

D.4 - The heart

Types of muscles

• Smooth muscle

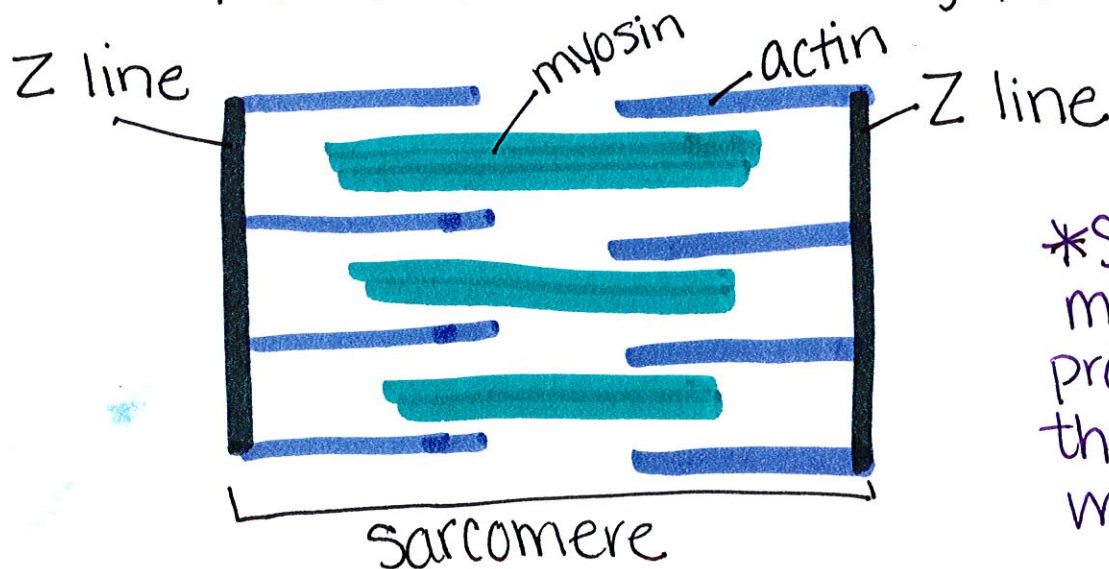
- involuntary
- found in digestive system
 - ex. esophagus

• Skeletal muscle

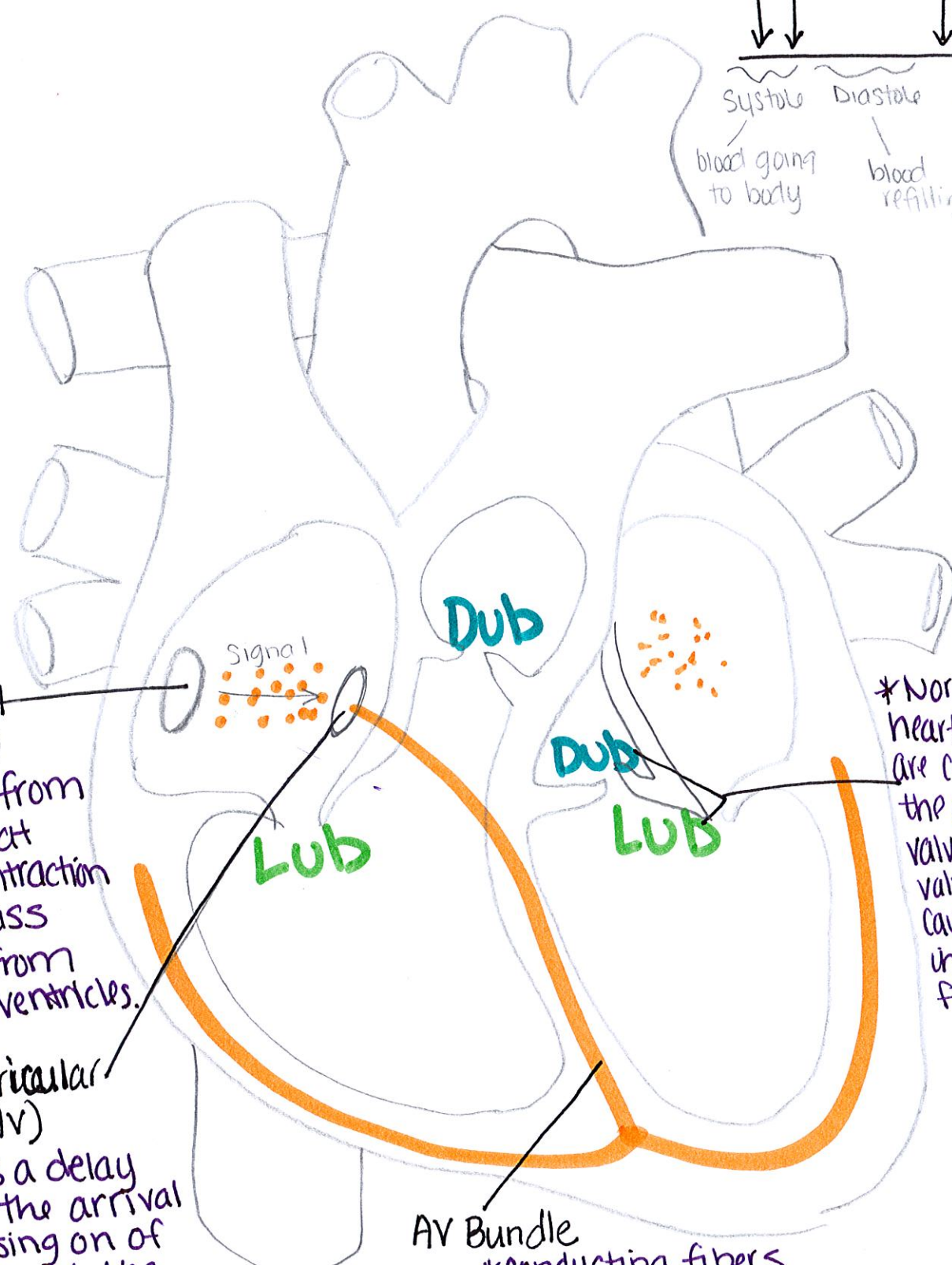
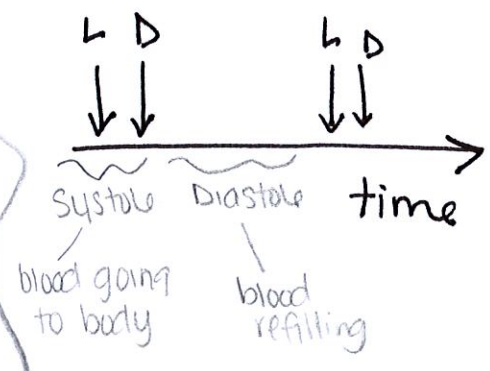
- voluntary
- striated (multiple nuclei)
- attached to bones via tendons

• Cardiac muscle

- involuntary
- thickened muscles, because they contract quickly
- contain sarcomeres
- Y-shaped, intercalated discs (gap junctions)



*Structure of cardiac muscle cells allows propagation of stimuli through the heart wall.



Sinoatrial node (SA)
 *Signals from the SA that cause contraction cannot pass directly from atria to ventricles.

Atrioventricular node (AV)
 *There is a delay between the arrival and passing on of a stimulus at the AV. ≈ 0.12 secs

*This delay allows time for atrial systole before the atrioventricular valves close.

AV Bundle
 *conducting fibers ensure coordinated contraction of the entire ventricle wall.

*Normal heart sounds are caused by the atrioventricular valves + semi-lunar valves closing causing changes in blood flow.

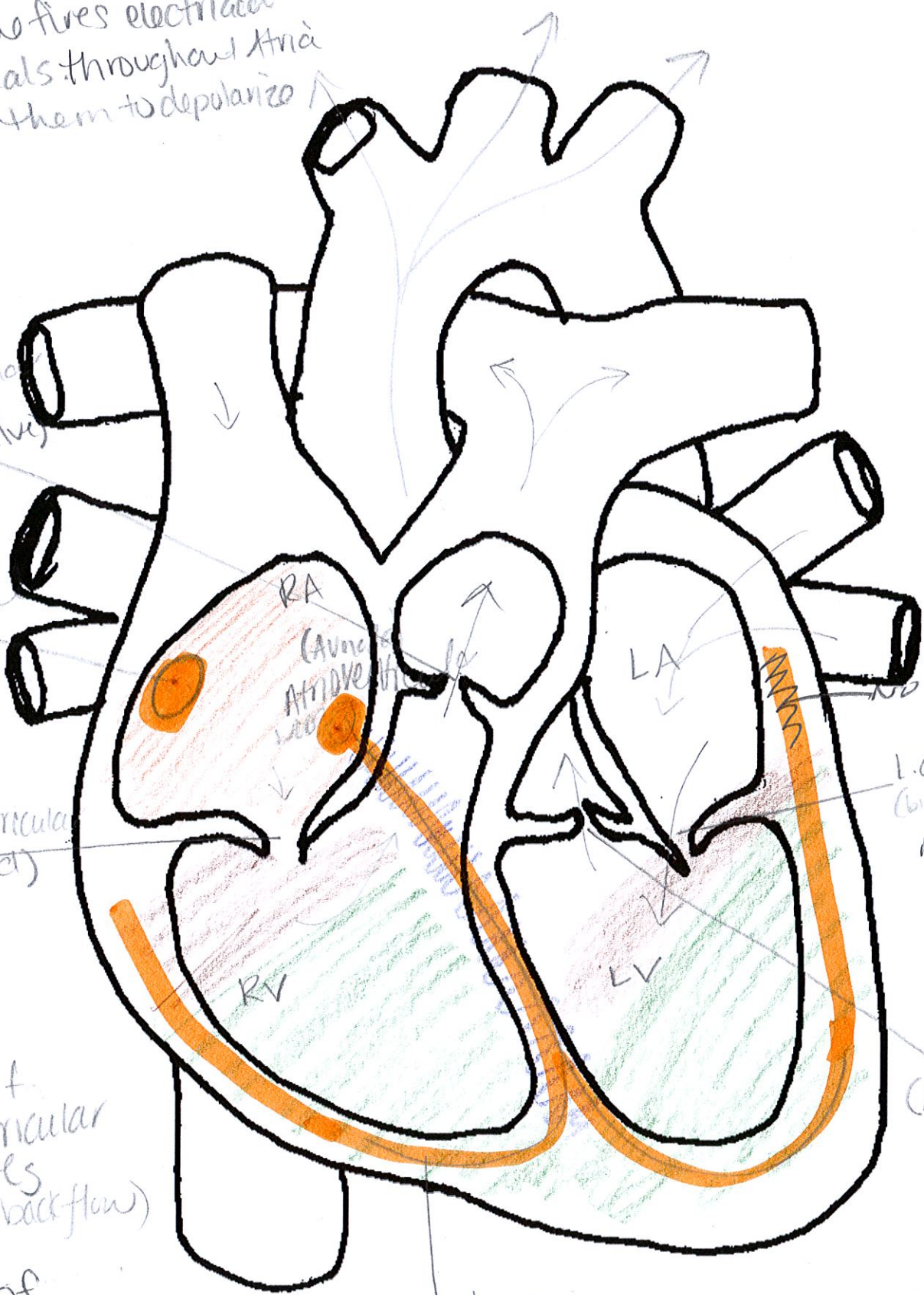
P-wave
 Atria full of blood
 SA node fires electrical
 signals throughout Atria
 Cause them to depolarize

R. semi-lunar
 (Pulmonary
 valve)

(SA Node)
 Sinus
 node
 (pace
 maker)
 & rate

R. atrioventricular
 (tricuspid)
 valve

"Lub"
 -closing of
 atrioventricular
 valves
 (to prevent back flow)
 "Dub"
 closing of
 semi-lunar
 valve
 (to prevent back flow)

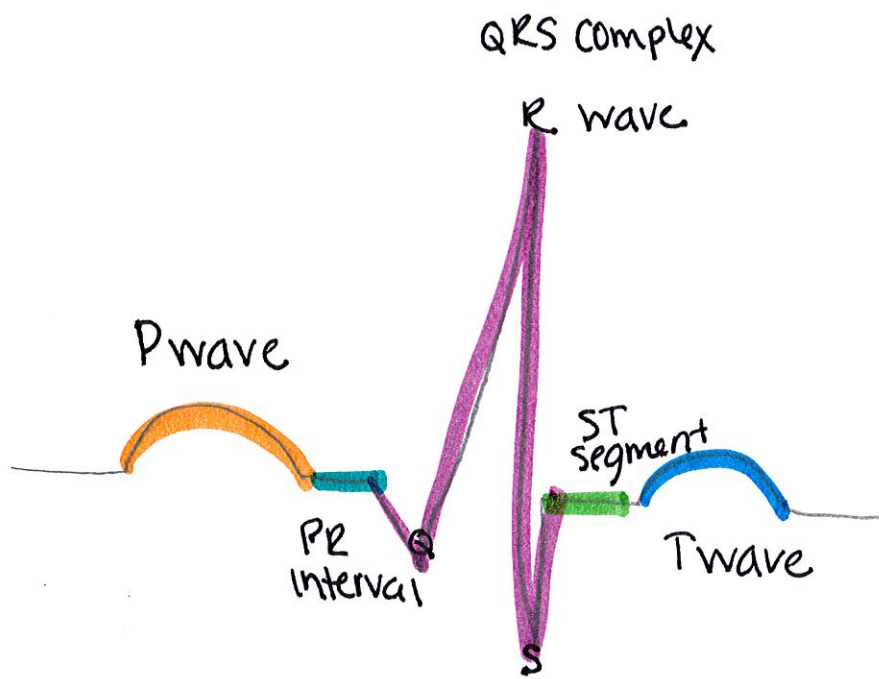


Conduct impulse

L. atrioventricular
 (bicuspid
 valve)
 Mitral

L. Semi-lunar
 (Aortic
 valve)

*Mapping of the cardiac cycle to a normal ECG trace.



P wave - depolarization of the atria in response to signaling from the sinoatrial node (atrial contraction)

QRS complex - depolarization of the ventricles (ventricular contraction), triggered by signals from AV node.

T wave - repolarization of the ventricles (ventricular relaxation) and the completion of a standard heart beat.

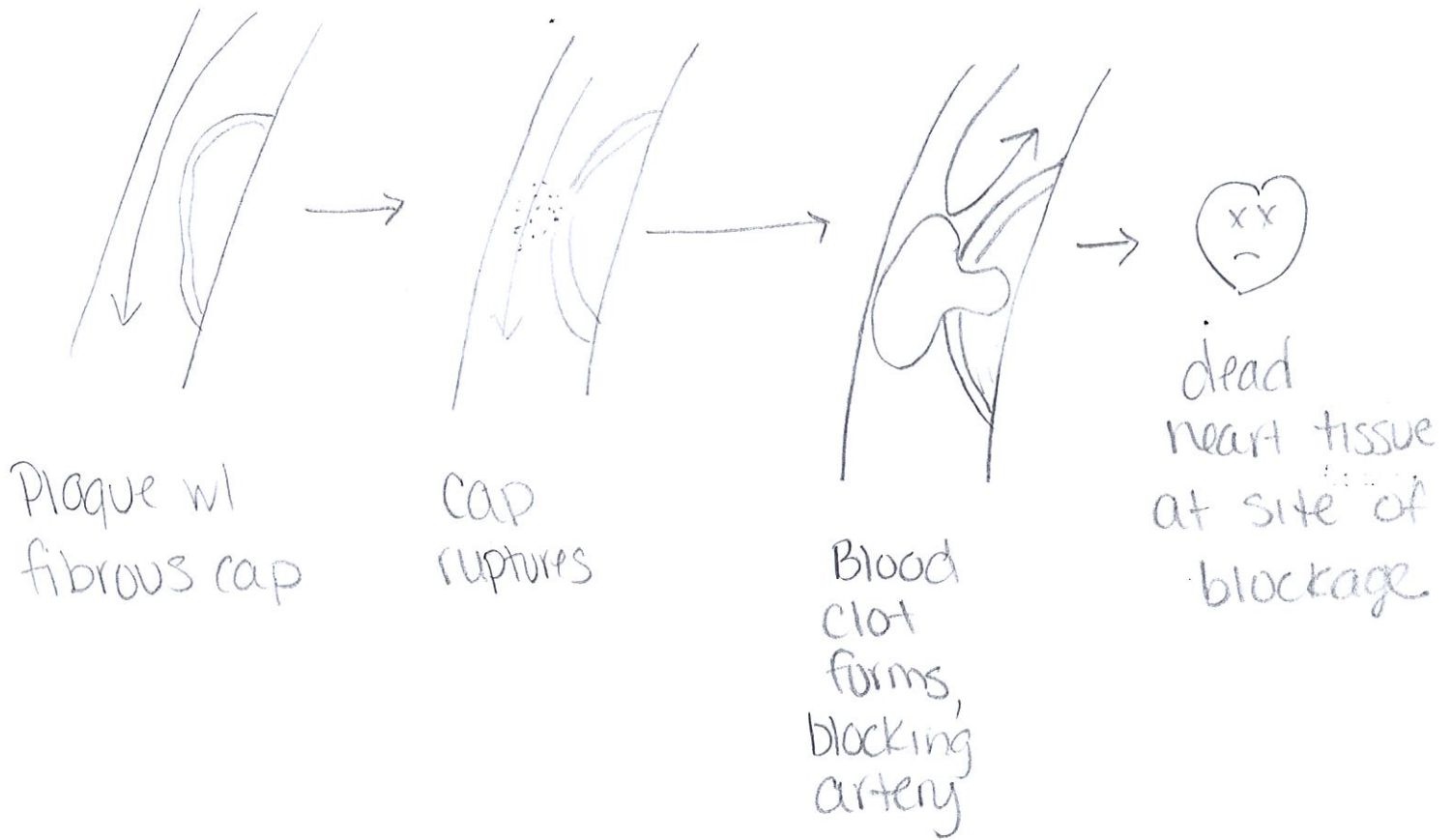
*Between these periods of electrical activity are intervals allowing for blood flow. (**PR interval** + **ST segment**)

Hypertension

- high blood pressure
- can lead to narrowing blood vessels

Thrombosis

- blood clot formation

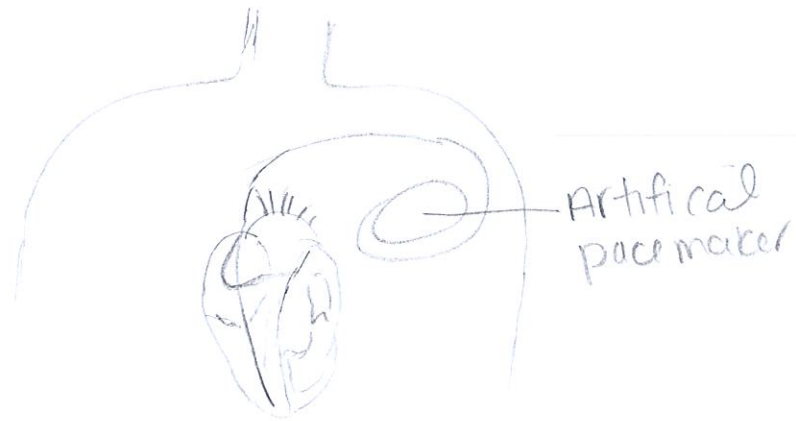


Pacemaker

*Use of artificial pacemakers to regulate heart rate.

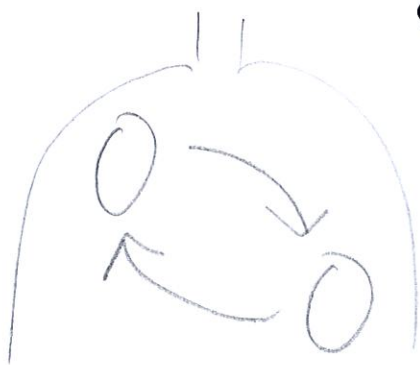
treat two conditions

- abnormally slow heart rates (bradycardia)
- Arrhythmias arising from blockages within the heart's electrical current



Fibrillation

*Use of defibrillation to treat life threatening cardiac contractions



- causes heart muscles to convulse spasmodically rather than beat in concert, preventing optimal flow of blood.

- depolarizes the heart tissue in an effort to terminate unsynchronized contractions