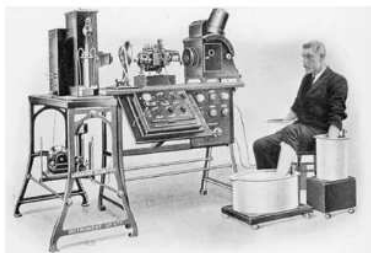
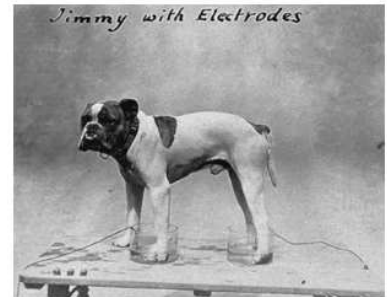


# Understanding 12-Leads

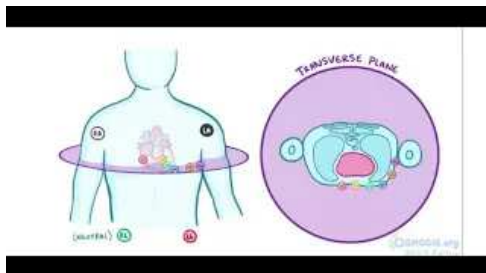
## Brief History of the Electrocardiogram

The electrocardiogram is an integral diagnostic tool. It is a rapid, reliable and cost-effective method to aid in the diagnosis of cardiac pathology including ischemic and arrhythmic events. Electrocardiography is not a new field of medicine. It began in the 19th century when the electrical activity of the heart was first recorded by Augustus Waller, who in 1887 recorded the curves of electrical activity using a capillary electrometer. At the First International Congress of Physiology in Basle, Switzerland, in 1889 Willem Einthoven witnessed a demonstration by Waller on his dog, Jimmy, who apparently sat patiently with his paws in glass jars of saline. Although Waller was able to record a heartbeat and the heart's electric pulses, the device was not accurate or precise, and it was slow in recording the pulses.



Einthoven wanted to develop a better device that could be used in clinical medicine. After three years of research and building prototypes, he introduced the string galvanometer to the field of electrocardiography. The string galvanometer comprised a thin, silver-coated quartz filament that passed between 2 electromagnets. An electric current passed through the filament and produced a movement that projected a shadow, which was magnified and projected on a running film sheet, which recorded the signal. The device measured the electrical signals more precisely, more accurately, and quicker than Waller's machine, due to the movement of the quartz fiber. This machine, much like Waller's, required patients to put their limbs into buckets of salt water. The filled buckets acted as electrodes to conduct the current from the skin's surface to the string galvanometer. The clinical recordings enabled Einthoven to characterize the shape of electrocardiograms as a number of successive waves. Einthoven also identified and coined the terms for *R*, *Q*, *R*, *S*, *T*, and *U* waves, which are components of the basic pattern of electrical activity on today's ECGs. While the modern ECG fulfills the same core functions it did more than a century ago, it has advanced in significant ways evolving from a three lead 600 lb machine that took 5 people to operate into the portable 12-lead electrocardiograms we use today.

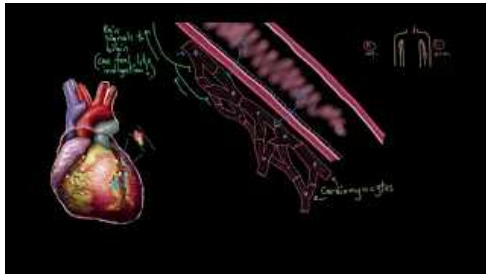
## How Modern Electrocardiograms Function



<https://youtu.be/yUmpTGai-Vk>

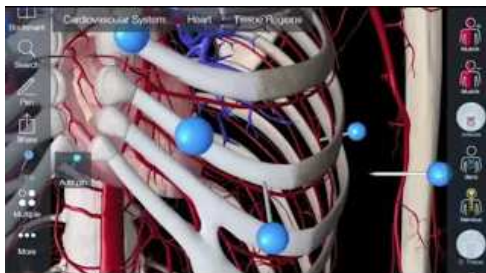
## Who Should Have a 12-Lead ECG

One of the most significant findings of myocardial infarction is the presence of ST segment elevation. The main purpose of the 12-lead ECG is to screen patients for possible cardiac ischemia. It assists EMS to quickly identify patients who have STEMI (ST elevation myocardial infarction) and perform appropriate medical intervention based on initial readings. The following video explains the pathophysiology of myocardial infarctions.



<https://youtu.be/Fgf76mB3w0M>

## 12- Lead Application



<https://youtu.be/drrOykVSahQ>

## Minimizing ECG Artifacts

<https://img1.wsimg.com/blobby/go/7186812a-ce10-4ac7-a580-9bbd784d9741/Minimizing%20ECG%20Artifacts.pdf>