CHAPTER

1

Monitoring Vital Signs

DEFINITION

Taking vital signs are defined as the procedure that takes the sign of basic physiology that includes temperature, pulse, respiration and blood pressure. If any abnormality occurs in the body, vital signs change immediately.

PURPOSES

- To assess the patient's condition.
- To determine the baseline values for future comparisons.
- To detect changes and abnormalities in the condition of the patient.

TYPES OF THERMOMETER

- Clinical thermometer
- Digital temple thermometer
- Digital ear thermometer
- Digital oral thermometer
- Wearable thermometer
- Forehead thermometer strips
- Pacifier thermometer, etc.

PREPARATION OF THE PATIENT

- Provide a comfortable position according to the site selected.
- Explain the procedure to the patient.
- Check the ability of the patient to follow instructions.
- Check for the contraindication of taking temperature by specified route.

PREPARATION OF ARTICLES AND THEIR PURPOSES

Articles	Purposes
Oral temperature	
• Clinical thermometer in types of thermometer in a glass bottle	• To take temperature
• Dry cotton swabs	• To clean the thermometer
• Paper bag	• To put the dry waste
• Blue and red pens	• For documentation
• Spirit	• To disinfect the thermometer
Axillary temperature	
• Small towel	• To wipe the axilla
• Clinical thermometer in a glass bottle	• To take temperature
• Dry cotton swabs	• To clean the thermometer
• Paper bag	• To put the dry waste
• TPR sheets, blue and red pens	• For documentation
• Spirit	• To disinfect the thermometer
Rectal temperature	
• Clinical thermometer (rectal) in a glass bottle	• To take temperature
• Dry cotton swabs	• To clean the thermometer
• Paper bag	• To put the dry waste
• TPR sheets, blue and red pens	• For documentation
• Spirit	• To disinfect the thermometer
• Gloves	• To prevent contamination of hands
• Gauze pieces	• To separate the buttocks
• Vaseline	• To lubricate the thermometer
• Screen	• To provide privacy
• A mackintosh with paper line (if required)	• To protect bed covering in a pediatric patient

COMMON SITES FOR CHECKING PULSE (FIGS 1 TO 5)

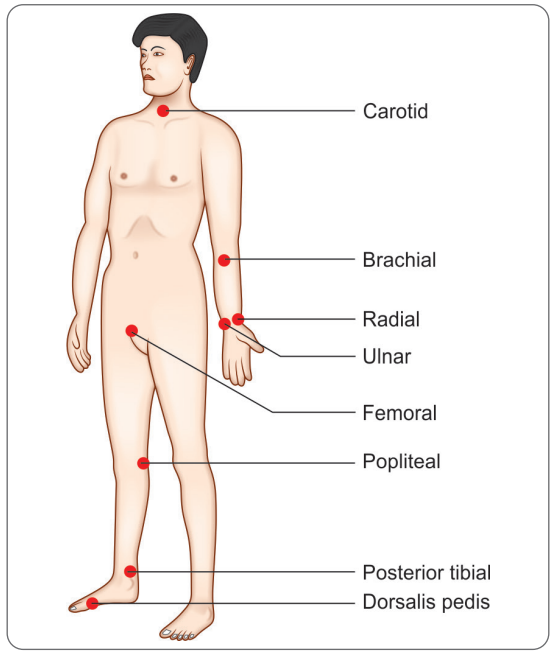

Fig. 1: Common sites for checking pulse

Fig. 2: Checking radial pulse

Fig. 3: Checking temporal pulse

Fig. 4: Checking carotid pulse

Fig. 5: Checking apical pulse

STEPS OF TAKING PULSE AND CHECKING RESPIRATION

Steps	Rationale
Checking pulse: Select the appropriate pulse site. Place tips of three fingers other than thumb over pulse site	Thumb is not used for assessing pulse as it has its own pulse which can be mistaken for patient's pulse
After getting the pulse regularly, count the pulse for 1 minute. Assess for rate, rhythm and volume of pulse	Irregularities can be noticed only if pulse is counted for 1 minute
Checking respiration: Position patients hand over his lower chest and keep your fingers over the wrist of patient as if checking pulse. Observe one complete respiratory cycle that is inspiration and expiration	Keeping hand over lower chest makes the movement of chest more visible and fingers are kept over wrist to make patient less aware of his/her respiration
Count the respiration for one minute. Assess for rate, rhythm and depth of respiration	Irregularities can be noticed only if respiration is counted for 1 minute

STEPS OF TAKING TPR AND RATIONALE

Steps	Rationale
• Wash hands for taking temperature, take the articles to the patient's bedside and wear gloves in case of rectal temperature	• Reduces transmission of microorganism and prevent cross contamination
• Explain the procedure to the patient and assess his condition, site for taking temperature	• Promotes cooperation and reduces anxiety
• Remove the thermometer from glass bottle. Wipe from bulb to stem in rotatory movement using a spirit swab	• To remove the disinfectant from the thermometer • To prevent transfer of any contamination from stem to bulb and maintain asepsis of the bulb end
• Shake down the mercury by holding the thermometer with thumb and fore finger if mercury level above 35°C or 95°F	• To record the temperature correctly the level of mercury should be well below the actual temperature of the patient
• **Oral temperature:**	
▪ Place the thermometer at the base of the tongue the right or left of the posterior sublingual pocket (big). Ask the patient to hold the thermometer in place by closing the lips for two minutes	• Heat from superficial blood vessels in sublingual pocket produces temperature reading • To prevent biting the thermometer • Maintain proper position during recording
• **For axillary:** ▪ After wiping the axilla with towel, keeps the thermometer in the axilla with the stem of the thermometer facing toward chest for three minutes	• Moisture can alter the temperature • To allow Enough time to register the body temperature (Fig. 6)
• **For rectal use:** ▪ Place the patient in side lying position. Screen to provide privacy ▪ Place lubricant on cotton swab and apply about 2–5 cm from the bulb	• Promotes cooperation decreases anxiety • The lubricant facilitates easy insertion of thermometer and reduces chances of injury  **Fig. 6:** Insertion of the thermometer in rectum for checking temperature in an infant
• Take the thermometer and wipe it with dry cotton swab from stem to bulb • Check the reading by holding thermometer at eye level and clean the thermometer with spirit	• For proper visualization of reading
• Ask the client to take a deep breath and insert the thermometer by separating the buttocks with the help of a gauze piece about 1½ inches into the rectum and hold the thermometer in place for one minutes	• Taking a deep breath often relaxes the external sphincter muscles thus easing insertion

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Steps	Rationale
• Count the pulse and respiration while the thermometer is in place	• It gives continuity in checking the vital signs
• Shake thermometer	• To bring down the mercury level
• Clean the thermometer with spirit	• To prevent cross-infection

PROCEDURE OF TAKING BLOOD PRESSURE

Preparation of the Patient

- Identify the patient to select appropriate cuff size. Provide a comfortable position.
- Explain the procedure to the patient.
- Assess the arm on which blood pressure is to be taken. Do not take blood pressure on the arm which has:
  - IV infusion
  - Injury
  - Shunt or fistula for renal dialysis
  - Female patient with radical mastectomy

Preparation of Articles and their Purposes

Articles	Purposes
A tray containing:	
• Sphygmomanometer with cuff of an appropriate size	• To record blood pressure
• Stethoscope	• To record systolic and diastolic pressure
• Spirit swab in a container	• To clean ear piece and diaphragm of stethoscope to prevent transmission of infection
• A paper bag	• To discard the used spirit swab
• Nurse's record	• To record the findings at the same time

STEPS OF PROCEDURE AND RATIONALE

Steps	Rationale
• Explain the procedure to the patient	• To promote cooperation, relaxation and reduce anxiety
• Wash the hands	• To reduce transmission of microorganisms and prevent cross-contamination
• Select the arm by removing constructive clothing	• Ensure proper cuff application
• Palpate brachial artery and position cuff 2.5 cm above brachial pulsation. Mercury sphygmomanometer is used, dial should be facing upwards	• Inflating bladder directly over brachial artery ensures that proper pressure is applied

Contd...

Steps	Rationale
• Wrap cuff evenly and snugly around the upper arm (Fig. 7)  **Fig. 7:** Wrap cuff evenly and snugly for checking BP	• Loose fitting may cause false reading
• Palpate radial artery with finger tips of one hand and inflate the cuff with the other hand, 30 mm Hg above the point of pulse disappearance and close the valve (Fig. 8)	• Identifies approximate systolic pressure  **Fig. 8:** Palpate radial artery with fingertips to identify approximate systolic pressure
• Place the stethoscope ear pieces in ear and diaphragm on the brachial artery	• Proper placement of stethoscope ensures optimal sound reception and accurate reading
• Slowly release the valve and allow the mercury to fall at the rate of 2–3 mm Hg/second	• Rapid or slow decline in mercury level causes inaccurate reading
• Note the point on manometer when the first clear sound is heard and continue to deflate gradually, noting the point at which the sound disappears or changes	• The first sound indicates systolic pressure and the last point indicates diastolic pressure
• Deflate cuff rapidly and completely and remove the cuff	• Continuous cuff inflation can cause arterial occlusion, resulting in numbness of arm
• Record blood pressure in the nurse's note	• To ensure accuracy
• Inform the client blood pressure reading. It helps to reduce anxiety	• Promotes the patient's participation in care and understanding of his health status
• Make the patient comfortable and wash hands	• To prevent transmission of microorganism

SCIENTIFIC PRINCIPLES OF TEMPERATURE

Anatomy and Physiology

- The heat regulating center is hypothalamus and it is situated in the brain.
- The regulation of body temperature is maintained by two mechanisms.
  - Thermogenesis—a chemical regulation by production of heat
  - Thermolysis—a physical regulation by loss of heat.
- Heat is produced in the body by oxidation of food. 1 g CHO gives 4 calories of heat. 1 g protein gives 4 calories of heat and 1 g fat gives 9 calories of heat.
- More oxidation takes place in muscles and glands.
- Heat is also produced by specific dynamics action of food, exercise, strong motions, hormonal effect, change in the environment and atmospheric conditions.
- The sweat glands keep the skin moist so that cooling results from evaporation.
- In fever, skin is pale due to constriction of the peripheral blood vessels.
- When the body temperature is abnormally high, a cold bath or a cold environment may produce comfort.

Microbiology

- Thermometers must be clean when they are used. Before and after, it should be disinfected with spirit swab.
- Before taking the temperature, wipe the thermometer from bulb to the stem to keep the bulb clean. After taking temperature, wipe it from the stem to the bulb to avoid contamination of the finger of nurse with saliva or feces.
- During the cleansing process, wipe it from the tip to avoid contamination.

Physics and Chemistry

- Heat is lost from the skin by radiation, convection, conduction and vaporization.
- Blankets are applied to raise the body temperature because blankets are full of air spaces and serve as insulation and keep the body hot.
- Rubbing the body surface increases heat in the skin by friction.
- Mercury is used in the clinical thermometer. It is liquid metal with silvery appearance.
- Heat is produced by the body is a by-product of metabolism which is the chemical reaction in all body cells.

Psychology

- Explain the procedure to the patient to get the cooperation.
- Explain the patient that mouth should be closed while the thermometer is put in the mouth.
- Do not leave the thermometer in the mouth for longer time because the patient may feel uncomfortable.
- Screen the patient and cover him while taking temperature by rectum.
- Do not tell the patient his temperature as patient is unduly alarmed.
- Keep the sphygmomanometer and stethoscope in the duty room/cupboard.
- Report any deviation from normal.

SCIENTIFIC PRINCIPLES OF RESPIRATION

Anatomy and Physiology

- The respiratory tract is composed of the nose, pharynx, larynx, trachea, bronchi and lungs.
- The respiratory tract is lined with ciliated mucous membrane. The cilia maintain the constant flow of fluid from sinuses into the nose and down the pharynx.
- Interchanges of carbon dioxide and oxygen takes place in the alveoli.
- The red blood cells carry the oxygen from the alveoli to the tissues of the body.
- Respiration is a chemical reaction and breathing is a physical and mechanical reaction.

Microbiology

- The respiratory system has many protective mechanisms.
- The cilia of the mucosa entrap bacteria and dust that are surrounded with fluid and they are expelled outward or down the pharynx.
- Sneezing and coughing protect the nose and throat from the irritants.
- Passage of solids or liquids or irritant gases into the pulmonary tract is blocked by a spasm of the glottis.
- Provide hand washing facilities to the patient.

Physics and Chemistry

- Oxygen passes from the air to the tissues, carbon dioxide passes from the tissues to the air.
- Normal breathing depends upon the partial pressure of gases; lung inflation is due to a difference of pressure in the atmosphere and in the lungs.
- During the inspiration the diaphragm lowers and the chest wall expands so intrapulmonic. When pressure is reduced about 2–3 mm of mercury air rushes into the lungs.
- Upon inspiration the intrapleural pressure increases, and when air is expelled from the lungs the intrapleural pressure decreases.
- Oxygen cannot be stored in the body, so there must be continuous supply of it.

Psychology

- Count the respirations without making the patient alert because, if the patient is alert there will be changes in the respiration.
- Feel the rise and fall of chest wall after observing the pulse rate.

SCIENTIFIC PRINCIPLES OF PULSE AND BLOOD PRESSURE

Anatomy and Physiology

- The circulatory system consists of the heart, arteries, veins and the capillaries.
- The upper part of the heart is called base of the heart and lower is called as apex.
- The heart is a hollow muscular organ having four cavities, the right and the left atria and the right and left ventricles.
- The heart muscles are involuntary and regulated by autonomic nervous system.
- When the left ventricle contracts, it forces about 60 mL of blood in the aorta and into the arteries.
- Pulse rate can be affected by exercise, posture, eating, emotions, extremes of heat and cold.

Microbiology

- Tachycardia could occur due to infection in the blood stream.
- Toxins of various kinds of organisms may constrict the blood vessels and raise the blood pressure.
- Taking pulse and blood pressure is a clean procedure.
- The ear piece on a stethoscope should be wiped off with spirit swab after each use.

Physics and Chemistry

- The ventricles of the heart act like pumps. They keep the blood flowing continuously in one direction.
- Blood flow in the blood vessels because of difference in pressure called pressure gradient.
- Fluids flow from high pressure to low pressure. The highest pressure occurs upon the contraction of the left ventricle.
- When the bleeding occurs, the blood pressure drops.
- A sudden drop of pressure indicates internal hemorrhage.

Psychology

- The patient must be comfortable and calm before taking the pulse.
- Emotions may cause rise in blood pressure so the patient's attention should be diverted before taking pressure.
- Explain the procedure to the patient and allay his anxiety and fear.

Points to Remember

- Client should be made comfortable before taking vital signs.
- Thermometer should be placed properly to get accurate reading.
- Thumb should not be used for taking pulse.
- Client should not be alert while checking respiration.
- Check the functioning of sphygmomanometer before taking blood pressure.