Tachycardia & bradycardia don’t forget clinical settings

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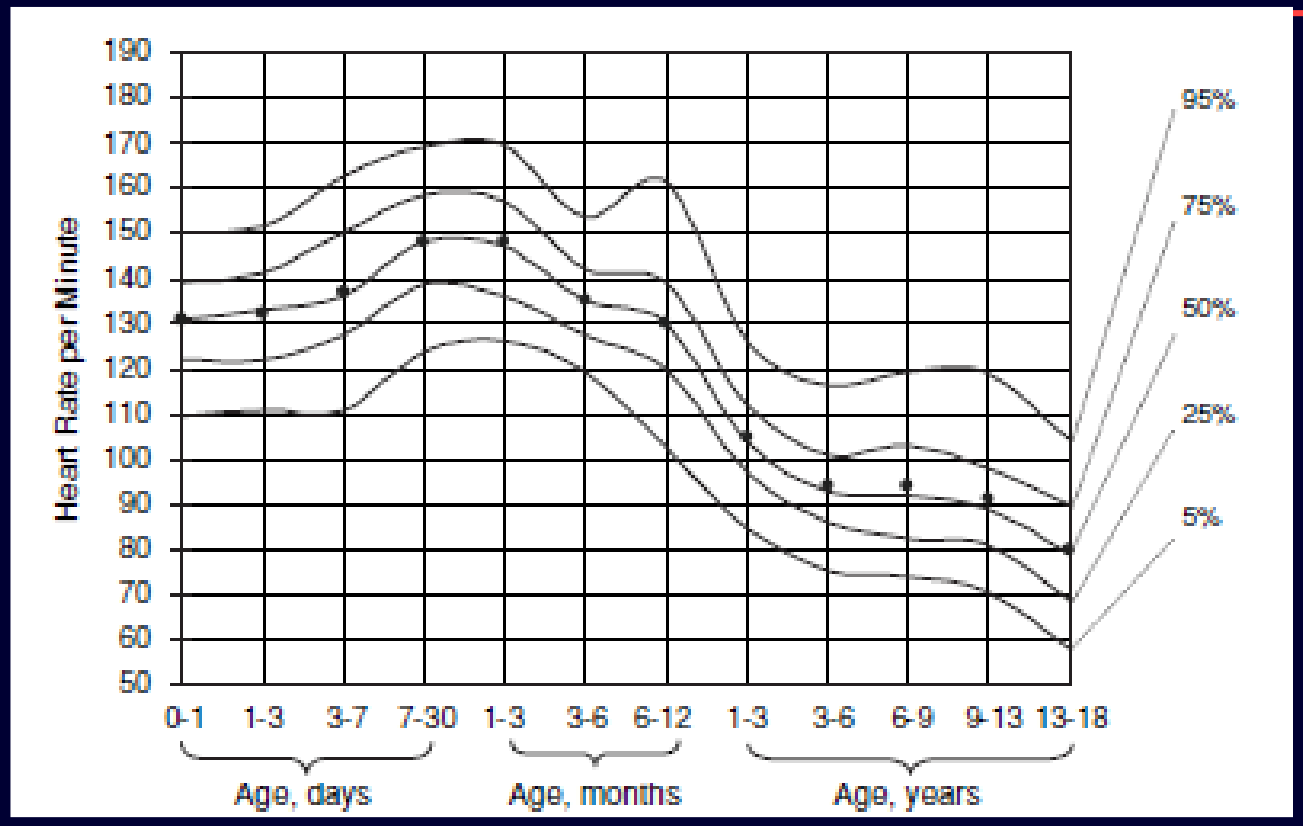
Heart rate by age



	Days				Months			Years				
Age	*0–1*	*1–3*	*3–7*	*7–30*	*1–3*	*3–6*	*6–12*	*1–3*	*3–6*	*6–9*	*9–13*	*13–18*
95%	150	152	163	169	169	154	161	126	117	119	119	105
Mean	**131**	**132**	**137**	**148**	**148**	**135**	**130**	**105**	**94**	**94**	**91**	**80**
(±SD)	**12.86**	**13.07**	**15.91**	**15.58**	**14.66**	**11.70**	**18.67**	**13.09**	**11.96**	**14.68**	**14.08**	**14.50**
5%	109	111	111	124	126	120	103	85	75	74	70	58
(N)	109	128	95	100	113	91	97	113	107	99	289	510

Heart rate by age, each curve corresponding to the indicated percentile level (•= mean). Striking changes in heart rate are noted from new born to adolescence. The heart rate increases from birth to ages 7–30, days and 1–3 months. From that age forward, the heart rate decreases with increasing age, most rapidly from age 6–12 months to 1–3 years.

Resting heart rate

- **Heart rate** is the speed of the heartbeat measured by the number of contractions (beats) of the heart per minute (bpm). It is usually equal or close to the pulse measured at any peripheral point.

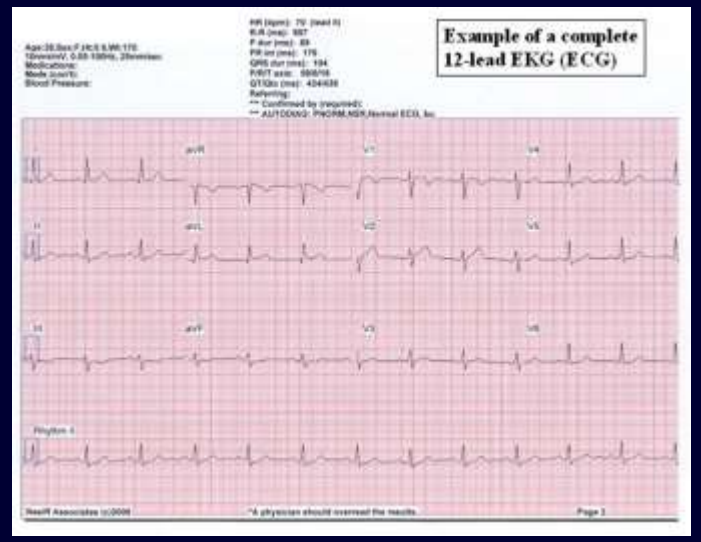
- The basal or resting heart rate (HR_{rest}) is defined as the heart rate when a person is awake, in a neutrally temperate environment, and has not been subject to any recent exertion or stimulation, such as stress or surprise. A large body of evidence indicates that the normal range is 60-100 beats per minute

Tachycardia	**Tachycardia**, also called **tachyarrhythmia**, is a heart rate that exceeds the normal resting rate. **A resting heart rate over 100 beats per minute** is accepted as tachycardia in adults
Bradycardia	**Bradycardia** is a condition wherein an individual has a very slow heart rate, typically defined as a **resting heart rate of under 60 beats per minute (BPM) in adults**

During sleep a slow heartbeat with rates around 40–50 bpm is common and is considered normal

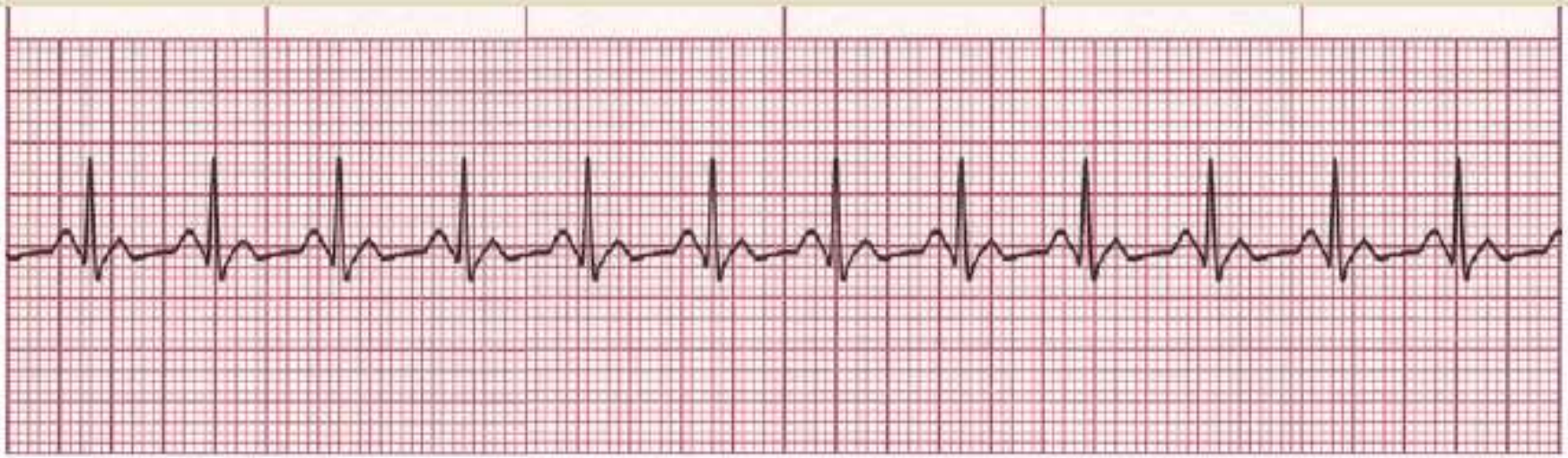
How to diagnosed ?

- **Manual measurement**
  - Heart rate is measured by finding the pulse of the heart
- **Electronic measurement**
  - A more precise method of determining heart rate involves the use of an electrocardiograph, or ECG
  - Alternative methods of measurement include pulse oximetry



SINUS TACHYCARDIA

- The SA node discharges more frequently than in NSR.



Rate: Fast (>100 bpm)

Rhythm: Regular

P Waves: Normal (upright and uniform)

PR Interval: Normal (0.12–0.20 sec)

QRS: Normal (0.06–0.10 sec)

Major factors increasing heart rate and force of contraction

Factor	Effect
Cardioaccelerator nerves	Release of norepinephrine
Proprioreceptors	Increased rates of firing during exercise
Chemoreceptors	Decreased levels of O_2; increased levels of H^+, CO_2, and lactic acid
Baroreceptors	Decreased rates of firing, indicating falling blood volume/pressure
Limbic system	Anticipation of physical exercise or strong emotions
Catecholamines	Increased epinephrine and norepinephrine
Thyroid hormones	Increased T3 and T4
Calcium	Increased Ca^{2+}
Potassium	Decreased K^+
Sodium	Decreased Na^+
Body temperature	Increased body temperature
Nicotine and caffeine	Stimulants, increasing heart rate

Tachycardia

Tachycardia is a resting heart rate more than 100 beats per minute

Physiological conditions where tachycardia occurs:

- Exercise
- Pregnancy
- Emotional conditions such as anxiety or stress.

Pathological conditions where tachycardia occurs:

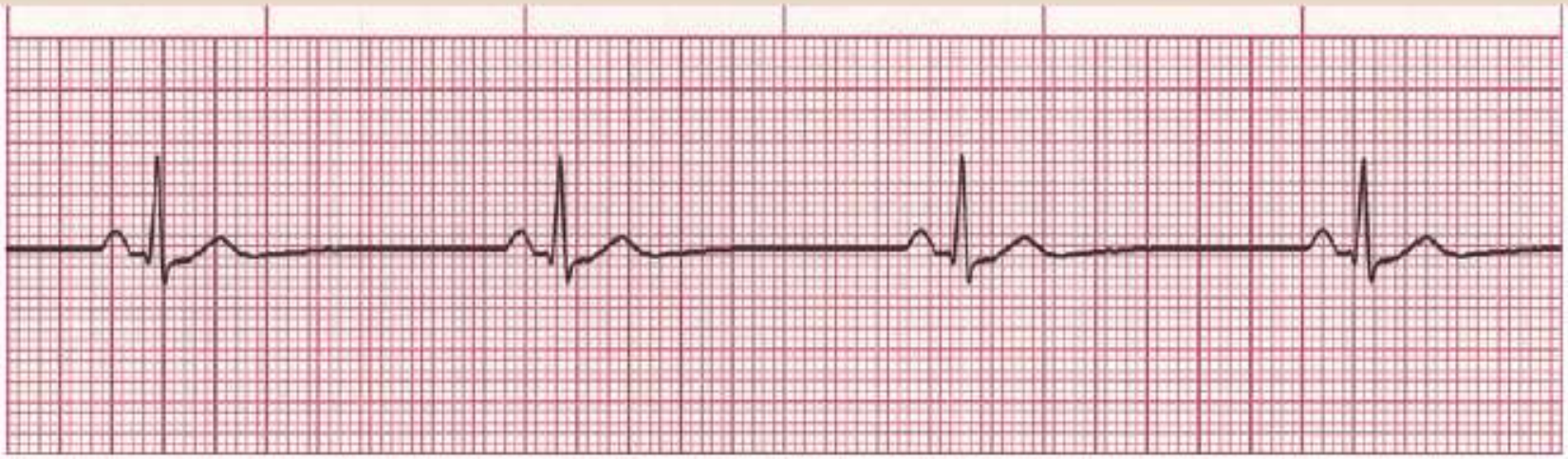
- Sepsis
- Fever
- Anemia
- Hypoxia
- Hyperthyroidism
- Hypersecretion of catecholamines
- Cardiomyopathy
- Valvular heart diseases
- Acute Radiation Syndrome

Drugs causing tachycardia

- Epinephrine & Norepinephrine
- Sudden withdrawal of Beta Blockers
- Caffeine
- Calcium Ch blockers (First generation)
- Atropine

SINUS BRADYCARDIA

- The SA node discharges more slowly than in NSR.



Rate: Slow (<60 bpm) **Rhythm:** Regular

P Waves: Normal (upright and uniform) **PR Interval:** Normal (0.12–0.20 sec) **QRS:** Normal (0.06–0.10 sec)

few patients actually become symptomatic until their heart rate drops to less than 50 beats per minute

Factors decreasing heart rate and force of contraction

Factor	Effect
Cardioinhibitor nerves (vagus)	Release of acetylcholine
Proprioreceptors	Decreased rates of firing following exercise
Chemoreceptors	Increased levels of O_2; decreased levels of H^+ and CO_2
Baroreceptors	Increased rates of firing, indicating higher blood volume/pressure
Limbic system	Anticipation of relaxation
Catecholamines	Decreased epinephrine and norepinephrine
Thyroid hormones	Decreased T3 and T4
Calcium	Decreased Ca^{2+}
Potassium	Increased K^+
Sodium	Decreased Na^+
Body temperature	Decrease in body temperature

Betts, J. Gordon (2013). *Anatomy & physiology*. pp. 787–846. ISBN 1938168135. Retrieved 11 August 2014

Causes of Bradycardia

Intrinsic causes	Extrinsic causes
Sick sinus syndrome	Drugs
Conduction system disease	Autonomic influences
Coronary artery disease	Electrolyte disturbances
Cardiomyopathy	Hypothyroidism
Infiltrative disorders	Stroke
Collagen vascular disease	Increased intracranial pressure
Inflammatory processes	Hypothermia
Surgical trauma	Sepsis
	Athletic heart

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- Miguel Indurain, a Spanish cyclist and five time Tour de France winner, had a resting heart rate of 28 beats per minute, one of the lowest ever recorded in a healthy human.

- Daniel Green achieved the world record for the slowest heart beat in a healthy human with a heart rate of just 26 bpm in 2014

Slowest heart rate: Daniel Green breaks Guinness World Records record". World Record Academy. 29 November 2014.

Causes of Relative Bradycardia

Table 1. Causes of Relative Bradycardia*

Infectious		Noninfectious
Legionella	Malaria	β-Blockers
Psittacosis	Leptospirosis	CNS lesions
Q fever	Yellow fever	Lymphomas
Typhoid fever	Dengue fever	Factitious fever
Babesiosis	Viral hemorrhagic fevers	Drug fever
	Rocky Mountain spotted fever	

**Patient has normal sinus rhythm without arrhythmia, second- or third-degree heart block, or pacemaker-induced rhythm; patient must not be taking β-blocker medication. CNS indicates central nervous system. This table is adapted with permission from Cunha BA. Diagnostic significance of relative bradycardia.* Infect Dis Pract. *1997;21:38-40.*

Relative bradycardia in infectious diseases

- Relative bradycardia in infectious diseases is a poorly defined term. No exact and useful definition exists and the underlying mechanisms are unknown
- Relative bradycardia as a characteristic feature of specific disease was found for typhoid fever (P = 0.003), Legionnaire's disease (P = 0.005), and pneumonia caused by Chlamydia sp. (P = 0.0005), but not for mycoplasma pneumonia.
- It was not found for other pulmonary infections, infections caused by other Salmonella sp., other extracellular Gram-negative infections, or viral infections.
- Thus, relative bradycardia as a clinical sign has no predictive value for obtaining a tentative diagnosis, but relative bradycardia as a feature of specific disease is seen in typhoid fever, Legionnaire's disease, and pneumonia caused by Chlamydia sp.

J Infect. 1996 Nov;33(3):185-91.

Faget sign

- Sometimes called **sphygmothermic dissociation** — is the unusual pairing of fever with bradycardia. (Fever is usually accompanied by tachycardia (rapid pulse), an association known by the eponym "Liebermeister's rule".) The Faget sign is named after Louisiana physician Jean Charles Faget, who studied yellow fever in Louisiana.
- Faget sign is often seen in:
- Yellow fever,Typhoid fever,Brain abscess,Tularaemia,Brucellosis
  Some pneumonias - Legionella pneumonia and Mycoplasma pneumonia
- Drug fever (e.g. beta-blockers, known as the Beta-Faget sign)
- Of note, the Faget sign in bacterial infections is consistently associated with bacteria that have an intracellular life cycle.

Drugs causing Bradycardia

AV blocking agents	Beta-blockers
	Calcium channel blockers
Cardiac glycosides	Digoxin
Cholinergic agents	Organophosphates (including nerve agents)
Antihypertensive agents	Clonidine
Antiarrythmics	Quinidine
Antipsychotic agents such as lithium	Amitriptyline

Sinus bradycardia after bariatric surgery

- There are anecdotal reports of unexplained sinus bradycardia (SB) after significant weight loss, but no systematic studies have been conducted.
- Twenty-five of 137 patients (18%) experienced postoperative SB. Patients with SB had significantly greater reduction in body mass index (BMI) than in those without bradycardia.

- Thanks