

Pulse rate (PR):

Pulse, is a wave of blood created by contraction of the left ventricles of the heart. The pulse rate reflect how often a person's heart beats per minute. Normal adult pulse rate ranges between 60-100 beat/minute (BPM), and for newborn babies ranges from 120-140 BPM; rates for children fall between those for adults and newborns, according to child's body size and age.



Cardiac output: Blood volume pumped into the arteries by the heart in one minute it is measured by multiplying heart rate by stroke volume. The heart of an adult on resting pumps about 5 liters of blood each minute.



Stroke volume: amount of blood that exits the left ventricle and enters the aorta with each ventricular contraction, about 60 to 70 ml of blood.



Pulse 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.



Pulse rhythm: is the spacing (regularity) of beats. With normal or regular rhythm, intervals between beats are the same. When the pulse occasionally skips a beat, this is described as irregular pulse.



Dysrhythmia or arrhythmia: a pulse with an irregular rhythm and force; a sign of some forms of heart disease or of an overactive thyroid gland.



Peripheral pulse: reflects heart rate and adequacy of circulation to a part of the body away from the heart, such as an extremity.

Altered in pulse rate:



Tachycardia: a pulse rate above normal (100 BPM) in an adult.



Bradycardia: a pulse rate less than normal (60 BPM) in an adult.

Methods for Measuring Pulse rate:

1. **Palpation (feeling with the fingers):** by using the middle three fingertips of one hand (do not use the thumb, which has its own pulse).
2. **Auscultation With a Stethoscope (listening to sounds):** normally heard at the heart's apex, will usually give the most accurate assessment of pulse rate.
3. **Doppler ultrasound (DUS) stethoscope:** used for peripheral pulses that are difficult to assess.

Pulse measurement site:

1. **Radial:** inner aspect of forearm on thumb side of wrist.
2. **Temporal:** over temporal bone of the head, superior and lateral to the eye, used when radial pulse is not accessible

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3. **Carotid:** bilateral, under lower jaw in neck, between the trachea and sternocleidomastoid muscle. use during cardiopulmonary resuscitation (CPR) or when assessing the presence of circulation to the brain
4. **Apical:** at the apex of the heart; **Indicated for:**
 - a) Clients with irregular or unavailable peripheral pulse.
 - b) Clients with cardiovascular, pulmonary, and renal diseases.
 - c) Prior to administration medication that affect heart rate.
 - d) Assess pulse for newborns, infants, and children up to 2-3 years of old.

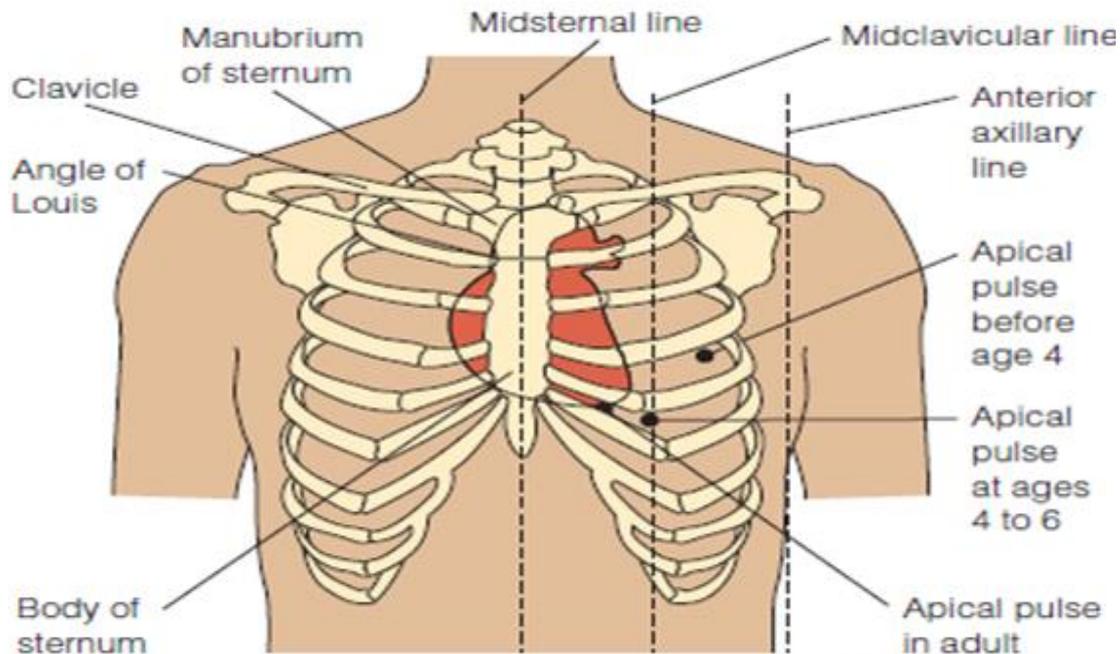
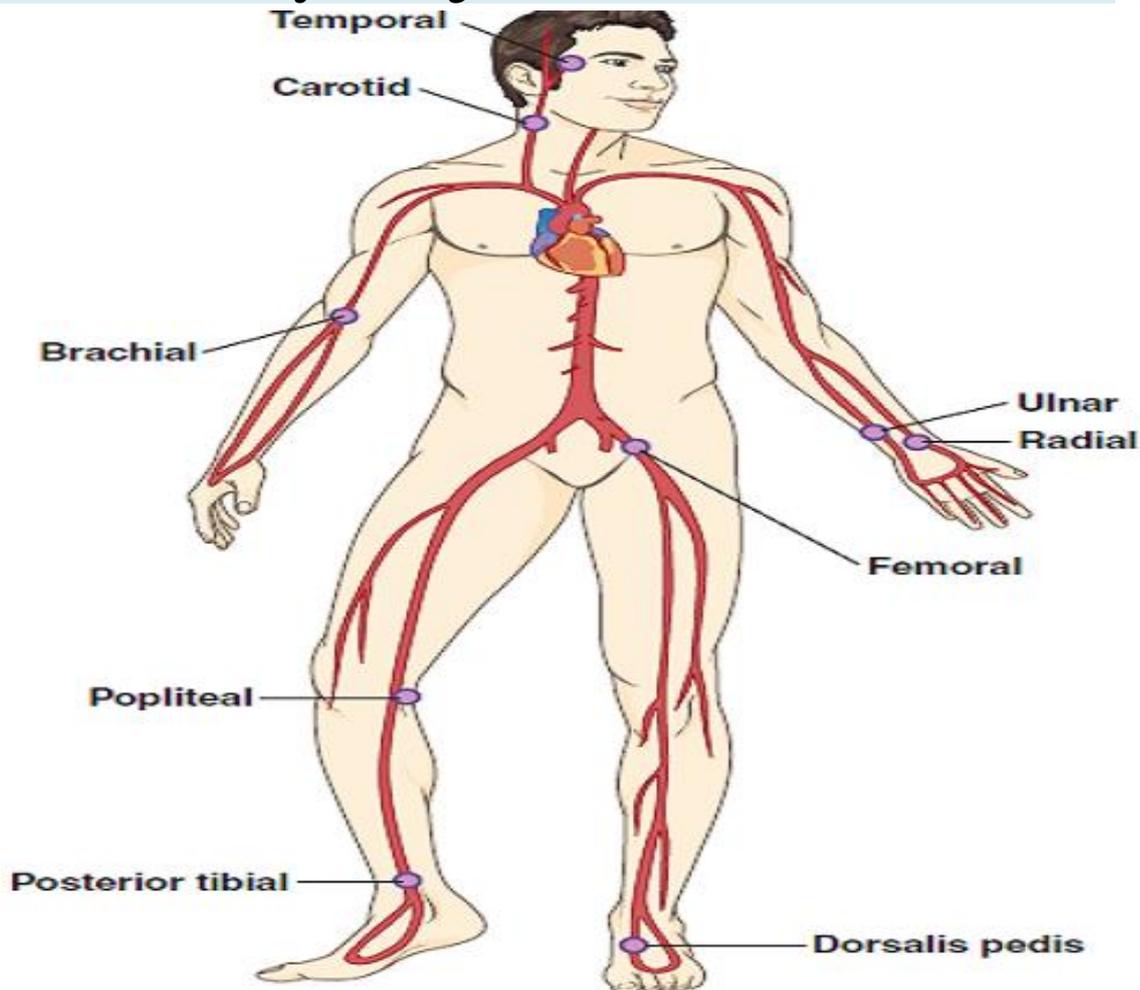


Figure ■ Location of the apical pulse for a child under 4 years, a child 4 to 6 years, and an adult.

5. **Brachial:** inner aspect between biceps and triceps muscles, used to measure blood pressure and during cardiac arrest for infants.
6. **Femoral:** alongside the inguinal ligament, used in cases of cardiac arrest/shock, and to determine circulation to a leg
7. **Popliteal:** behind the knee, used to determine circulation to the lower leg.
8. **Posterior tibial:** on the medial surface of the ankle, used to determine circulation to the foot.
9. **Dorsalis pedis (pedal):** Over instep, midpoint between extension tendons of great and second toe, used to determine circulation to the foot. Inspect the feet for color, temperature, and presence of edema, also observe condition of the client's toenails and cuticles. Always check pedal pulse bilaterally for comparison. Avoid documenting "absent pedal pulses" because the pulses may actually be present, but are not detectable manually; this is an instance in which the Doppler might be used.

Measuring and recording vital signs

Instructor: Hassan Abdullah Athbi



Peripheral pulse sites. (From Wilkinson and Treas [2011].

Fundamentals of nursing, Vol. 1, 2nd ed. Philadelphia: F. A. Davis

NOTE:



When assessing the pulse, the nurse should collect the following data:

- ✓ Rate,
- ✓ Rhythm,
- ✓ Volume,
- ✓ Arterial wall elasticity, and
- ✓ Presence or absence of bilateral equality.



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.



Never press both carotid artery at the same time because this can cause a reflex drop in blood pressure or pulse rate, so could cut off circulation to the brain, possibly causing a cerebrovascular accident (CVA, stroke).



Pulse deficit: Difference between apical and radial rates (apical rate minus radial rate).

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Factors affecting pulse rate:

1. **Age:** as age increased, the pulse rate gradually decreased.
2. **Gender:** after puberty, the average males PR slightly lower than female's.
3. **Exercise:** Pulse rate increase with activity, because of the increase in BMR and the increased demand for oxygen and nutrients at the cellular level; stroke volume and cardiac output increase.
4. **Medication:** some medication decrease PR (e.g., digoxin, antihypertensives) and others medications increase PR (e.g., epinephrine, theophylline, and atropine).
5. **Body temperature:** With a fever, each degree of Fahrenheit increases heart rate by 10 beats/minute to compensate for the decreased BP associated with vasodilation and increased BMR. When the body cools, each degree of Fahrenheit decreases the heart rate by 10 beats/minute because BMR slows.
6. **Blood volume:**
 - A. Increased blood volume (hypervolemia): Pulse is full and bounding, Commonly caused by fluid volume excess or excess IV fluids.
 - B. Decreased blood volume (hypovolemia): Pulse is weak or thready; rate increases to transport more oxygen to body cells. Commonly caused by decreased fluid volume related to dehydration or hemorrhage
7. **Stress, fear, anxiety and severe pain:** increase pulse rate as a result of sympathetic stimulation.
8. **Pathological processes:** for example, obstructive pulmonary diseases and hypoxia increase the heart rate; cardiovascular disease may increase or decrease the heart rate or make it irregular.

**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)

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