Nursing Science

Vital Signs (Part one)

Learning objectives

After completing this lecture, the students will be able to:

- **Identify the vital signs and times to assess vital signs.**
- **Describe the body temp and factors affect the body's temp.**
- **Identify the pulse rate and pulse sites most commonly used to assess.**
- **Describe various factors affect the pulse and methods for measuring pulse rate**

Vital Sign

Vital signs: are assessed to monitor the functions of the body. Also called signs of life. ***Vital signs Include:***

- Body temperature
- Pulse
- Respirations, and
- Blood pressure

Pulse oximetry or oxygen saturation as well as pain levels are also commonly measured at the same time.

Times to Assess Vital Signs

- On admission to a health care agency to obtain baseline data
- When a client has a change in health status or reports symptoms such as chest pain or feeling hot or faint
- Before and after surgery or an invasive procedure
- Before and/or after the administration of a certain medication.
- Before and after any nursing intervention that could affect the vital signs (e.g., ambulating a client on bed rest).
- Routine vital signs according to the care agency.

Body Temperature:

- Reflects the balance between the heat produced and the heat lost from the body.

There are two kinds of body temperature:

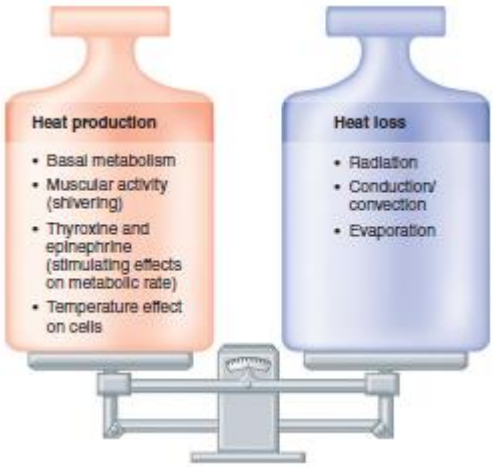
- ✓ **Core temperature:** is the temperature of the deep tissues of the body, such as the abdominal cavity.
- ✓ **Surface temperature**: is the temperature of the skin, the subcutaneous tissue, and fat. Response to the environment (rises or fall).

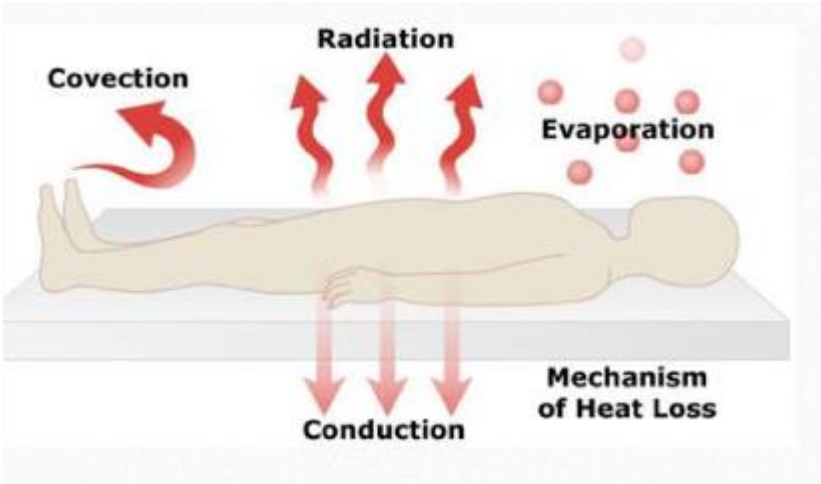
Factors Affect the Body's Heat Production

- **Basal metabolic rate (BMR)** is the rate of energy utilization in the body required to maintain essential activities such as breathing.
- **Muscle activity**
- **Thyroxine output**
- **Epinephrine, norepinephrine, and sympathetic stimulation/stress response**
- **Inflammation/fever**

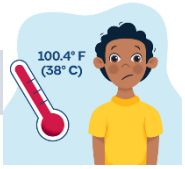
Factors Contributing to Heat Loss

- Radiation
- Conduction
- Convection
- Evaporation





Factors Affecting Body Temperature



1. **Age**
   - ✓ The infant is greatly influenced by the temperature of the environment and must be protected from extreme changes
   - ✓ Children's temperatures vary more than those of adults until puberty.
   - ✓ Older people are also particularly sensitive to extremes in the environmental temperature
2. **Diurnal variations (circadian rhythms)**
   - ✓ Body temperatures normally change throughout the day, varying by as much as 1°C between the early morning and the late afternoon.
3. **Exercise**
   - ✓ Hard work or strenuous exercise can increase body temperature
4. **Hormones**
   - ✓ Women usually experience more hormone fluctuations than men. In women, progesterone secretion at the time of ovulation raises body temperature by about 0.3°C to 0.6°C
5. **Stress**
   - ✓ Stimulation of the sympathetic nervous system can increase the production of epinephrine and norepinephrine, thereby increasing metabolic activity and heat production
6. **Environment**
   - ✓ Extremes in environmental temperatures can affect a person's temperature regulatory systems

Alterations in Body Temperature

- **Pyrexia (hyperthermia, fever):** A body temperature above the usual range (>38 C)
- **Hyperpyrexia**: A very high fever, such as 41° C (105.8° F). A client who has a fever is referred to as febrile; the one who does not is afebrile.

In some conditions, an elevated temperature is not always a true fever. Three examples of this are heat exhaustion, heat stroke, and malignant hyperthermia.

Malignant hyperthermia: a pharmacogenetic disorder, can be triggered by exposure to certain anesthetic agents.

- **Hypothermia** is a core body temperature below the lower limit of normal (<36C).

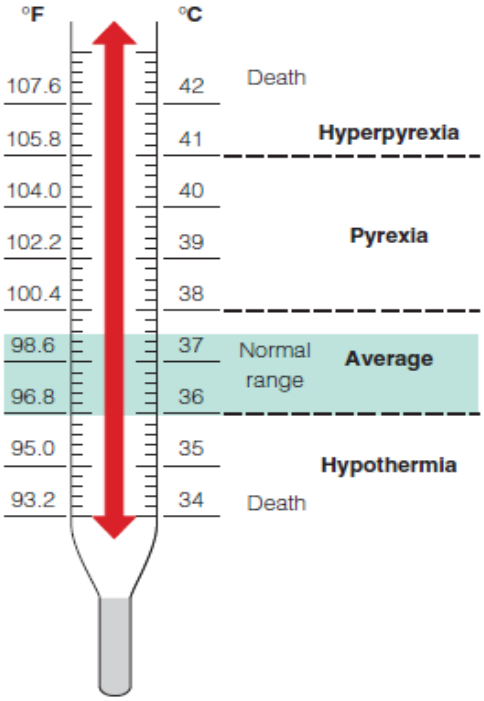


Figure 29–4 ■ Terms used to describe alterations in body temperature (oral measurements) and ranges in Fahrenheit and Celsius (centigrade) scales.

Assess Body Temperature

TABLE 29.1 Range of Normal Body Temperatures by Route of Measurement

Route of Measurement	Temperature Range
Core	36.7°C–37.0°C
Oral	36.0°C–38.0°C
Rectal	36.7°C–38.0°C
Tympanic	35.5°C–38.0°C
Temporal artery	36.7–38.0°C
Axillary	35.4°C–37.4°C

Sources: Adapted from Canadian Paediatric Society. (2010). *Temperature measurement in paediatrics.* Position Statement: Canadian Pediatric Society. Retrieved from http://www.cps.ca/english/statements/CP/cp00-01.htm; Estes, M. E. Z. (2014). Health Assessment and Physical Examination (5th Ed.). Toronto, ON: Nelson.

Pulse

- The pulse is a wave of blood created by contraction of the left ventricle of the heart.
- Pulse rate is expressed as beat per minute.

TABLE 29–2 Variations in Pulse and Respirations by Age

AGE	PULSE AVERAGE (AND RANGES)	RESPIRATIONS AVERAGE (AND RANGES)
Newborn	130 (80–180)	35 (30–60)
1 year	120 (80–140)	30 (20–40)
5–8 years	100 (75–120)	20 (15–25)
10 years	70 (50–90)	19 (15–25)
Teen	75 (50–90)	18 (15–20)
Adult	80 (60–100)	16 (12–20)
Older adult	70 (60–100)	16 (15–20)

- **Types:**
  - ✓ **Peripheral pulse:** is located periphery of the body (away from the heart) such as in the foot, hand, or neck**.**
  - ✓ **Apical pulse:** a central pulse; that is, it is located at the apex of the heart.

Assessing the Pulse

- **Methods for Measuring Pulse Rate:**

1. **Palpation (feeling with the fingers):**

The middle three fingertips are used for palpating all pulse sites (do not use the thumb) except the apex of the heart.

2. **Auscultation with a Stethoscope (hearing):**

A stethoscope is used to assess apical pulses.

- **Pulse sites most commonly used:**

1. **Radial Artery:** located along the radial bone, on the thumb side of the inner aspect of the wrist.

2. **Brachial Artery**: found at the inner aspect of the biceps muscle of the arm or medially in the antecubital space.

3. **Apical Pulse**: at the apex of the heart. In an adult, this is located on the left side of the chest, about 8 cm (3 in.) to the left of the

sternum(breastbone) at the fifth intercostal space (area between the ribs).

Induction for measure:

- To obtain the heart rate of newborns, infants, and children aged 2 to 3 years or of an adult with an irregular peripheral pulse
- To determine whether the cardiac rate is within normal range and the rhythm is regular
- To monitor patients with cardiac disease, pulmonary, and renal diseases and those receiving medications to improve heart action

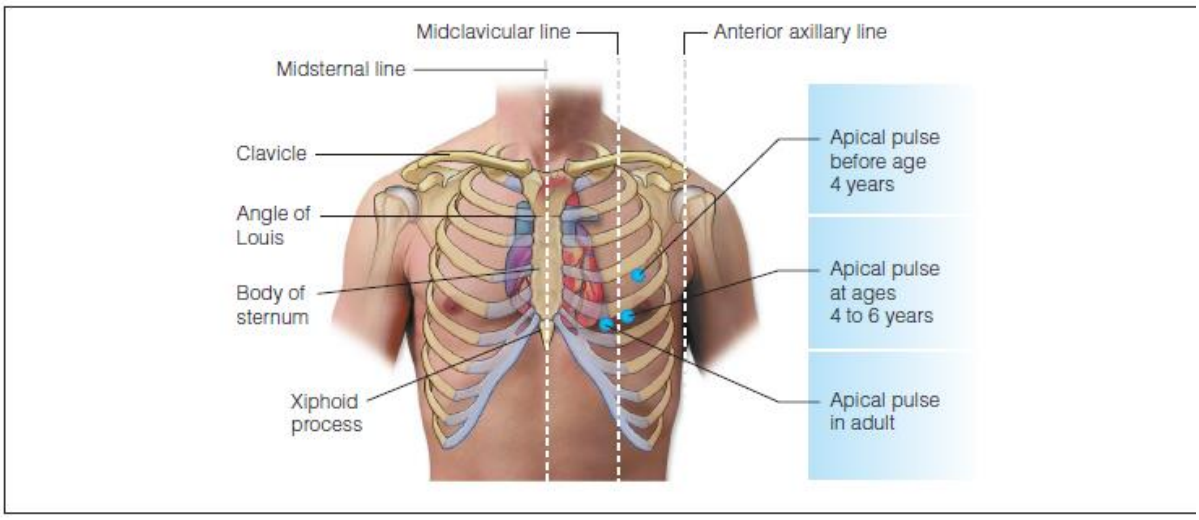


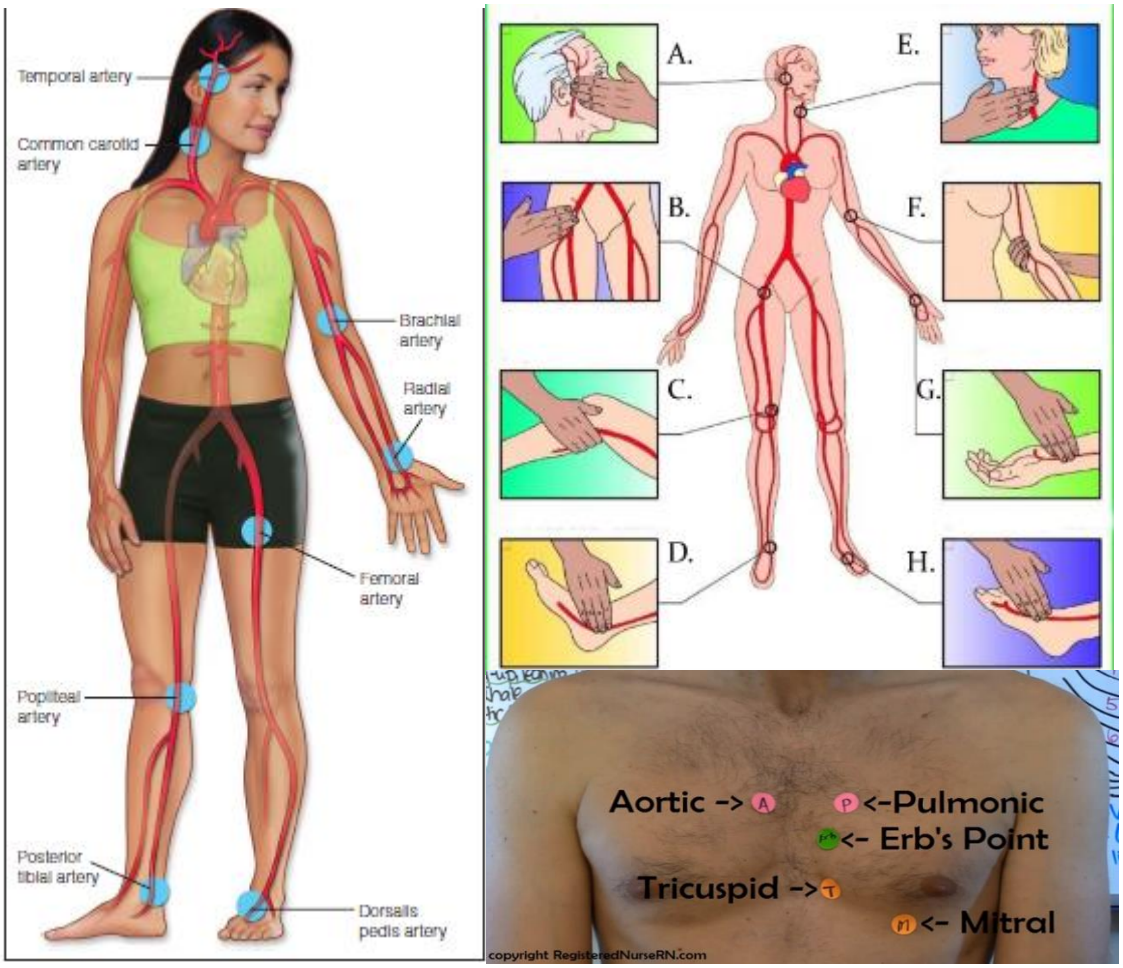
FIGURE 29.12 Locations of the apical pulse in a child younger than 4 years, a child 4 to 6 years, and an adult.
Source: From D'Amico, D., et al. (2012). Health & Physical Assessment in Nursing, Canadian Edition, Pearson Education Canada. Reprinted with permission by Pearson Canada Inc.

4. **Carotid Artery**: at the side of the neck where the carotid artery runs between the trachea and the sternocleidomastoid muscle

Never press both carotids at the same time because this can cause reflex drop in blood pressure or pulse rate.

5. **Temporal Artery**: where the temporal artery passes over the temporal bone of the head. The site is superior (above) and lateral to (away from the midline of) the eye.

6. **Femoral Artery:** where the femoral artery passes alongside the inguinal ligament.
7. **Popliteal Artery**: where the popliteal artery passes behind the knee. This point may be difficult to locate, but it can be palpated if the patient flexes the knee slightly.
8. **Posterior tibial Artery**: on the medial surface of the ankle, where the posterior tibial artery passes behind the medial malleolus.
9. **Pedal (dorsalis pedis) Artery:** Passes over the bones of the foot. The dorsum (upper surface) of the foot on an imaginary line drawn from the middle of the ankle to the space between the big and second toes.



- **When assessing the pulse, the following data are collected:**

✓ **Rate**

- **Normal (60-100 bpm).**
- **Tachycardia:** is an excessively fast heart rate (e.g., more than 100 beats/min in an adult).
- **Bradycardia**: is a heart rate that is lower than normal (e.g., less than 60 beats/min in an adult).

✓ **Rhythm:** is the pattern of the beats and the intervals between the beats

- **Dysrhthmia or arrhythemia** :A pulse with an irregular rhythm and force.
- If the rhythm is regular, count the pulse for 15 seconds and then multiply by 4 to get the rate per minute.
- If the rhythm is irregular, count the pulse for a full 60 seconds.

✓ **Volume:** Force of blood with each beat. Usually, the pulse volume is the same with each beat. It can range from absent, thread, to bounding.

✓ **Arterial wall elasticity**

✓ **Presence or absence of bilateral equality**

Factors Affecting the Pulse

1. **Age**: As age increases, the pulse rate gradually decreases.
2. **Sex:** After puberty, the average male's pulse rate is slightly lower than the female's.
3. **Exercise:** The pulse rate normally increases with activity.

4. **Fever:** The pulse rate increases (a) in response to the lowered blood pressure that results from peripheral vasodilation associated with elevated body temperature and (b) because of the increased metabolic rate.
5. **Medications:** Some medications decrease the pulse rate, and others increase it. For example, cardiotonics (e.g., digitalis preparations) decrease the heart rate, whereas epinephrine increases it.
6. **Hypovolemia/dehydration:** Loss of blood from the vascular system increases pulse rate.
7. **Stress, fear, anxiety, and severe pain:** increased pulse rate as a result of stimulation sympathetic system
8. **Position:** When a person is sitting or standing, blood usually pools in dependent vessels of the venous system. Pooling results in a reduction in blood pressure and an increase in heart rate.
9. **Pathology:** Certain diseases such as some heart conditions or those that impair oxygenation can alter the resting pulse rate.

References

1. Berman, A., Snyder, SH., & Frandsen, G. (2016). Kozier and Erb's Fundamentals of nursing: concepts; 10 process; and practices. 10th edition. Pearson education, Inc. United states of America: 477- 496.
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3. Kozier, B., Erb, G., Berman, A., Snyder, SH., & Frandsen, G., Buck, M., Ferguson, L., Yiu, L., and Stamler, L. (2018). Fundamentals of Canadian Nursing: Concepts, Process, and Practice. 4th edition. Pearson Canada Inc., Pp. 630-.648