Ishik International University

Nursing Department

Fundamental of Nursing

Vital signs- Pulse

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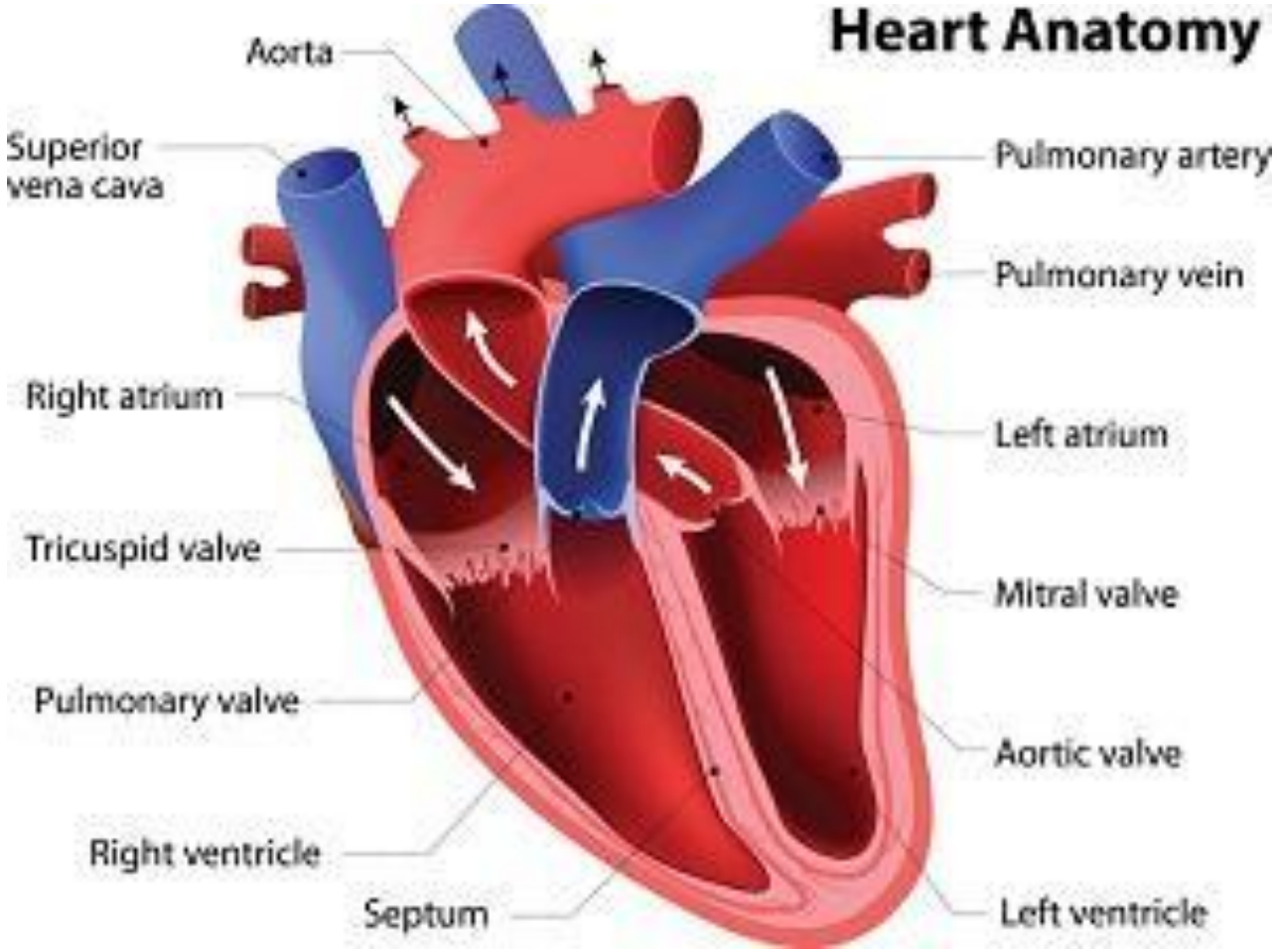
- **The pulse** is a wave of blood created by contraction of the left ventricle of the heart.
- Generally, the pulse wave represents the stroke volume output or the amount of blood that enters the arteries with each ventricular contraction.
- **Compliance** of the arteries is their ability to contract and expand.


Heart Anatomy
Aorta
Superior vena cava
Pulmonary artery
Pulmonary vein
Right atrium
Left atrium
Tricuspid valve
Mitral valve
Pulmonary valve
Aortic valve
Right ventricle
Septum
Left ventricle

- **Cardiac output** is the volume of blood pumped into the arteries by the heart and equals the result of the stroke volume (SV) times the heart rate (HR) per minute.
- For example, 65 mL × 70 beats per minute = 4.55 L per minute. When an adult is resting, the heart pumps about 5 liters of blood each minute.

- **A peripheral pulse** is a pulse located away from the heart, for example, in the foot or wrist.
- **The apical pulse** , in contrast, is a central pulse; that is, it is located at the apex of the heart. It is also referred to as the **point of maximal impulse (PMI) .**

Factors Affecting the Pulse

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

- **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.
- **Medications.** Some medications decrease the pulse rate, and others increase it.

- **Hypovolemia/dehydration**. Loss of blood from the vascular system increases the pulse rate.
- In adults, the loss of circulating volume results in an adjustment of the heart rate to increase blood pressure as the body compensates for the lost blood volume.

- **Stress.** In response to stress, sympathetic nervous stimulation increases the overall activity of the heart.
- Stress increases the rate as well as the force of the heartbeat. Fear and anxiety as well as the perception of severe pain stimulate the sympathetic system.

- **Position.** When a person is sitting or standing, blood usually pools in dependent vessels of the venous system.
- **Pathology.** Certain diseases such as some heart conditions or those that impair oxygenation can alter the resting pulse rate.

Pulse Sites

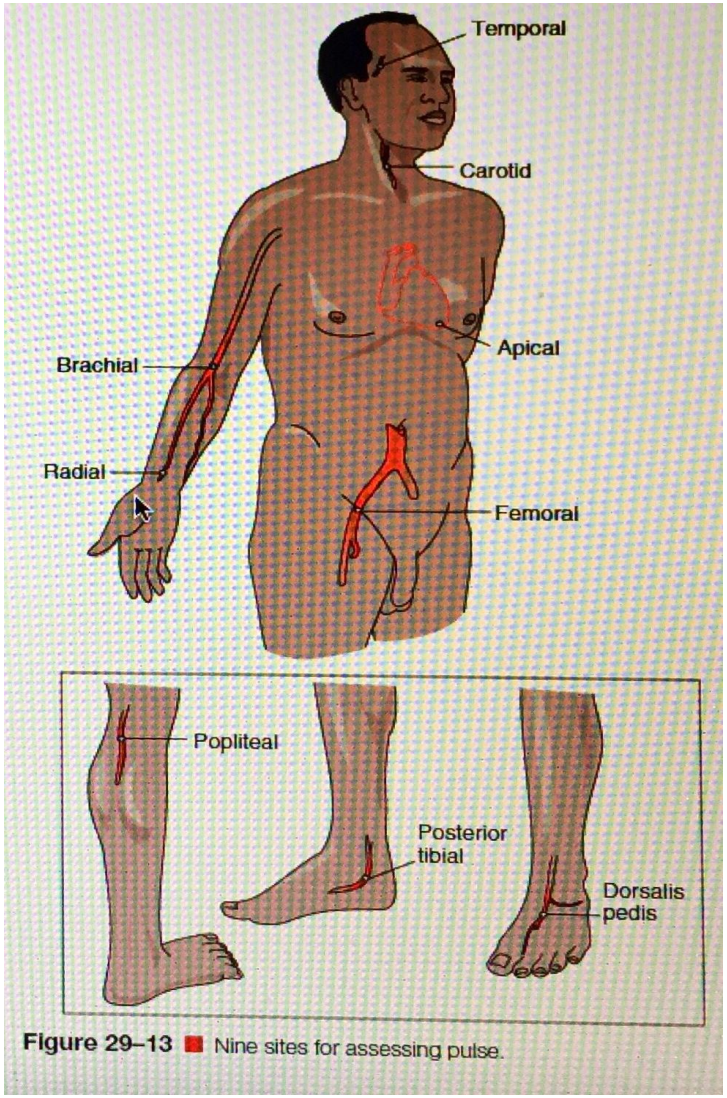


Figure 29–13 ■ Nine sites for assessing pulse.

- **Apical,** 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)
- In older adults, the apex may be further left if conditions are present that have led to an enlarged heart.

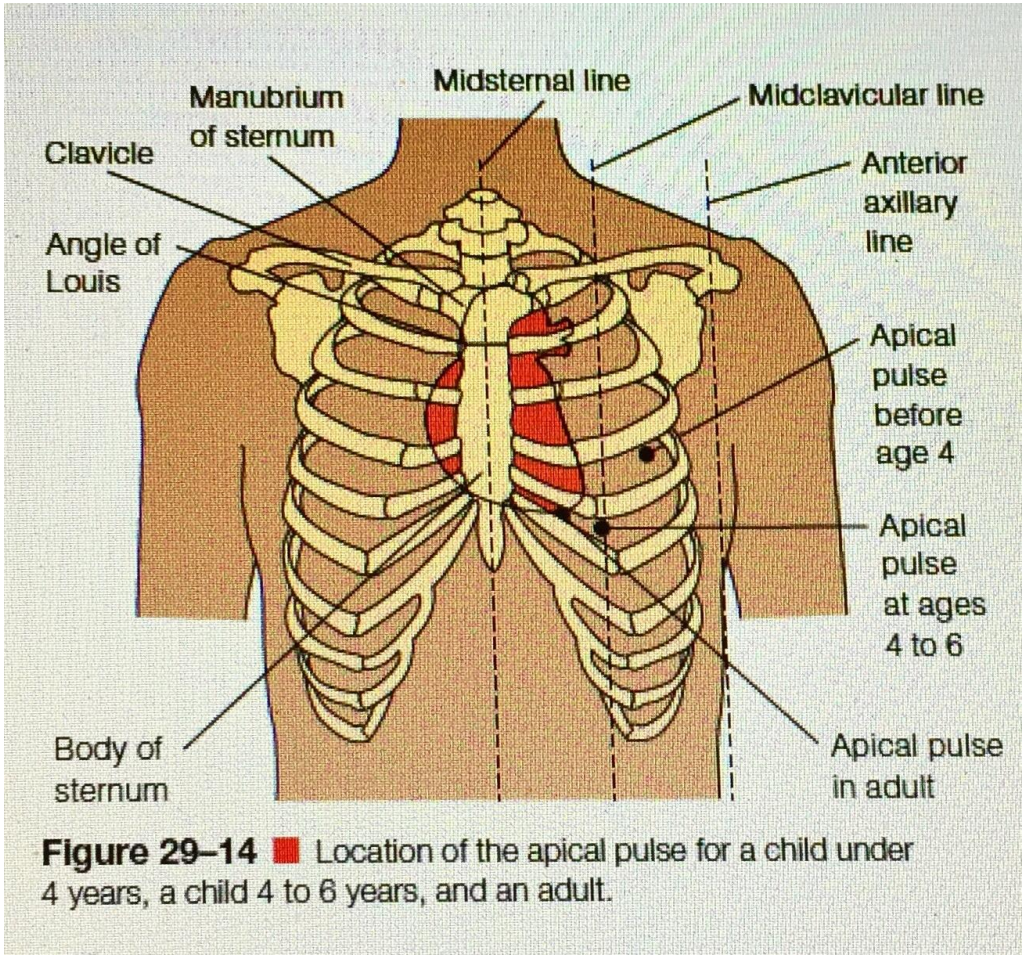


Figure 29–14 ■ Location of the apical pulse for a child under 4 years, a child 4 to 6 years, and an adult.

- Before 4 years of age, the apex is left of the midclavicular line (MCL); between 4 and 6 years, it is at the MCL.
- For a child 7 to 9 years of age, the apical pulse is located at the fourth or fifth intercostal space.
- The radial site is most commonly used in adults. It is easily found in most people and readily accessible.

Assessing the Pulse

- A pulse is commonly assessed by palpation (feeling) or auscultation (hearing). The middle three fingertips are used for palpating all pulse sites except the apex of the heart.
- A stethoscope is used for assessing apical pulses.

Before the nurse assesses the resting pulse, the client should assume a comfortable position. The nurse should also be aware of the following:

- Any medication that could affect the heart rate.
- Whether the client has been physically active. If so, wait 10 to 15 minutes until the client has rested and the pulse has slowed to its usual rate.

- Any baseline data about the normal heart rate for the client. For example, a physically fit athlete may have a resting heart rate below 60 beats/min.
- Whether the client should assume a particular position (e.g., sitting). In some clients, the rate changes with the position because of changes in blood flow volume and autonomic nervous system activity.

- When assessing the pulse, the nurse collects the following data: the **rate, rhythm, volume**.
- An excessively fast heart rate (e.g., over 100 beats/min in an adult) is referred to **as tachycardia** .
- A heart rate in an adult of less than 60 beats/min is called **bradycardia** .
- If a client has either tachycardia or bradycardia, **the apical pulse** should be assessed.

- **The pulse rhythm** is the pattern of the beats and the intervals between the beats. Equal time elapses between beats of a normal pulse.
- A pulse with an irregular rhythm is referred to as a **dysrhythmia or arrhythmia** .
- It may consist of random, irregular beats or a predictable pattern of irregular beats (documented as “regularly irregular”).
- When a dysrhythmia is detected, the **apical pulse** should be assessed.

- **Pulse volume,** also called the **pulse strength or amplitude**, refers to the force of blood with each beat.
- Usually, the pulse volume is the same with each beat.
- It can range from absent to bounding.
- A normal pulse can be felt with moderate pressure of the fingers and can be obliterated with greater pressure

- A forceful or full blood volume that is obliterated only with difficulty is called a full or bounding pulse.
- A pulse that is readily obliterated with pressure from the fingers is referred to as weak, feeble, or thready.
- A healthy, normal artery feels straight, smooth, soft, and pliable.

- Older adults often have inelastic arteries that feel twisted (tortuous) and irregular on palpation.
- When a peripheral pulse is located, it indicates that pulses more proximal to that location will also be present.
- For example, if the dorsalis pedis, the most distal pulse of the lower extremity, cannot be felt,

- The nurse next palpates for the posterior tibial pulse.
- If it is not felt, the popliteal pulse must be assessed.
- If the popliteal pulse is found, it is not necessary to assess the femoral pulse since it must also be present in order for the more distal pulse to exist.

Apical Pulse Assessment

- Assessment of the apical pulse is indicated for clients whose peripheral pulse is irregular or unavailable
- and for clients with known cardiovascular, pulmonary, and renal diseases.
- It is commonly assessed prior to administering medications that affect heart rate.

- The apical site is also used to assess the pulse for newborns, infants, and children up to 2 to 3 years old

APICAL-RADIAL PULSE ASSESSMENT

- **An apical-radial pulse** may need to be assessed for clients with certain cardiovascular disorders.
- Normally, the apical and radial rates are identical. An apical pulse rate greater than a radial pulse rate can indicate that the thrust of the blood from the heart is too weak for the wave to be felt at the peripheral pulse site

- Any discrepancy between the two pulse rates is called **a pulse deficit,** and needs to be reported promptly.
- An apical-radial pulse can be taken by two nurses or one nurse, although the two-nurse technique may be more accurate.