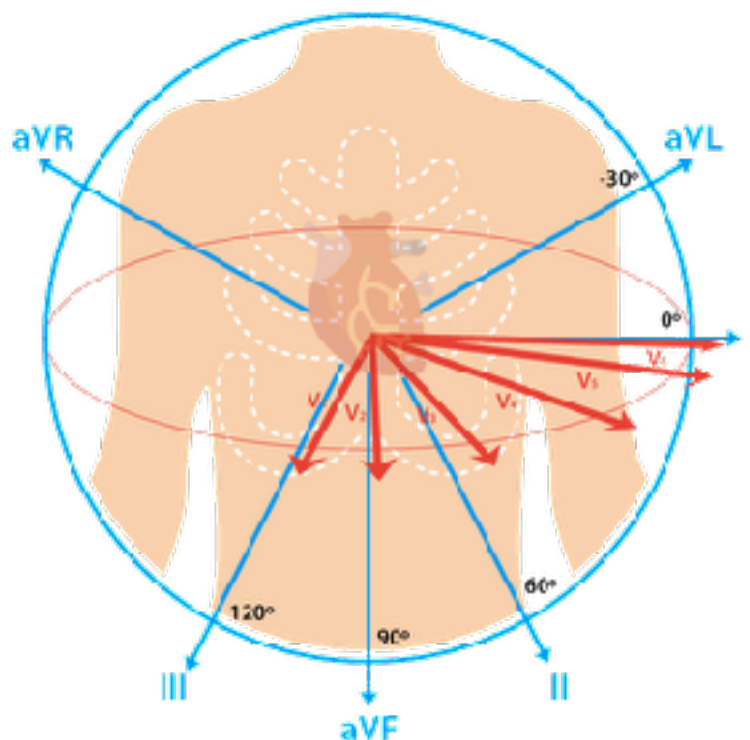


Cardiology

ECG Infos

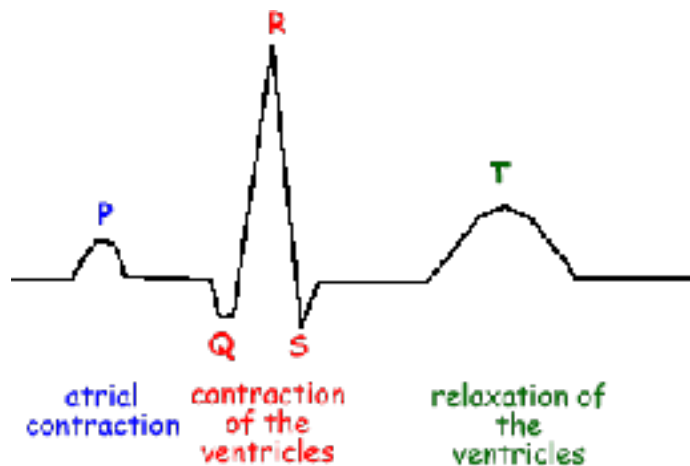
- Difference between ECG and EKG
 - There is no difference at all
- Things an ECG can detect
 - Cholesterol clogging up your heart's blood supply
 - A heart attack in the past
 - Enlargement of one side of the heart
 - Too thick walls of the heart chambers
 - Abnormal heart rhythms
 - How well mechanical devices (e.g. pacemakers) are working
 - The cause of heart diseases in general
- General procedure/infos
 - Leads from an electrocardiograph machine are attached to the skin on your arms, legs and chest using sticky patches. These leads read signals from your heart and send this information to the electrocardiograph. An ECG checks the heart's electrical activity.
 - If the cardiac current flows in the same direction as the direction of the lead, the ECG "line" is deflected strongly upward. If the current flows obliquely to lead axis, the "line" is deflected less strongly upward, depending on the angle between flow and lead axis (no deflection if perpendicular; opposite directions means strong deflection downward). No current means no deflection.
 - ECG machines usually draw 25 or 50 mm in a second
 - Major grid lines are separated by 5 mm, so this would, in 25mm/s scenario, represent 0.2s (minor grid lines -> 1 mm & 0.04s)
 - Horizontal axis represents the voltage (0.1 mV per mm of deflection)
 - Formula to measure heart beats (25mm/s machine)
 - $(25 \text{ mm/s} * 60) / \text{number of mm between beats}$
 - Types of ECG

- Resting ECG
 - Recorded while lying down
- Exercise ECG
 - Recorded while running on a treadmill or cycling a bike
- 24-hour ECG
 - Heartbeat is monitored throughout the day
 - Patient wears a small electrocardiograph machine
- 12-Lead ECG
 - Tracing of 12 different “electrical positions” of the heart
 - Two electrical planes are monitored; vertical and horizontal planes
 - Types of leads



- 6 limb leads: I, II, III (bipolar leads) and aVR, aVL, aVF (unipolar, augmented voltage leads). Used to determine QRS complex and are responsible for the vertical plane.
- 6 chest leads: V1, V2, V3, V4, V5, V6 (unipolar and responsible for the horizontal plane).

- Types of waves and segments



- P Wave
 - Deals with the sequential activation (depolarisation) of the right and left atria (upper two heart chambers).
- PR Segment
 - Important to remember is that segments are a different concept than intervals. Segments are used to analyze the change from the isoelectric (middle) line (elevation or depression). The single important factor in intervals is the duration.
 - Abnormalities of the PR segment are not very common, they can indicate certain cardiac disease states.
- Q Wave
 - The normal individual will have a small Q wave in many, but not all, ECG leads.
- R Wave
- S Wave
- QRS Complex
 - Relates to the right and left ventricular (bottom two larger heart chambers) depolarisation. Both are usually activated simultaneously.
 - The normal duration (interval) of the QRS complex is between 0.08 and 0.10 seconds
- T Wave
 - Is a result of ventricular repolarization.

- QT Interval
 - In general, the normal QT interval is below 400 to 440 milliseconds
- ST Segment
 - The ST segment normally remains isoelectric
- TP Segment
- Standard approach for reading an ECG
 - Examining the rate
 - There are two different rates which should be the same in absence of disease. The atrial rate which is determined by the frequency of the P waves. The ventricular rate determined by the frequency of the QRS complexes.
 - Examining the rhythm
 - The P wave is checked to determine rhythm.
 - Examining the axis
 - The goal is to check the major direction of the overall electrical activity of the heart. It can be normal, leftward (left axis deviation, or LAD), rightward (right axis deviation, or RAD) or indeterminate (northwest axis).
 - Examining waves, segments and intervals
- Other ECG variants
 - 3-lead and 5-lead ECG
 - Often used to continuously monitor the heart rate and rhythm of a critical ill patient
- Sources
 - <https://www.practicalclinicalskills.com/12-lead-ecg-interpretation?courseid=311>
 - <https://www.cablesandsensors.eu/pages/12-lead-ecg-placement-guide-with-illustrations>
 - <https://ecg.utah.edu/lesson/1>
 - <https://www.healio.com/cardiology/learn-the-heart/ecg-review/ecg-interpretation-tutorial>