Blood Pressure

By

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Objectives

- Define sphygmomanometer and identify its parts.
- Describe the palpatory and auscultatory methods for ABP measurement.
- Differentiate between the palpatory and auscultatory methods in measuring ABP.
- Perform ABP measurement for a fellow student using the sphygmomanometer.
- Identify Korotkov sounds and describe their use ABP determination.
- Enumerate the precautions considered before and during ABP measurement.
- Recognize the effect of exercise on the ABP.

Blood pressure

The force exerted by the blood against any unit area of the vessel wall

Bl. Pressure 50mmHg:

Means that the force exerted is sufficient to push a column of mercury against gravity up to a level of

50 mmHg high.

Equipment

1. A stethoscope
2. A sphygmomanometer
3. A bicycle and/or a treadmill

Measurement of arterial blood pressure

Precautions for measuring arterial blood pressure

- The cuff size should be appropriate for the age and built of the subject.
- The cuff must be applied snuggly (not too tight and not too loose) about 2.5 cm above the cubital fossa.
- The free margin of the cuff should not be on the course of brachial artery

- The manometer should be at the same level as the heart to exclude the effect of gravity while measuring the blood pressure.
- The mercury manometer should be in the vertical position.
- Adequate amount of mercury in the bulb of the instrument.
- The subject must be physically and mentally relaxed and in a comfortable environment.

PALPATORY METHOD

(This method only gives an estimate of the **systolic** blood pressure)

1. Ask the subject to sit comfortably on a chair with their arm resting on the bench.
2. Apply the cuff around the arm and over the brachial artery about 2.5cm above the antecubital crease. Make sure the arm is at heart level.
3. Inflate the cuff until the radial pulse disappears. By compressing the brachial artery, the pulse or pressure wave is prevented from being transmitted to the radial artery.
4. Deflate the cuff slowly (3-4 mmHg/second) and note the pressure at which the radial pulse returns. This will be the systolic blood pressure.

AUSCULTATORY METHOD

(This method measures both **systolic** and **diastolic** blood pressures)

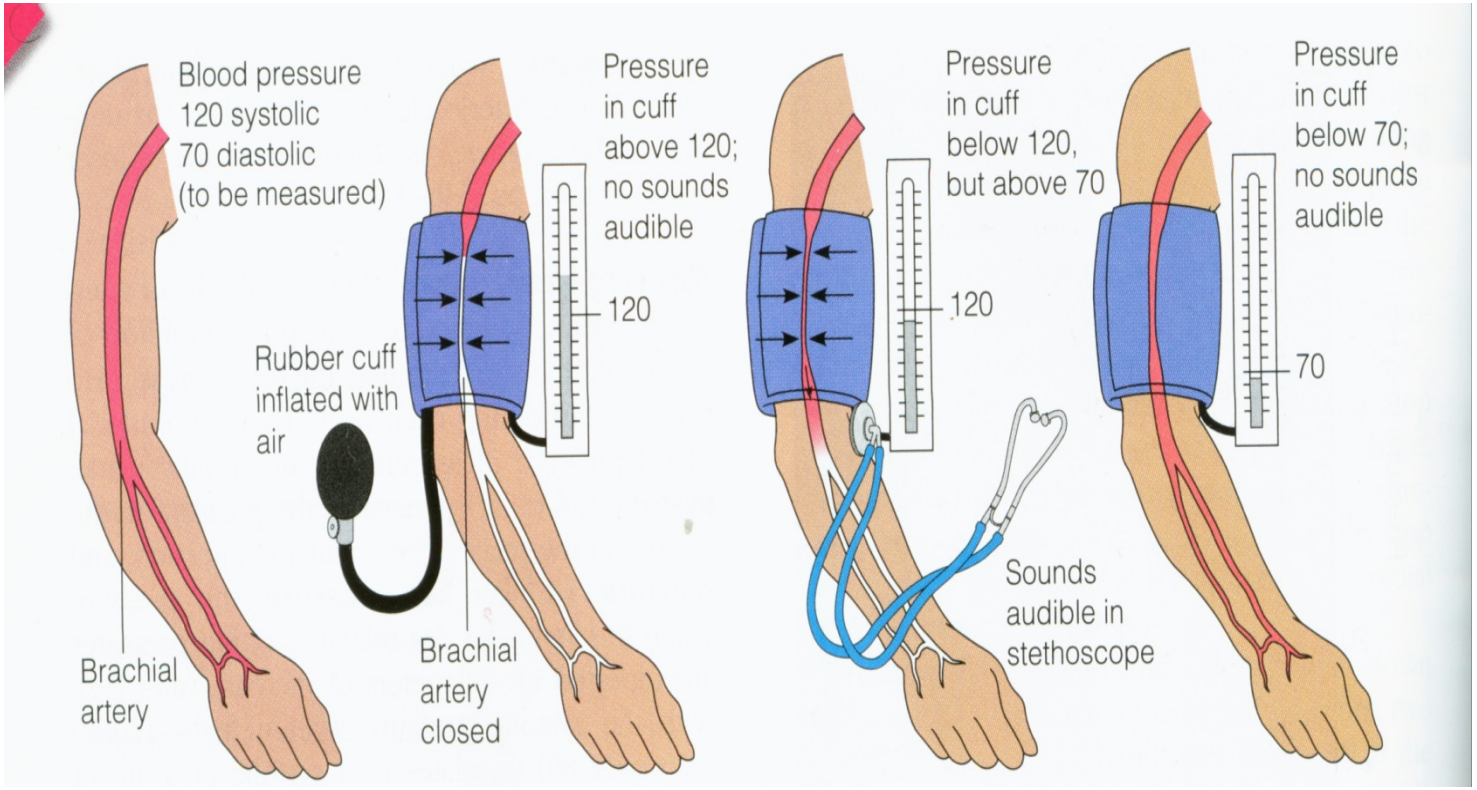
- Inflate the sphygmomanometer cuff until there is no radial pulsation.
- Place the diaphragm of the stethoscope over the brachial artery just above and on the medial side of the elbow joint.
- Deflate the cuff slowly. A series of sounds are usually heard

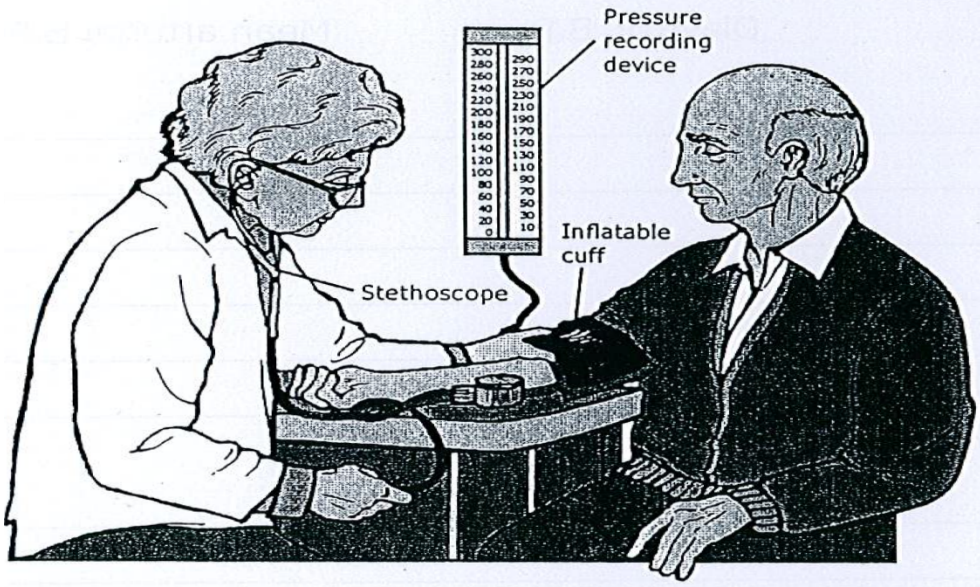
AHA guidelines for hypertension

BP category	Systolic BP		Diastolic BP
Normal	<120mmHg	and	<80mmHg
Elevated	120-129mmHg	and	<80mmHg
Hypertension stage 1	130-139mmHg	or	80-89mmHg
Hypertension stage 2	≥ 140mmHg	or	≥ 90mmHg
Hypertensive urgency	> 180mmHg	and/or	> 120mmHg
Hypertensive emergency	> 180mmHg + target organ damage	and/or	> 120mmHg + target organ damage

The korotkov sounds

- These sounds are produced by turbulent flow in the constricted brachial artery.
- **Phase 1:** The appearance of a clear tapping sound. This is the first sound that is heard and it represents the **Systolic** Pressure.
- **Phase 2:** Blowing or swishing sounds.
- **Phase 3:** The sounds become sharper and crisper.
- **Phase 4:** An abrupt muffling of sounds.
- **Phase 5:** All sounds disappear. The point where the sound disappears is the **diastolic** blood pressure.


Blood pressure
120 systolic
70 diastolic
(to be measured)
Brachial artery
Rubber cuff inflated with air
Pressure in cuff above 120; no sounds audible
120
Brachial artery closed
Pressure in cuff below 120, but above 70
120
Sounds audible in stethoscope
Pressure in cuff below 70; no sounds audible
70



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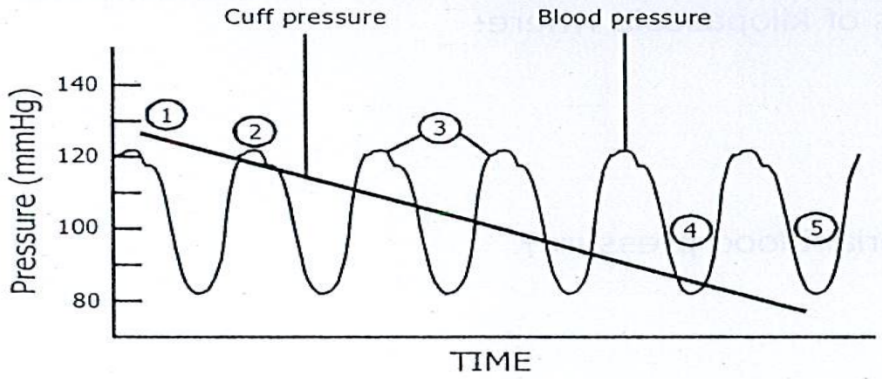
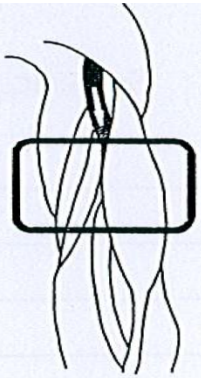
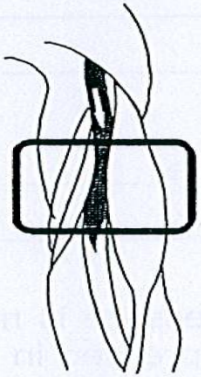




Cuff pressure is greater than 120mmHg.

No blood flows through vessel.

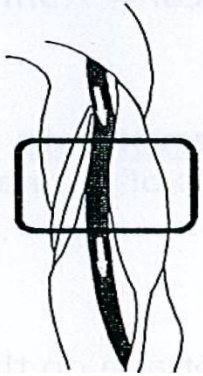
No sound is heard.



Cuff pressure is between 120 and 80mmHg.

Blood flows through vessel is turbulent whenever blood pressure exceeds cuff pressure.

Intermittent sounds are heard as blood pressure fluctuates throughout cardiac cycle.



Cuff pressure is less than 80mmHg.

Blood flows through vessel in smooth, laminar fashion.

No sound is heard.

The pulse pressure

It is the difference between systolic and diastolic blood pressures.

- Systolic pressure = 120 mmHg and Diastolic pressure = 80 mmHg; then
- Pulse Pressure = Systolic – Diastolic pressure i.e. 120 – 80 = 40 mmHg.

The mean arterial blood pressure

- It is the average blood pressure within the arteries during a whole cardiac cycle

- The force responsible for maintaining a continuous forward flow of the blood in the circulation during the whole cardiac cycle.

M.A.B.P.= diastolic blood pressure + 1/3 pulse pressure

The effects of exercise on the systolic & diastolic blood pressures

MILD TO MODERATE EXERCISE

- Systolic BP increases, while Diastolic BP remains the same.
- Because of sympathetic stimulation, the cardiac output increases, which in turn increases the systolic BP, but no effect on diastolic BP.

SEVERE OR HEAVY EXERCISE

- Systolic BP increases further and Diastolic BP decreases
- More sympathetic stimulation will increase the Systolic BP further and the Diastolic BP drops because of a net decrease in the total peripheral resistance due to the more vasodilatation effect on the arterioles supplying the exercising skeletal muscles than the vasoconstriction effect on the arterioles supplying the other tissues.

BP changes with exercise

Conditions	Blood pressure
Before exercise	120/80 mmHg
After mild exercise	140/80 mmHg
After heavy exercise	160/60 mmHg

Factors affecting blood pressure

- **Posture:**

In erect posture: the systolic falls a little but soon returns to normal by the compensatory mechanisms.

- **Age:** blood pressure increase with age.

- At birth: 50/30 mm Hg
- Adult:120/80 mm Hg
- Old age:170/90 mm Hg

- **Sex:**

Blood pressure is lower in females until menopause.

- **Body build:**

Obesity increase blood pressure.

- **Diurnal variation:**

Blood pressure is lower in the morning.

- **Digestion:**

Systolic blood pressure rises by 6-8 mmHg after meals (1 hour).

- **Exercise:**

Systolic blood pressure increase while diastolic blood pressure remains unchanged

- **Temperature:**

Cold causes vasoconstriction so increase blood pressure due to increase peripheral resistance

- **Emotions:**

Increase blood pressure

It drops during sleep and excessive hemorrhage.

THANK YOU