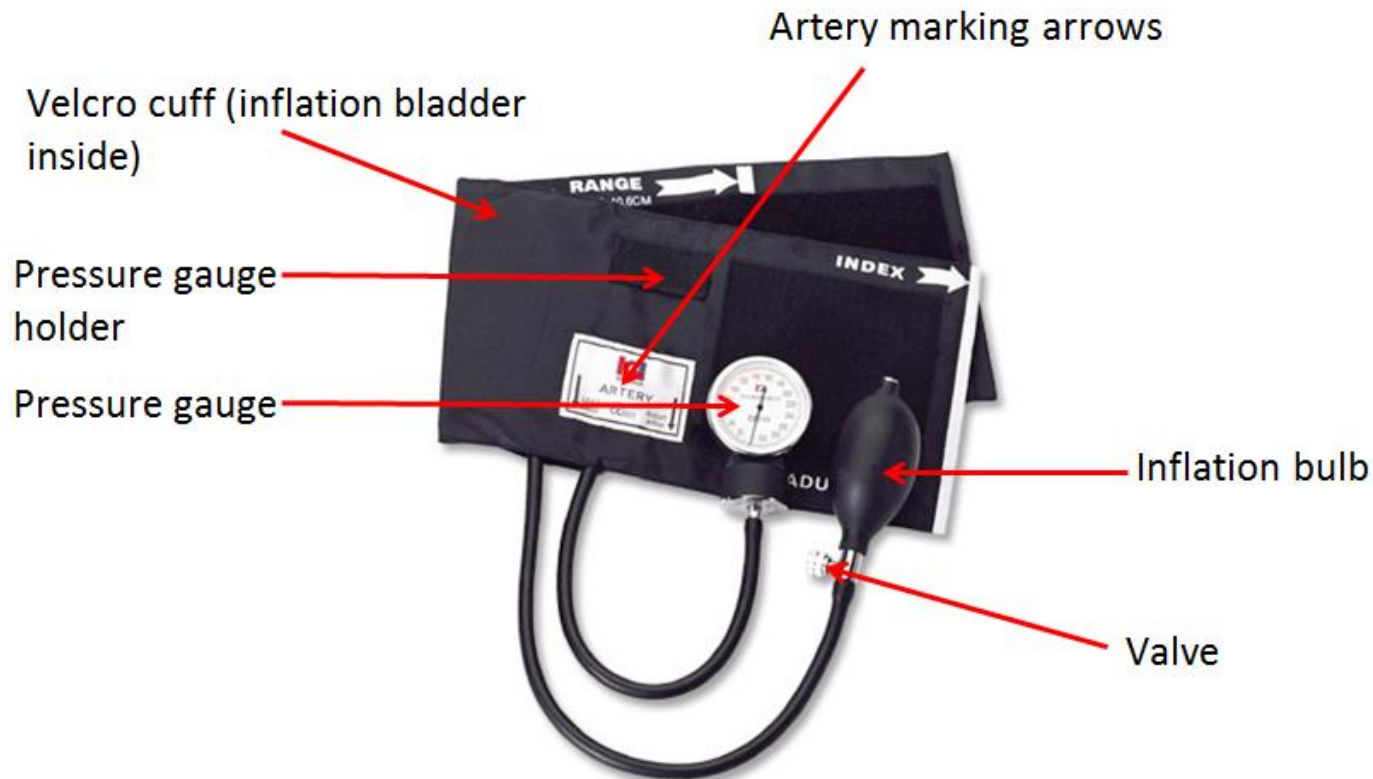
Pulse pressure is the difference between the systolic and diastolic pressures. It is the rise in pressure caused by the ejection of blood into the aorta by ventricular contraction. It is a measure of stroke volume and compliance of arteries.

Mean arterial pressure is the average pressure present throughout the cardiac cycle. It is responsible for pushing the blood through the systemic circulatory system. It is equal to diastolic pressure + $\frac{1}{3}$ pulse pressure

APPARATUS

- SPHYGMOMANOMETER, STETHOSCOPE, CHAIR OR COUCH
- ANEROID SPHYGMOMANOMETER:

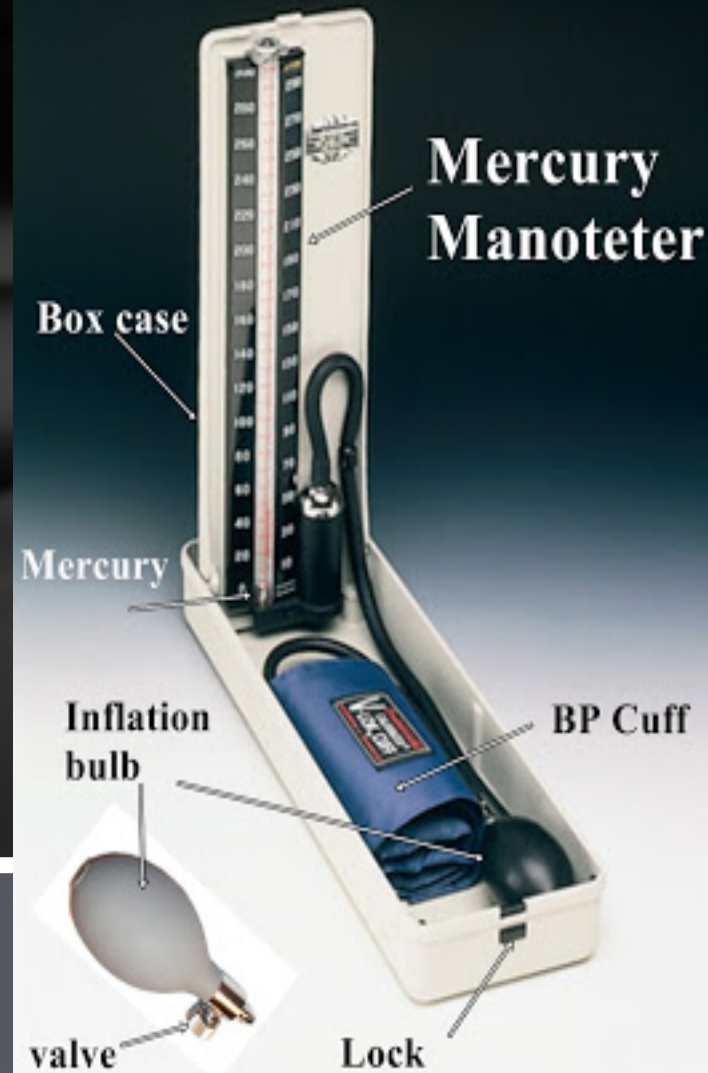
Sphygmomanometer (blood pressure cuff)



MERCURY SPHYGMOMANOMETER

- Manometer is U-shaped tube.
- Broader limb is reservoir for Mercury
- Narrow limb is graduated from 0-300 mm

nursing-skills-guide



PROCEDURE

- TWO METHODS ARE USED:

1. Direct Method (Invasive):

Used in experimental animals (unsafe).

Artery is cannulated and other end of cannula is connected to a mercury manometer.

2. Indirect Method:

Used routinely. Brachial artery is used to record BP.

Same level as heart, pressure is almost equal to pressure in Aorta.

Includes: Palpatory method, Auscultatory Method

General Rules: Primum Non Nocere

- Introduction, Consent, and Right side approach
- Explain the procedure to the subject
- Positioning of the subject (sit in a chair or lie down supine on a couch with arm at the level of heart)
- Proper exposure of upper arm and application of cuff to the area (midpoint of cuff overlies the Brachial Artery and lower edge of cuff is 1 inch (2.54 cm) above the cubital fossa)
- Conventionally, BP is first recorded by Palpatory method followed by Auscultatory method.

Procedure:

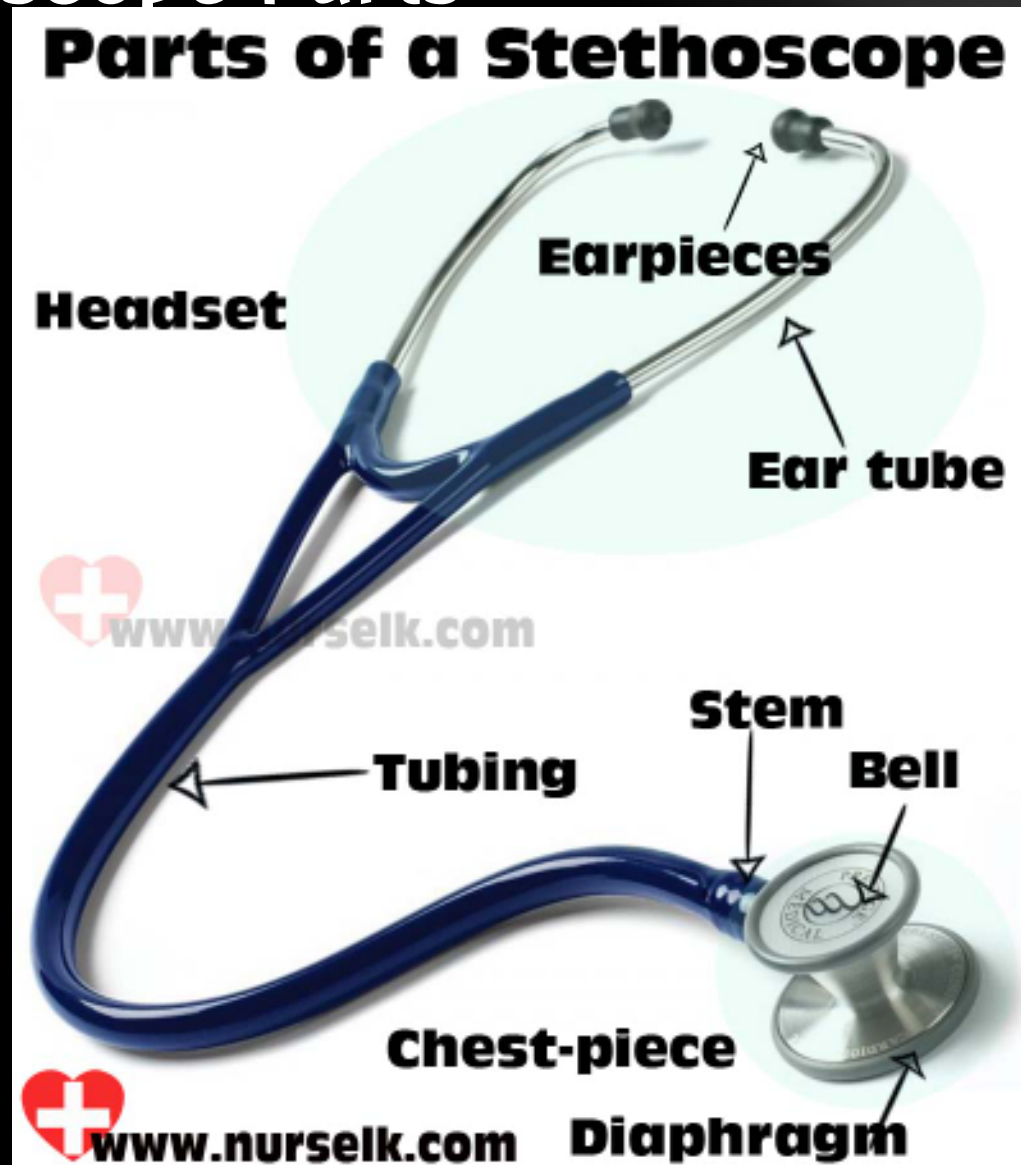
- 1. Palpatory method:** The subject is asked to sit on a stool. The cuff is tied around the upper arm with the lower border of the cuff not less than 2.5 cm above the cubital fossa. The outlet valve of the bulb is closed. The radial pulse is palpated while the cuff is being inflated to a pressure slightly above the level at which the radial pulsation is no longer felt. The pressure at which the pulsation was obliterated is read in the mercury manometer. The outlet valve is opened. The manometric reading is noted at the point where the pulsation reappears. The average of the two readings gives the systolic pressure. The diastolic pressure cannot be determined by this method.



Disadvantages

1. Pressure recorded is 6-10 mm Hg less than that recorded by Auscultatory method
2. Only SBP can be measured.

Stethoscope Parts



Asculatatory method

- Place the chest piece of stethoscope over the arm medial to biceps tendon (Brachial artery pulsation can be felt here)
- Inflate the cuff 30-40mm Hg above the pressure obtained by palpatory method.
- Gradually lower the pressure till a sharp light tapping sound is heard.
- When the pressure is further lowered, sound changes in quality and intensity (Korotokoff sounds)

Divided into 5 phases:

1. Sudden appearance of a clear but faint **tapping sound** growing louder during the succeeding 10mm Hg fall in pressure

2. Sound takes **murmur like quality** during next 15mm Hg fall in pressure

3. Sound changes little in quality but becomes **clearer and louder** during next 15mm Hg fall in pressure

4. **Muffled quality** lasting throughout the next 5-6 mm Hg fall in pressure

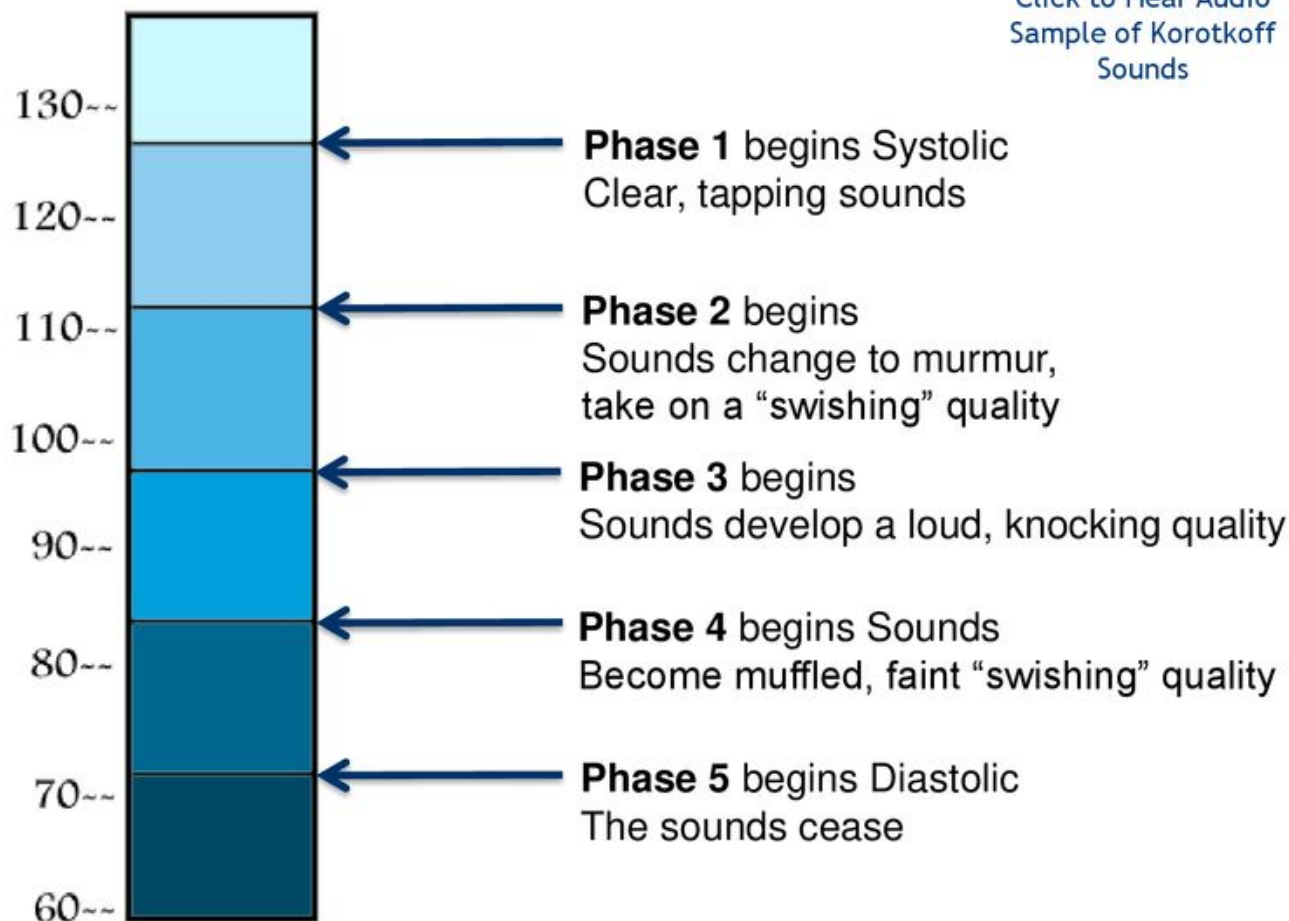
5. **Complete disappearance of sound**

- The appearance of sound = SBP; Disappearance of sound (Phase 5) = DBP
- If sound doesn't disappear, muffling of the sound (phase 4) is taken as DBP. Happens in hyperdynamic circulation.
- Deflate the cuff completely and allow the subject to rest and then take two more readings.
- Calculate MAP and PP from reading of BP.

Korotkoff Sounds



Click to Hear Audio
Sample of Korotkoff
Sounds



PRECAUTIONS

- Every step to measure BP is discussed with subject prior to procedure
- Subject should be quiet and comfortable for 5-10 minutes before measurement of BP.
- Zero error of sphygmomanometer should be corrected
- Arm , with the cuff wrapped around it should be at the level of heart.
- Inflator rubber bag along with its tubing should be placed over the inner side of arm.
- Cuff should not be too tight or too loose.
- cuff should not be left inflated for long periods (more than 2 cm), specially in person suffering from purpura or tetany
- In susceptible hypertensive individuals, cuff pressure should be well above 200mm Hg (or above estimated BP by palpatory method) to avoid auscultatory gap.
- Muscles of arm should not be in a state of contraction during determination of BP.

Factor affecting BP in Normal Subjects

- **Age:** both SBP and DBP increase with age. SBP increases more than DBP. Due to loss of elasticity of blood vessels (arteriosclerosis) with age.
- **Sex:** in female before menopause BP is lower than male.
- **Body built:** overweight individuals have higher values.
- **Sleep:** Fall during sleep due to relaxation of blood vessels.
- **Gravity:** BP increases in arteries below heart and decreases in arteries above heart.
- **Exercise:** increase SBP and decrease DBP.
- **Posture:** has effects on BP.

Normal Values

- Average value in adult: 120/80 mmHg
- SBP range: 100 – 140 mmHg
- DBP range: 60 – 90 mmHg

Blood Pressure Categories



BLOOD PRESSURE CATEGORY	SYSTOLIC mm Hg (upper number)		DIASTOLIC mm Hg (lower number)
NORMAL	LESS THAN 120	and	LESS THAN 80
ELEVATED	120 – 129	and	LESS THAN 80
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 1	130 – 139	or	80 – 89
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 2	140 OR HIGHER	or	90 OR HIGHER
HYPERTENSIVE CRISIS (consult your doctor immediately)	HIGHER THAN 180	and/or	HIGHER THAN 120

White Coat Hypertension

WHITE COAT HYPERTENSION

- a syndrome whereby a patient's feeling of anxiety in a medical environment results in an abnormally high reading when their blood pressure is measured.
- 20% of mild hypertensive individual may present with whitecoat hypertension



CURE FOR
WHITE COAT HYPERTENSION

Palpatory Method:

<https://www.youtube.com/watch?v=pmD0UbEaqtA>

Ascultatory Method:

<https://www.youtube.com/watch?v=pmD0UbEaqtA>

THANK YOU