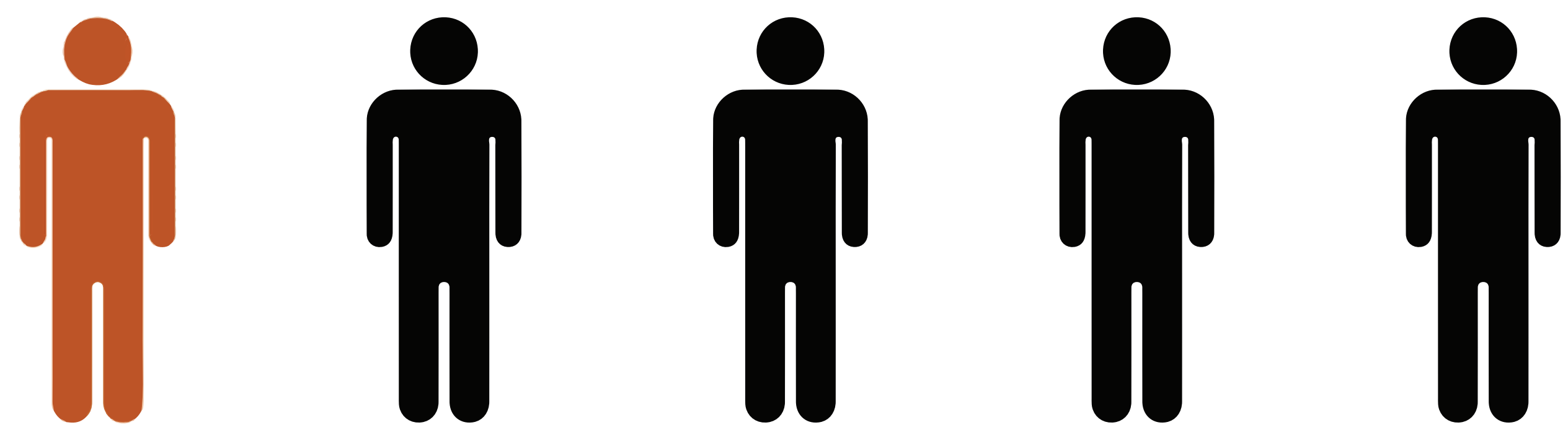




Introduction

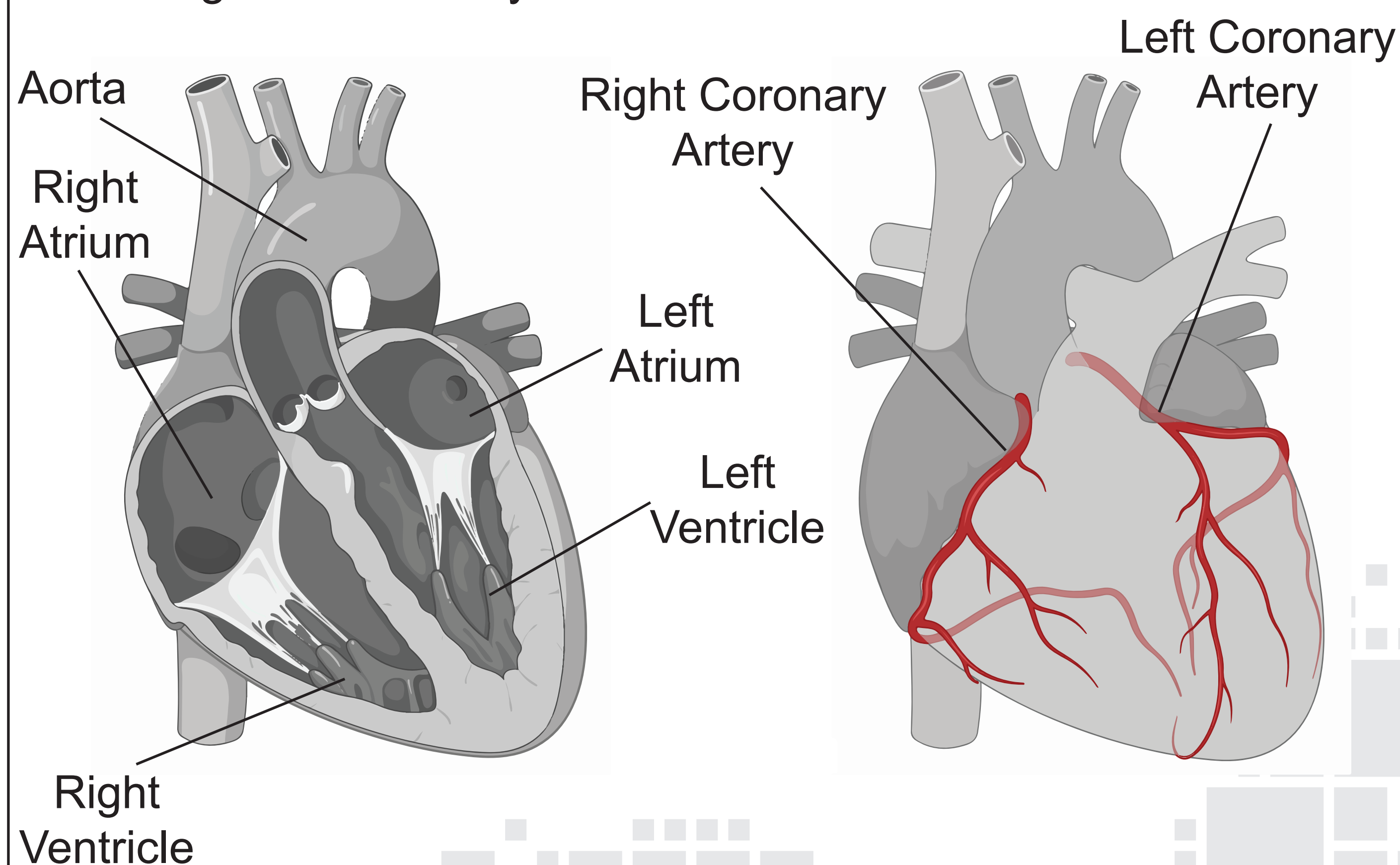
One person dies every 33 seconds in the United States from cardiovascular disease. About 695,000 people in the United States died from heart disease in 2021—that's 1 in every 5 deaths¹.



Our lab focuses on cardiac electrical problems at the tissue level in experimental and simulation settings. Some of the diseases studied include arrhythmias, myocardial ischemia, and sudden cardiac death.

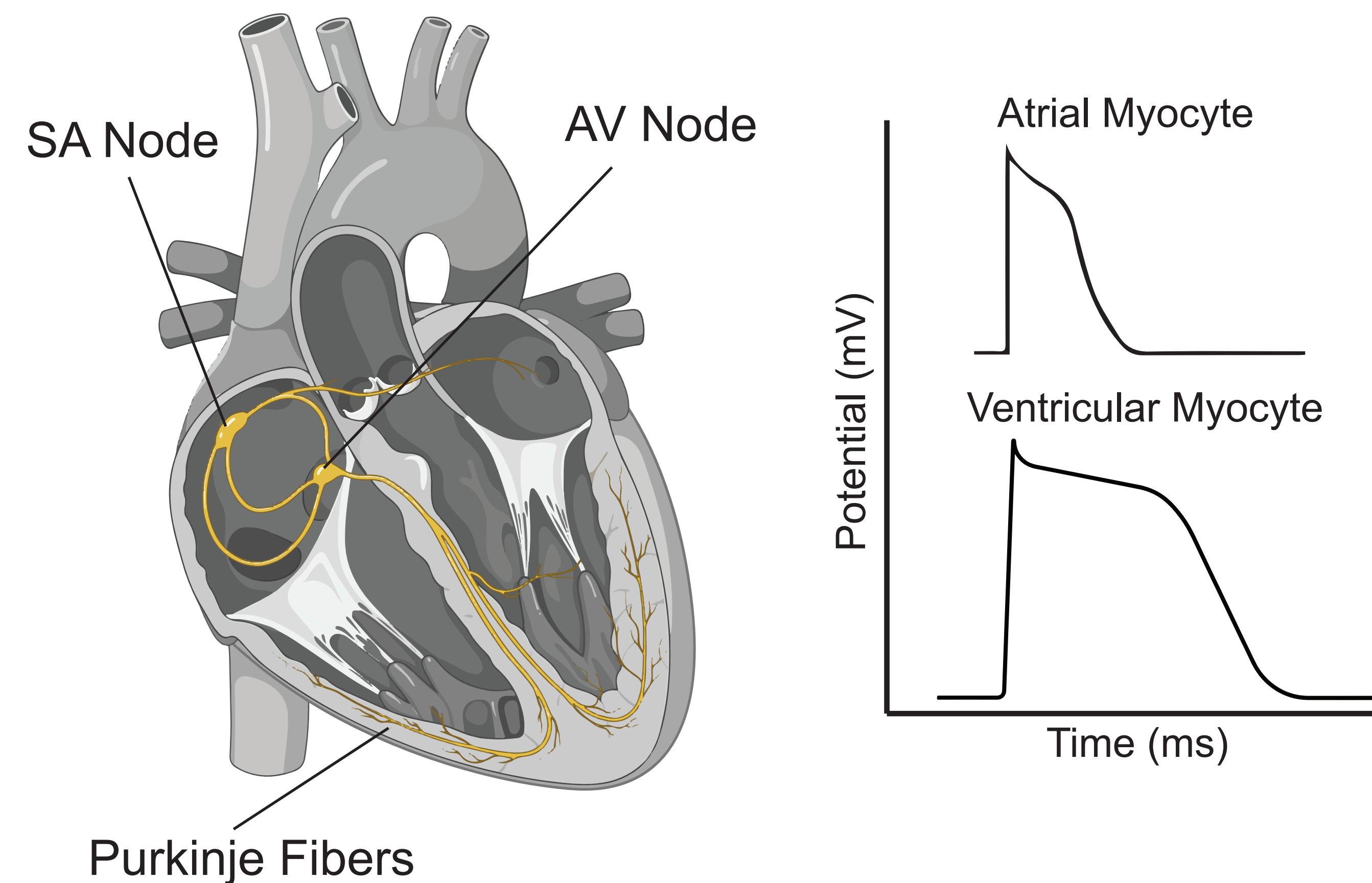
Cardiac Anatomy

The heart is comprised of four chambers, the atria and ventricles. The heart receives supply of oxygen and nutrients through the coronary arteries.



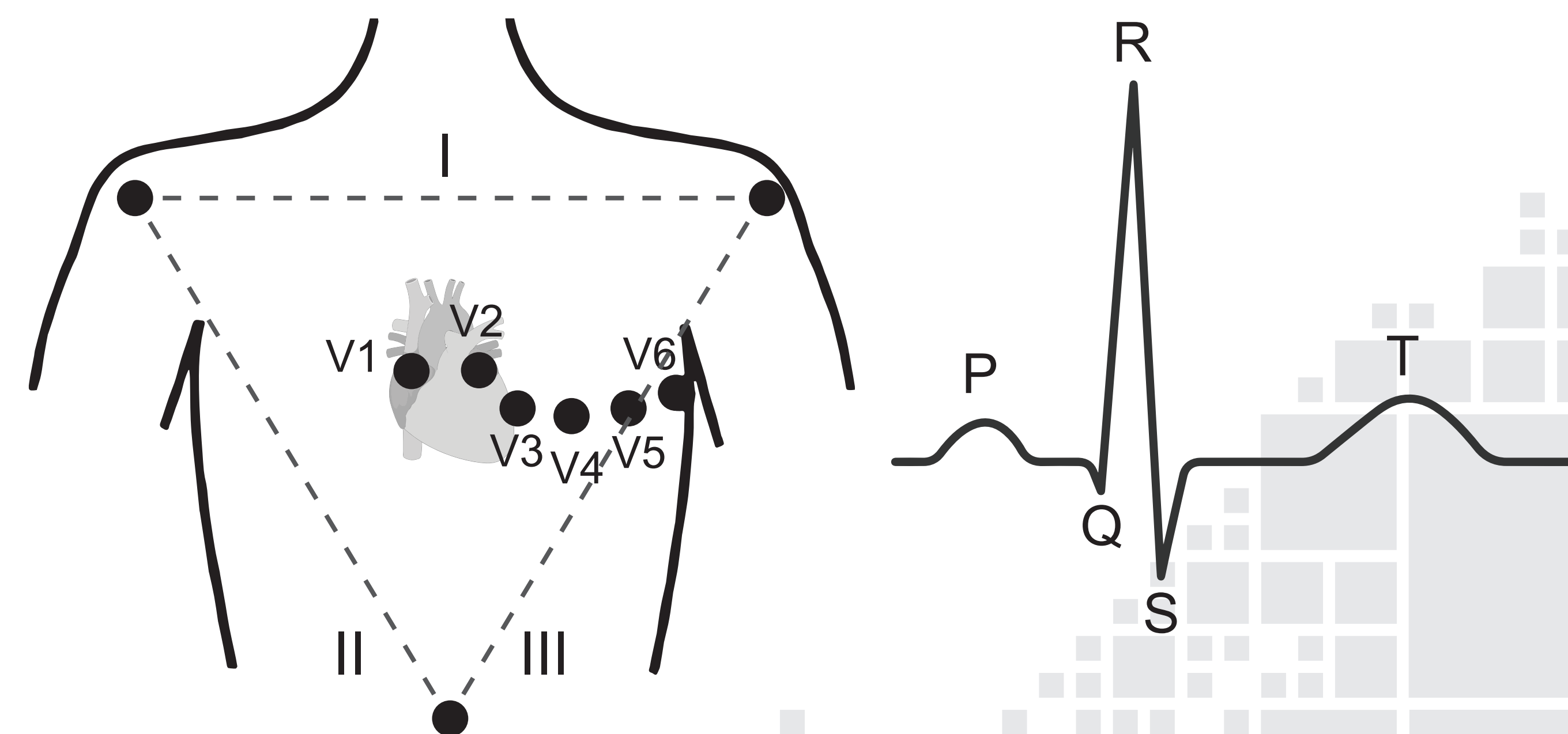
Electrical Activity

The heart is an electrical organ that generate contraction.



Electrocardiogram

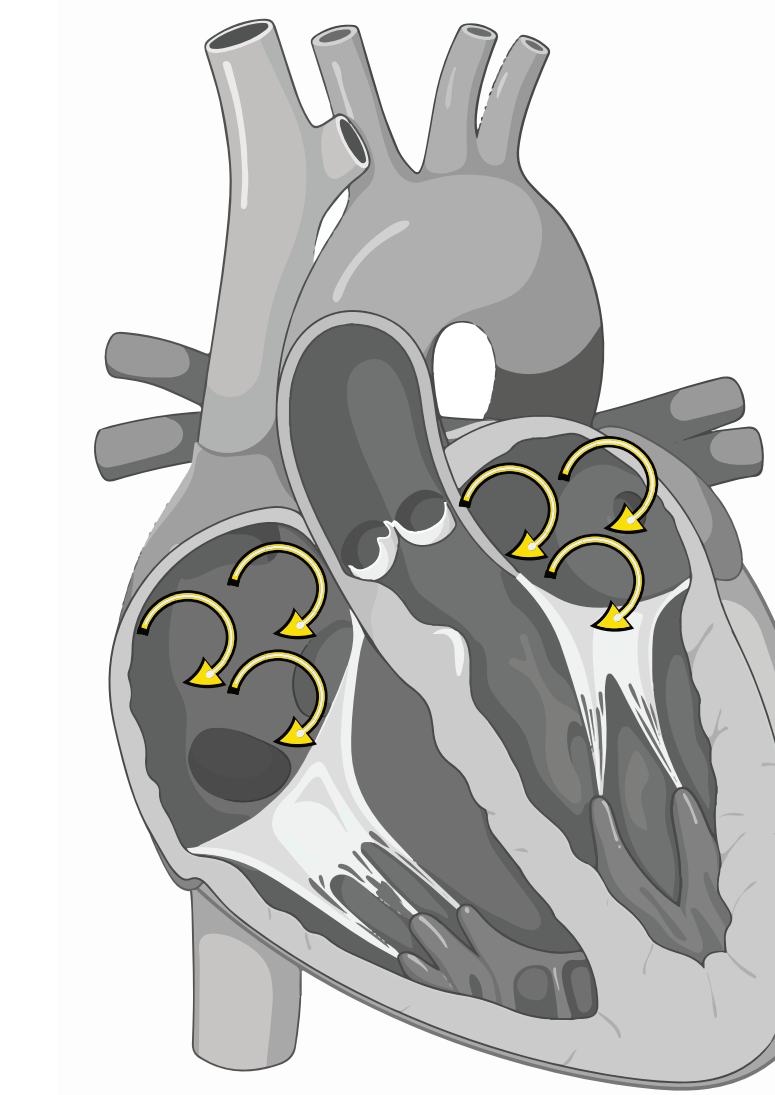
Electrical abnormalities can be diagnosed clinically with the 12 lead ECG. The ECG is widely used because it is cheap, easy to obtain, and non invasive.



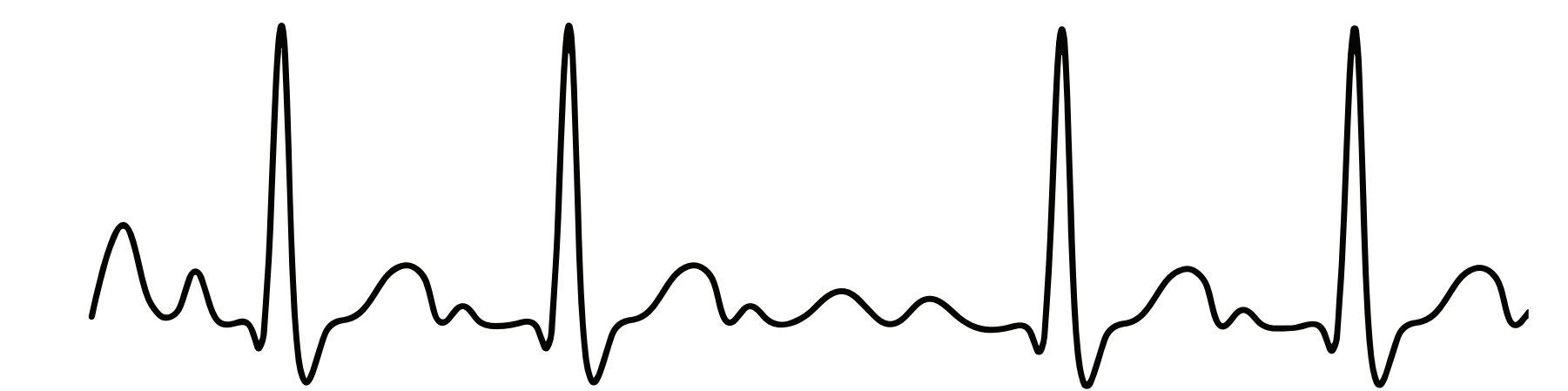
The ECG diagnostic accuracy varies widely depending on the disease state, ranging between 4% and 95%, with a median accuracy of 54%².

Cardiac Disease Examples

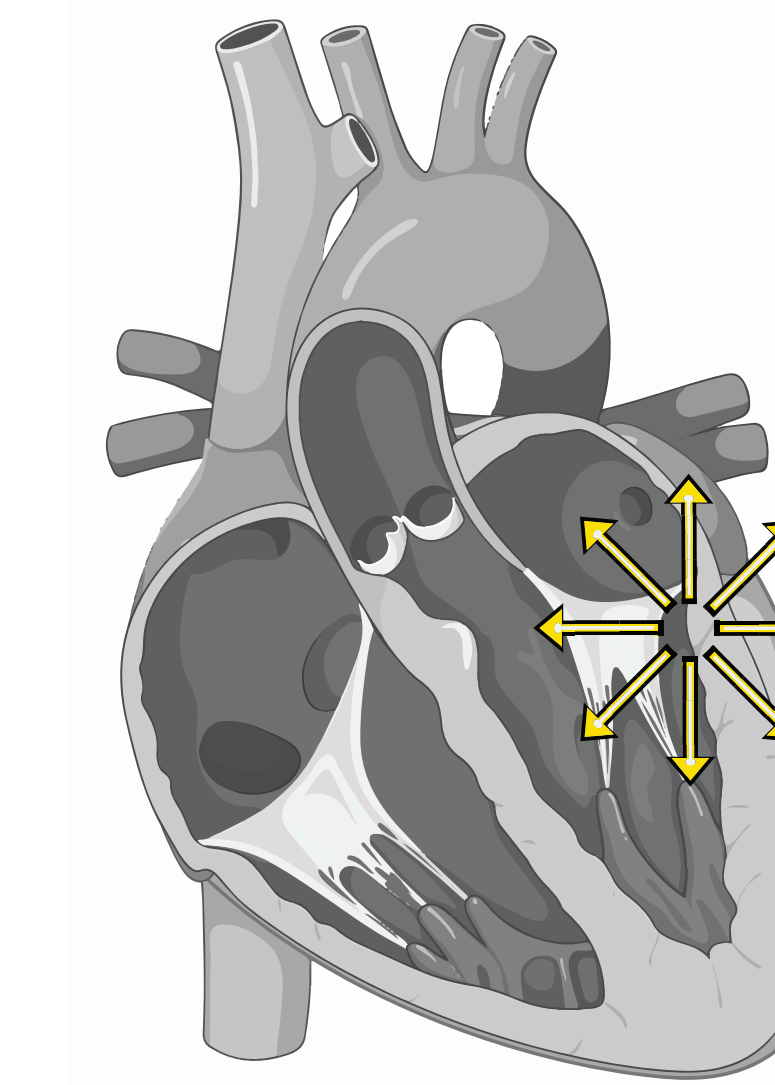
ATRIAL ARRHYTHMIAS



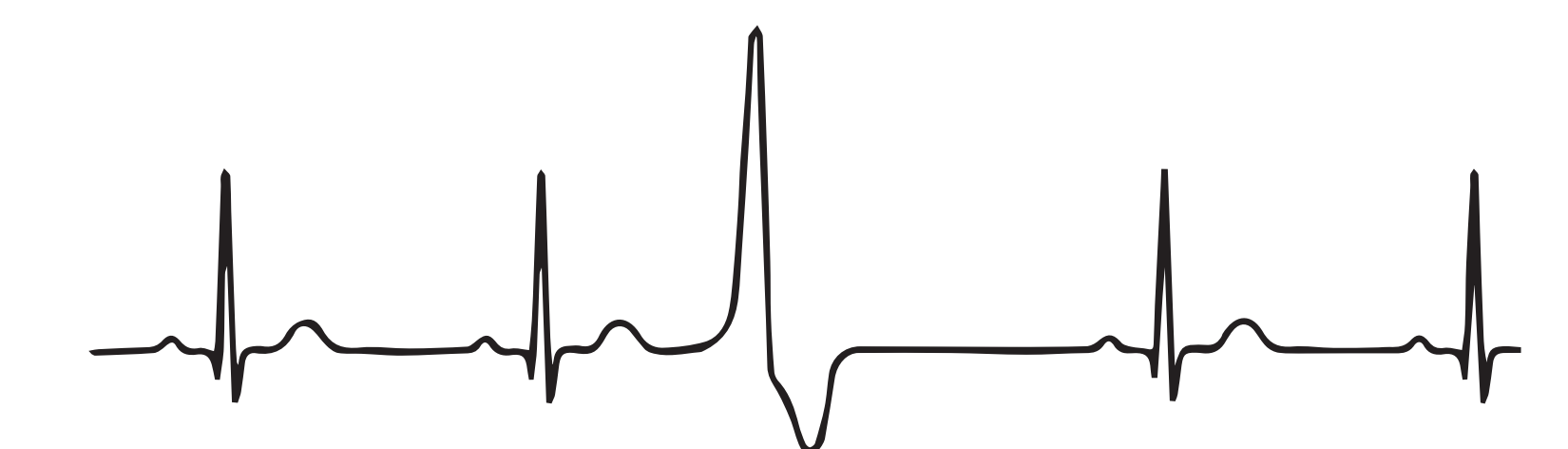
Atrial fibrillation (AF) is characterized by chaotic atrial activity leading to rapid and irregular heart rate. Often AF is treated by ablation procedures, however it is only successful in 70% of the patients³.



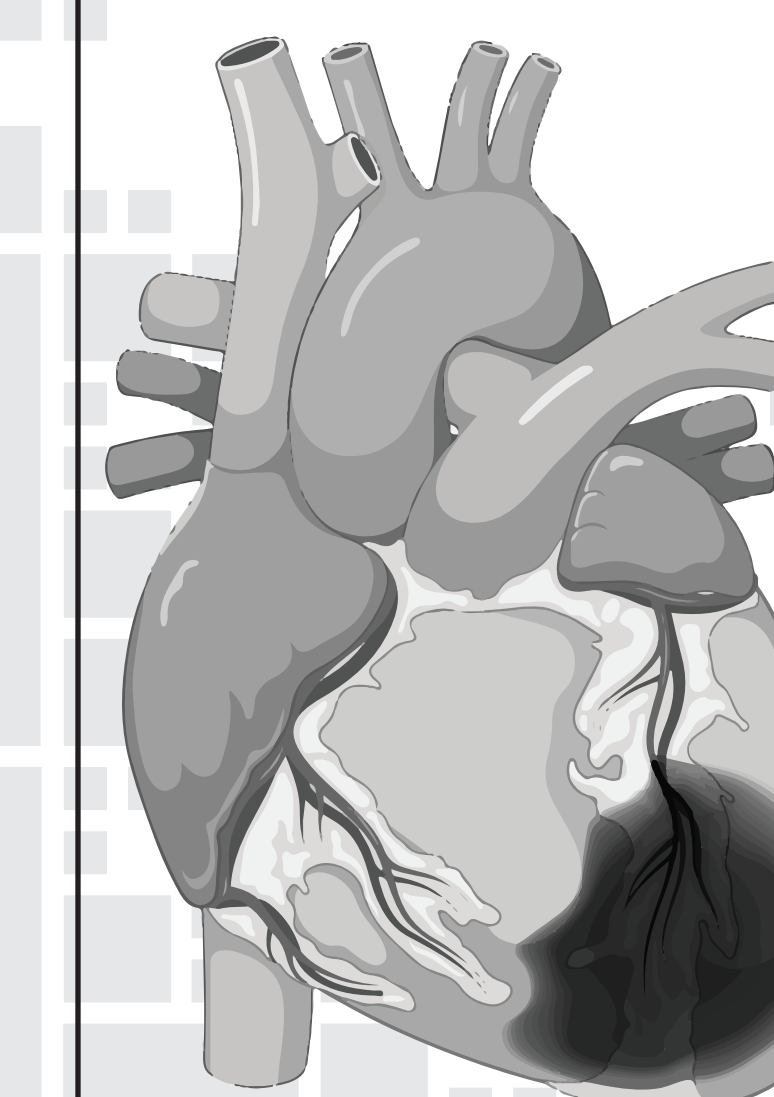
VENTRICULAR ARRHYTHMIAS



Premature ventricular contractions (PVCs) occur when the heartbeat is initiated from the ventricles, leading to uncoordinated contraction. PVC are common, however when they occur in conjunction with a substrate change, they can lead to fatal arrhythmias.



MYOCARDIAL ISCHEMIA



Myocardial ischemia (MI) develops when blood flow to the heart tissue is decreased, leading to electrical changes and potentially even tissue death.

