

Tishik International University

Nursing Department

Fundamental of Nursing

Blood pressure

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- Arterial blood pressure is a measure of the pressure exerted by the blood as it flows through the arteries.
- Blood pressure is taken using two measurements: systolic (measured when blood pressure is at its highest) and diastolic (when blood pressure is at its lowest).

- The difference between the diastolic and the systolic pressures is called the **pulse pressure** .
- A normal pulse pressure is about 40 mmHg but can be as high as 100 mmHg during exercise.

- Blood pressure is measured in millimeters of mercury (mmHg) and recorded as a fraction: systolic pressure over the diastolic pressure.
- A typical blood pressure for a healthy adult is 120/80 mmHg (pulse pressure of 40).

Determinants of Blood Pressure

- Arterial blood pressure is the result of several factors:
the pumping action of the heart.
- the peripheral vascular resistance (the resistance supplied by the blood vessels through which the blood flows),
- And the blood volume and viscosity

PUMPING ACTION OF THE HEART

- When the pumping action of the heart is weak, less blood is pumped into arteries (lower cardiac output), and the blood pressure decreases.
- When the heart's pumping action is strong and the volume of blood
- pumped into the circulation increases (higher cardiac output), the blood pressure increases.

PERIPHERAL VASCULAR RESISTANCE

- Peripheral resistance can increase blood pressure.
- Some factors that create resistance in the arterial system are the capacity of the arterioles and capillaries, the compliance of the arteries, and the viscosity of the blood.

BLOOD VOLUME

- When the blood volume decreases (for example, as a result of a hemorrhage or dehydration), the blood pressure decreases because of decreased fluid in the arteries.
- Conversely, when the volume increases (for example, as a result of a rapid intravenous infusion), the blood pressure increases because of the greater fluid volume within the circulatory system.

BLOOD VISCOSITY

- Blood pressure is higher when the blood is highly viscous (thick), that is, when the proportion of red blood cells to the blood plasma is high.
- This proportion is referred to as the hematocrit . The viscosity increases markedly when the hematocrit is more than 60% to 65%.

Factors Affecting Blood Pressure

- Factors influencing blood pressure are age, exercise, stress, race, gender, medications, obesity, diurnal variations, medical conditions, and temperature.

Age.

- Newborns have a systolic pressure of about 75 mmHg.
- The pressure rises with age, reaching a peak at the onset of puberty, and then tends to decline somewhat.
- In older adults, elasticity of the arteries is decreased, the arteries are more rigid and less yielding to the pressure of the blood

- This produces an elevated systolic pressure. Because the walls no longer retract as flexibly with decreased pressure, the diastolic pressure may also be high

Exercise.

- Physical activity increases the cardiac output and hence the blood pressure.
- For reliable assessment of resting blood pressure, wait 20 to 30 minutes following exercise.

Stress.

- Stimulation of the **sympathetic nervous system** increases cardiac output and vasoconstriction of the arterioles, thus increasing the blood pressure reading

Race.

- African Americans older than 35 years tend to have higher blood pressures than European Americans of the same age although the exact reasons for these differences are unclear.

Sex.

- After puberty, females usually have lower blood pressures than males of the same age;
- this difference is thought to be due to hormonal variations.
- After menopause, women generally have higher blood pressures than before.

- **Obesity.** Both childhood and adult obesity predispose to hypertension.
- **Diurnal variations.** Pressure is usually lowest early in the morning, when the metabolic rate is lowest, then rises throughout the day and peaks in the late afternoon or early evening.

Medical conditions

- Any condition affecting the cardiac output, blood volume, blood viscosity, and/or compliance of the arteries has a direct effect on the blood pressure such as **kidney disease** , **thyroid dysfunction** and others
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Temperature.

- Because of increased metabolic rate, fever can increase blood pressure. However, external heat causes vasodilation and decreased blood pressure.
- Cold causes vasoconstriction and elevates blood pressure.

Hypertension

- A blood pressure that is persistently above normal is called hypertension .
- A single elevated blood pressure reading indicates the need for reassessment.
- Hypertension cannot be diagnosed unless an elevated blood pressure is found when measured twice at different times.

- An elevated blood pressure of unknown cause is called **primary hypertension** .
- An elevated blood pressure of known cause is called **secondary hypertension** .
- Individuals with diastolic blood pressures of **80 to 89 mmHg** or systolic blood pressures of **120 to 139 mmHg** should be considered **pre-hypertensive** and, without intervention, may develop cardiac disease

- Hypertension is when either the systolic BP is higher than 140 mmHg or when the diastolic blood pressure (BP) is 90 mmHg or higher

TABLE 29-4 Classification of Blood Pressure

Category	Systolic BP (mmHg)		Diastolic BP (mmHg)
Normal	<120	and	<80
Prehypertension	120–139	or	80–89
Hypertension, stage 1	140–159	or	90–99
Hypertension, stage 2	>160	or	>100

From the "The Seventh Report of the Joint National Committee for the Detection, Evaluation, and Treatment of High Blood Pressure—Completed Report," by National Institutes of Health, National Heart, Lung, and Blood Institute, 2004. Retrieved from <http://www.nhlbi.nih.gov/guidelines/hypertension/jnc7full.htm>.

- **Factors associated with hypertension** include thickening of the arterial walls, and inelasticity of the arteries
- as well as such lifestyle factors as cigarette smoking, obesity, heavy alcohol consumption, lack of physical exercise, high blood cholesterol levels, and continued exposure to stress.

Hypotension

- Hypotension is a blood pressure that is below normal, that is, a systolic reading consistently between 85 and 110 mmHg in an adult whose normal pressure is higher than this.

Orthostatic hypotension

- Is a blood pressure that decreases when the client sits or stands.
- It is usually the result of peripheral vasodilation in which blood leaves the central body organs, especially the brain, and moves to the periphery, often causing the person to feel faint.

- Hypotension can also be caused by analgesics such as **meperidine hydrochloride**, bleeding, severe burns, and dehydration.
- It is important to monitor hypotensive clients carefully to prevent falls.

When assessing for orthostatic hypotension:

- Place the client in a supine position for 10 minutes.
- Record the client's blood pressure.
- Assist the client to slowly sit or stand. Support the client in case of faintness.
- Immediately recheck the blood pressure in the same sites as previously.

- Repeat the pulse and blood pressure after 3 minutes.
- Record the results. A drop in blood pressure of 20 mmHg systolic or 10 mmHg diastolic indicates orthostatic hypotension
- (Mager, 2012).

Assessing Blood Pressure

- Blood pressure is measured with a blood pressure cuff, a sphygmomanometer, and a stethoscope. The blood pressure cuff consists of a bag, called a bladder, that can be inflated with air

- There are two types of sphygmomanometers: aneroid and digital.
- The aneroid sphygmomanometer has a calibrated dial with a needle that points to the calibrations

Aneroid and mercury sphygmomanometer



A manual sphygmomanometer is shown against a white background. It consists of a black fabric cuff with a white label that reads "INDEX" with an arrow pointing to the right and "ADULT SIZE". The cuff is connected to a black rubber bulb and a black tube. The tube leads to a silver-colored gauge with a white face and black markings. The gauge has a needle pointing to the 120 mark. The gauge also has a small "CE" mark. The entire device is used for measuring blood pressure.



METHODS

- Blood pressure can be assessed directly or indirectly. Direct (invasive monitoring) measurement involves the insertion of a catheter into the brachial, radial, or femoral artery.
- Arterial pressure is represented as wavelike forms displayed on a monitor. With correct placement, this pressure reading is highly accurate.

- noninvasive indirect method of measuring blood pressure is **auscultatory method**.
- The auscultatory method is most commonly used in hospitals, clinics, and homes.

- External pressure is applied to a superficial artery and the nurse reads the pressure from the sphygmomanometer while listening with a stethoscope
- When carried out correctly, the auscultatory method is relatively accurate

OXYGEN SATURATION

- A pulse oximeter is a noninvasive device that estimates a client's arterial blood oxygen saturation (SaO₂) by means of a sensor attached to the client's finger.

- The pulse oximeter can detect hypoxemia (low oxygen saturation) before clinical signs and symptoms, such as a dusky color to skin and nail beds, develop.
- The high and low SpO₂ levels are generally preset at 100% and 85%, respectively,



Factors Affecting Oxygen Saturation Readings

- Hemoglobin
- Circulation. The oximeter will not return an accurate reading if the area under the sensor has impaired circulation.
- Activity. Shivering or excessive movement of the sensor site may interfere with accurate readings