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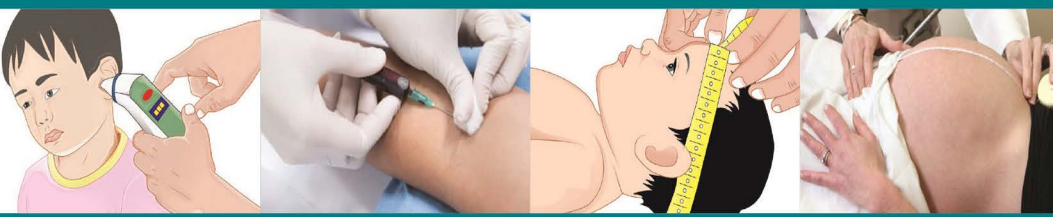
LC Gupta's Practical Nursing Procedures

4th Edition



Edited by
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CHAPTER 2

Vital Signs

INTRODUCTION

Vital signs are the signs that indicate the status of the body's vital organs **(Fig. 2.1)**. It is an objective measurement of the essential physiological functions. Assessment of vital sign is the primary step for clinical evaluation.

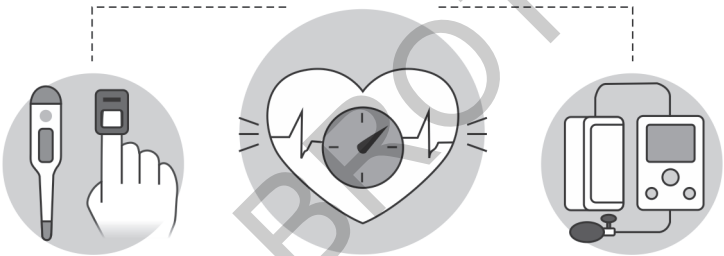

Fig. 2.1: The status of the body's vital signs.

Assessment of vital signs allows the nurse to identify nursing diagnoses, to implement planned intervention and to evaluate outcomes. When the nurse learns the physiological variables influencing vital signs and recognizes the relationship of vital sign changes to other physiological assessment findings, precise determination of the client's health problems can be made.

BODY TEMPERATURE

It is defined as the degree of heat maintained by the body. In other words, body temperature is the balance between the heat produced/thermogenesis and the heat lost/thermolysis from the body **(Fig. 2.2)**.



Fig. 2.2: Body temperature.

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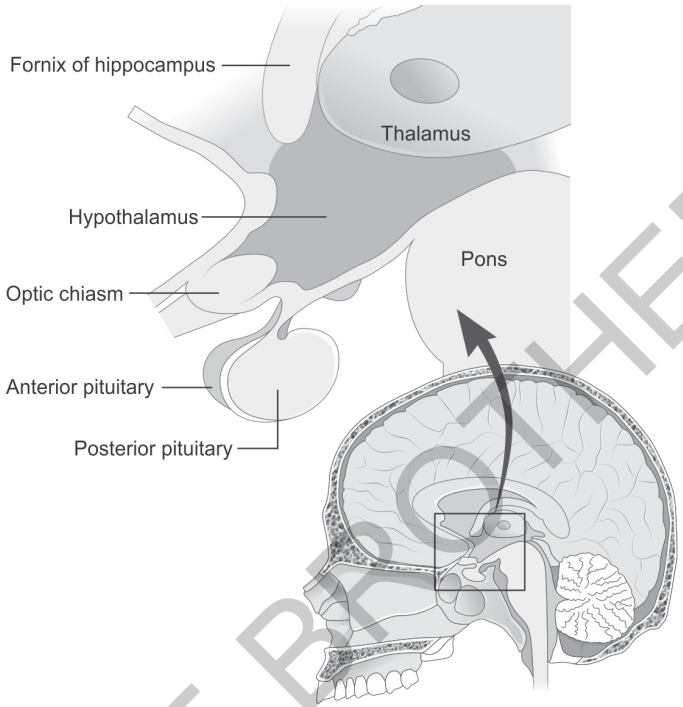

Fig. 2.3: Temperature controlling center: Hypothalamus.

Hypothalamus is the heat regulating center which is situated in the brain **(Figs. 2.3 and 2.4)**.

Types of Temperature

- **Core temperature:** It is the temperature of deep structures. It is the optimum temperature at which the internal organs and body system function. It also refers as body's internal temperature. It is constant 37°C.
- **Surface temperature:** It is the temperature of the outer surface (i.e., skin).

Ways of Heat Production

Oxidation of food	During the metabolism of proteins, carbohydrates, and fats, heat is produced as a by-product like 1 g of carbohydrate and 1 g of protein gives each 4 calories of heat and 1 g fat gives 9 calories of heat

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Muscle activity	During muscular activity, the stored glycogen is converted into sugar causing increase in heat and blood supply to the skin, and an individual feels hot
Emotions	Excitement, anxiety, nervousness, etc., stimulate an autonomic nervous system that causes stimulation of different organs in the body secreting glands. Due to this, heat is produced in the body
Hormonal effect	Increased activity of thyroid gland and adrenal gland produces heat; ovarian hormone/progesterone produces rise in temperature; when these hormones are produced in the blood, it stimulates oxidation process and produces heat
Environmental and atmospheric condition	High room temperature increases the body temperature by preventing the evaporation process. Very high external temperature may upset the heat-regulating process and body temperature increases in high fever (e.g., sunstroke and heatstroke)
Fever	It is a protecting action against bacterial invasion; the degree of temperature increases according to the severity of infection

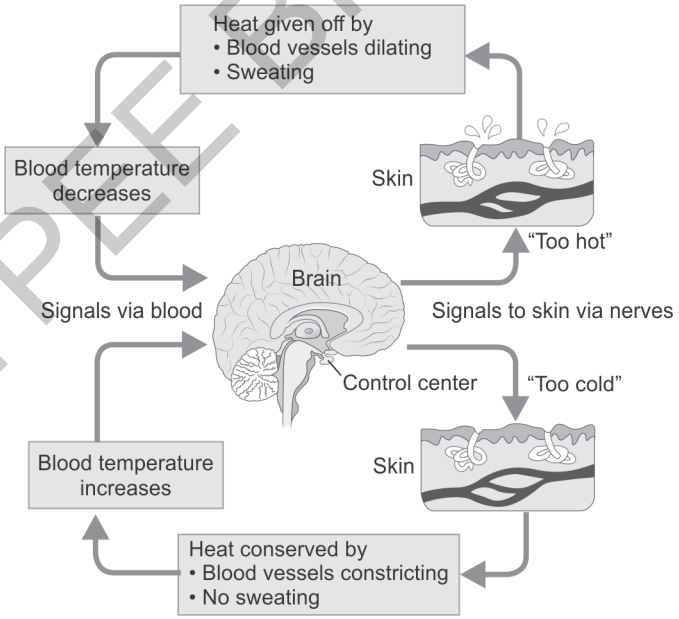

Fig. 2.4: Regulation of body temperature.

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Ways of Heat Loss

The heat is lost from the body in different ways:

- **Through the skin:** Heat is controlled by the hypothalamus when the body temperature is increased the warm blood flows through the hypothalamus. It is very sensitive to heat variation in the blood and sends impulses to the skin causing vasodilatation. Due to vasodilatation, more blood comes to the skin and the heat is lost by means of conduction, convection, radiation, and evaporation.
  - *Conduction* is the transfer of heat directly through a substance from the hot part to the cold part from one molecule to the other (by direct contact). Heat is transferred by conduction from the body to any substances in contact with the body such as air, food stuffs, and water.
  - *Convection* is the method of the transfer of heat by circulating air in liquid. It depends upon the air movement and the temperature of atmosphere.
  - *Radiation* is the transfer of heat from the surface of one object to another which is not in contact with each other.
  - *Evaporation* is the process by which a substance in a liquid state is changed into vapor. The body loses a large amount of heat by evaporation of perspiration and sweat.
- **Through the lungs:** The temperature of the air which is taken to the lungs is that of the atmosphere, and it is lower than that of the body temperature. On entering the respiratory tract, it is warmed to that of the body temperature by absorbing heat from the lung tissue. As the individual breathes out, the warm air is lost through the expired air. Approximately 300 mL of water is also vaporized from the lungs daily.
- **Through the kidney:** Secrete urine which is warmed by the heat taken from the body. As the urine is excreted, the heat is also lost from the body.
- **Through the bowel:** The feces that are formed in the bowels absorb heat from the body, so as individual defecates the heat is lost from the body.

Conversion of Body Heat

The heat can be considered by the type of clothing worn, that is, cotton garments are good conductors of heat, so they are used for summer. Woolen garments and blankets are used in the winter

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season. Wool is a bad conductor of heat because the air is trapped in the interlocking space of the material, which thereby prevents the heat loss from the body.

Use of hot water bottle and hot drinks helps to maintain the body temperature in a client who is exposed to cold. Rubbing the skin surface increases the body temperature by friction which changes mechanical energy to thermal energy. Cold drinks and cold sponges reduce the temperature by the evaporation of moisture.

Normal Temperature Variations

The normal temperature of the body is 98°F (37°C). In a normal healthy person, the temperature varies from 97–99°F (36.1–37.2°C).

- **Age:** Temperature regulation is unstable until children reach puberty. The normal temperature in young people is higher than that of the people of old age.
- **Exercise:** Heavy exercise increases heat; rest and sleep reduce temperature.
- **Hormonal level:** Women generally experience fluctuation in temperature. Progesterone and thyroid hormone increase temperature.
- **Time of the day (circulation rhythm):** It is less in the morning and more in the evening by 0.5°C. Temperature is usually the lowest at 1–4 AM.
- **Stress:** Physical and psychological emotions cause an increase in temperature.
- **Fasting:** When a person is fasting, the body temperature decreases.

Assessment of Temperature

The body temperature can be assessed through the various types of thermometers.

Types of Thermometers

Glass Thermometer/Clinical Thermometer (Figs. 2.5A and B)

- It is available in both Fahrenheit and Celsius scales.
- It has two parts—a bulb containing mercury and a steam in which the mercury can rise on the stem in a graduated scale representing the degree of temperature.

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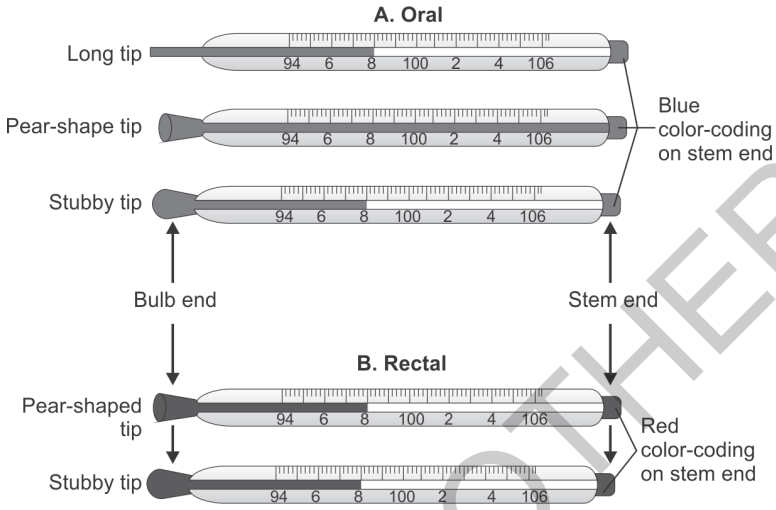

Figs. 2.5A and B: Showing oral and rectal thermometer.

- The lowest registered temperature is 35°C or 95°F and the highest is 43.3°C or 110°F, because the body temperature above or below this range is rare.
- The stem usually has a curved surface that magnifies the lines and figures on the scale and a flattened back with a sharp ridge that makes it easier to read and lessen the danger of breakage.
- The bulbs are of different sizes and shapes; the greater the surface of glass surrounding mercury, the more rapidly the thermometer registers; the oral thermometers are with long and slender bulbs, whereas the rectal ones are with short and fat bulbs.
- Mercury is a liquid metal with silvery appearance used in thermometers because it is very sensitive to temperature; expansion of mercury is uniform and easily visible; it boils in very high temperature (35.7°C) and freezes in very low temperature (39°F).
- There is a constriction above the bulb which prevents the mercury from falling into the bulb on cooling so reading can be done conveniently.

Clinical Thermometer is Different from Lotion Thermometer

- Lotion thermometer is 13.5 times heavier than water, so a small glass tube is used.
- There is no constriction.

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- Grading on the lotion thermometer is from the freezing point to the boiling point of water (0–100°C or 32–212°F); the clinical thermometer is from 35–43.3°C or 95–100°F.

General Instructions to be Kept in Mind while using Thermometer

- To shake the mercury down, grasp the thermometer securely by the upper end of the stem and never hold it by the bulb and shake it down by quick movement of wrist.
- Do not let the thermometer fall or strike against anything while shaking.
- Never store it in disinfectant solution; rinse it with clean water, dry it, and keep it in containers with the bulb down on a smooth surface.
- Never place the thermometer in the mouth of the person who cannot follow the instructions.

Disinfection of Thermometers (Table 2.1)

Table 2.1: Disinfection of thermometers.

Disinfecting solution	*Strength*	*Time*
Dettol	1:40	5 min
Savlon	1:20	5 min
Lizol	1:40	3 min

Celsius and Fahrenheit Scales

Formula used to change from one scale to another:
$F = (C \times 9/5) + 32$
$C = (F - 32) \times 5/9$

Electronic Thermometer (Fig. 2.6)

- It has a battery-powered control unit and a temperature-sensitive probe.
- This type of thermometer readily provides the temperature within <60 seconds.
- Convenient, safe, accurate, and fast method and easy to read; typically, the unit beeps when the measurement is complete.



Fig. 2.6: Electronic thermometer.

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Tympanic Membrane Thermometer (Fig. 2.7)

- It resembles an otoscope that can be recharged.
- Records temperature by placing a probe in the ear canal.
- It is appropriate for infants over 2 months or very young children; the recording is available in 2 seconds. It should not be used in clients who have ear drainage or scarred tympanic membrane.

Disposable Paper Thermometer (Fig. 2.8)

Single-use paper thermometers are thin strips of chemically treated paper with dots that can change color to reflect temperature in <1 mL available in Celsius and Fahrenheit scales.



Fig. 2.7: Tympanic membrane thermometer.



Fig. 2.8: Disposable paper thermometer.

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Temperature-Sensitive Strips and Chemical Dot (Fig. 2.9)

They are usually placed on the forehead or abdomen. The skin under the strips must be dry. After the specified time, the strips change the color. The strips are removed and discarded after the color change is noted.

- **Oral digital pacifier thermometer** can be used for infants supralingually; it is ideal for children. The sheath is unbreakable.
- For the visually impaired people, **auditory thermometers** are available. The disadvantages are their high cost and need for regular maintenance.

Common Sites for Assessing Temperature

To get an accurate temperature, the bulb must be placed where it can be surrounded by the body tissues and where there are blood vessels situated near the surface; the temperature may vary when the bulb is in contact with clothing, air, and moisture. Common sites are mouth, axilla, groin, vagina, and rectum.

Temperature by Mouth

See **Fig. 2.10**.

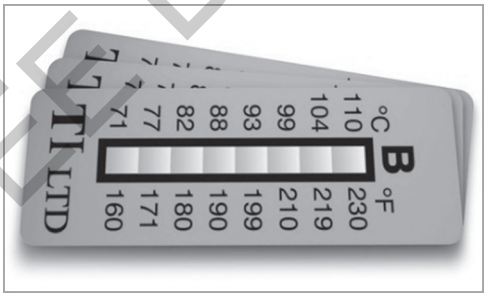

Fig. 2.9: Temperature sensitive strips.

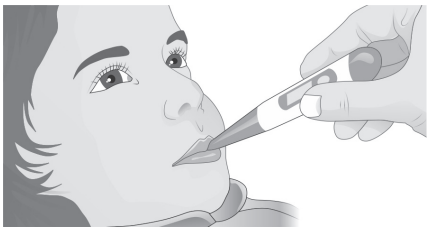

Fig. 2.10: Temperature by mouth (oral temperature).

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Contraindications

- Clients who are extremely nervous, delirious, unconscious, hysterical, mentally confused, and who cannot follow instructions.
- Client having convulsions
- Mouth breather
- Injuries, surgeries, and inflammation in mouth
- Extremely weak persons not able to hold a thermometer
- Suffering from severe cough
- Children under 6 years.

Temperature by Axilla (Fig. 2.11)

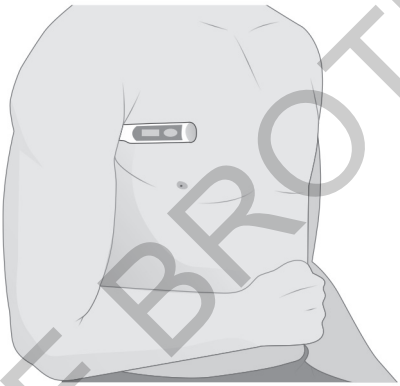

Fig. 2.11: Temperature by axilla.

Temperature by Rectum (Fig. 2.12)

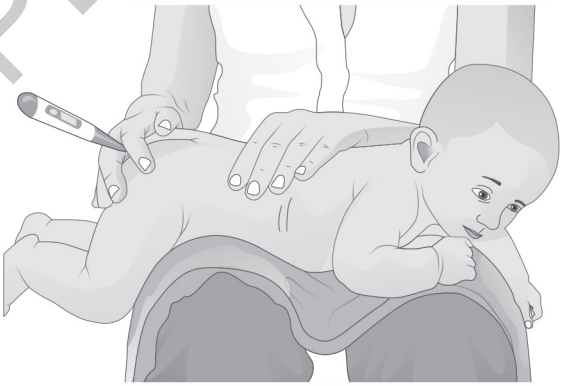

Fig. 2.12: Temperature by rectum.

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Fig. 2.13: Temperature through ear.

Contraindications

- Rectal surgeries
- Diarrhea
- Rectum packed with fecal matters that are having treatment like bowel wash, enema, etc.

Temperature by Ear (Fig. 2.13)

Temperature through ear can be easily and safely measured.

FEVER

Fever or Pyrexia is defined as a rise in body temperature above 99°F/37.2°C. The causes of fever are infections, diseases of nervous system, malignant neoplasms, blood diseases, exposure to hot environment, dehydration, etc.

Effects of Fever on Different Systems

- **Respiratory system:** Shallow and rapid breathing
- **Circulatory system:** Increased pulse rate and palpitation
- **Alimentary system:** Dry mouth, coated tongue, loss of appetite, indigestion, nausea, vomiting, constipation, or diarrhea
- **Urinary system:** Diminished output, burning micturition high colored urine
- **Nervous system:** Headache, restlessness, irritability, insomnia, convulsions, delirium
- **Muscular skeletal system:** Heavy sweating, hot flushes, goose flush, shivering, or rigors

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Types of Fever (Fig. 2.14)

- **Onset or invasion:** It is the period in which the body temperature is rising, and it is a gradual process.
- **Fastigium or stadiums:** It is the period in which the body temperature reaches its maximum and remains constant at a high level.
- **Defervescence or decline:** It is the period in which the temperature is returning to normal.
- **Fevers subside:** Suddenly within few hours, means crisis and gradually means lyses.
- **True crisis:** The temperature falls suddenly by a marked improvement in the patient's condition.
- **False crisis:** Sudden fall in temperature but not accompanied by the improvement in general condition.
- **Lyses:** The temperature falls in a zigzag manner for 2–3 days or a week before reaching normal.
- **Remittent fever:** This is a fever characterized by variations of more than 2° between morning and evening but does not reach normal.
- **Intermittent or quotidian fever:** The temperature rises from normal or subnormal to high fever back at regular interval may vary from few hours to 3 days. Usually, the temperature is higher in the evening than in the morning.
- **Constant fever or continuous fever:** It is one in which the temperature varies not more than 2° between morning and evening and does not reach normal for a period.
- **Inverse fever:** Highest range of fever recorded in the morning and lowest in the evening.
- **Hectic or swinging:** The difference between high and low points is very great.
- **Relapsing fever:** One in which a brief febrile period is followed by 1 or more days of normal temperature.
- **Irregular fever:** It is entirely irregular in its course.
- **Rigor:** It is a sudden attack of shivering in which the body temperature rises rapidly to a stage of hyperpyrexia seen in malaria.
- **Low pyrexia:** Fever does not rise above 99–100°F or between 37.2 and 37.8°C.
- **Moderate pyrexia:** Body temperature rises between 100 and 103°F or between 37.8 and 39.4°C.

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LC Gupta's
Practical Nursing Procedures

Salient Features

- This book covers a wide range of nursing procedures encompassing various aspects of patient care.
- Each nursing procedure is presented with clear and detailed step-by-step instructions.
- Content is prepared on the latest evidence-based on nursing practice.
- The whole text is presented in concise and easy-to-follow approach with simplified explanations.
- Clinical pearls and nursing responsibilities are added for better understanding of nursing students.

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