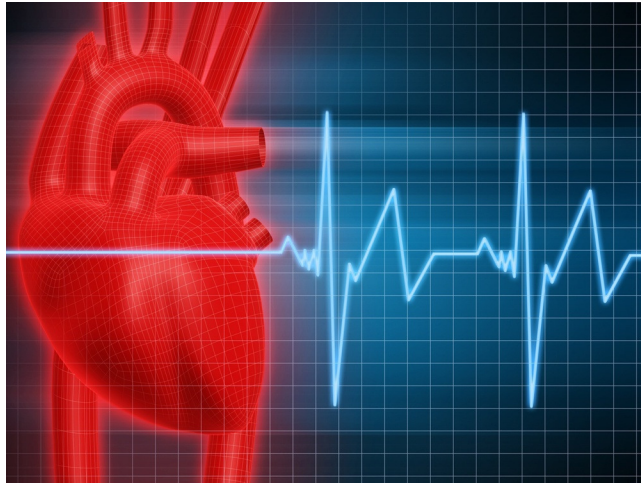
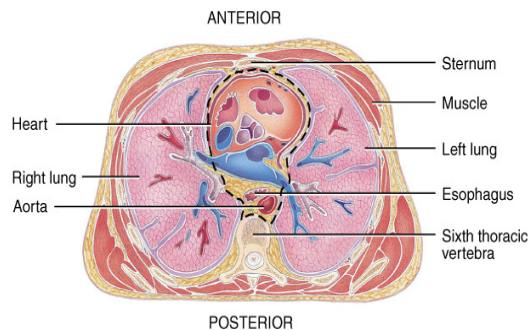


## PTA/OTA 106 Unit 2 Lecture 1



### Position of the heart and Associated Structures

- **Coronary trivia**  
**Pumps blood through 60,000 miles of blood vessels**
- **Pumps about 3,600 gal per day**
- **2.6 million gal per year**



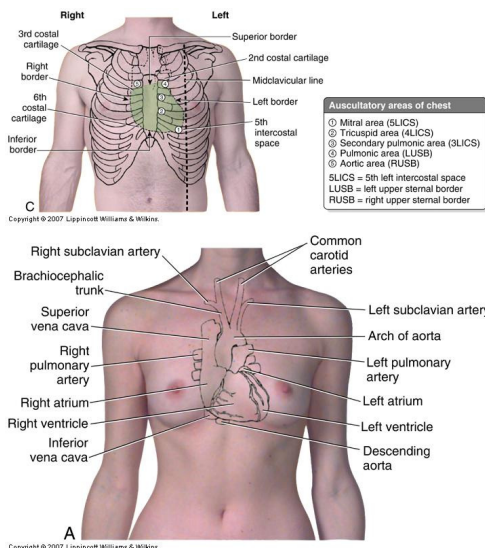
(a) Inferior view of transverse section of thoracic cavity showing the heart in the mediastinum

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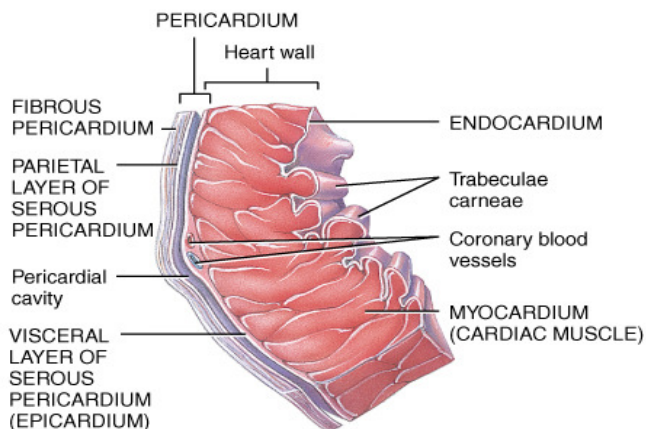
## Approximate Location of the heart projected to the surface

### Landmarks

- **Superior R point:** Is at the superior border of the R 3<sup>rd</sup> costal cartilage
- **Superior L point:** Is located at the inferior border of the L 2<sup>nd</sup> costal cartilage
- **Inferior L point:** (the apex) is located at of the heart in the L 5<sup>th</sup> intercostal space
- **Inferior R point:** Is located at the superior border of the sixth R costal cartilage



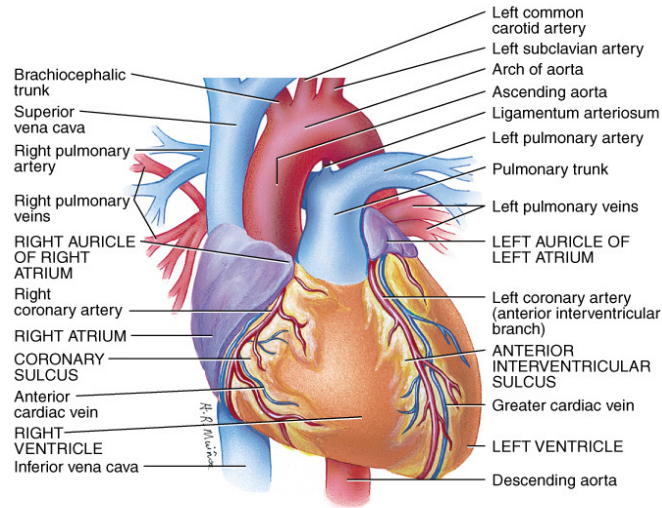
## Layers of the heart wall and it's associated membranes



(a) Portion of pericardium and right ventricular heart wall showing the divisions of the pericardium and layers of the heart wall

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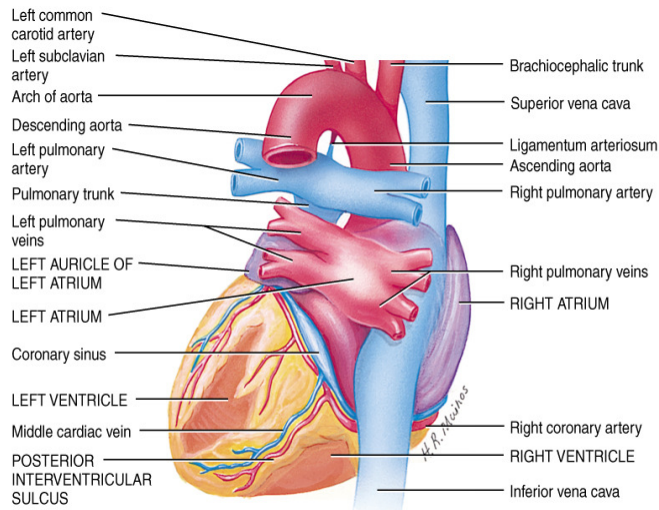
# External Anatomy of the Heart



(a) Anterior external view showing surface features

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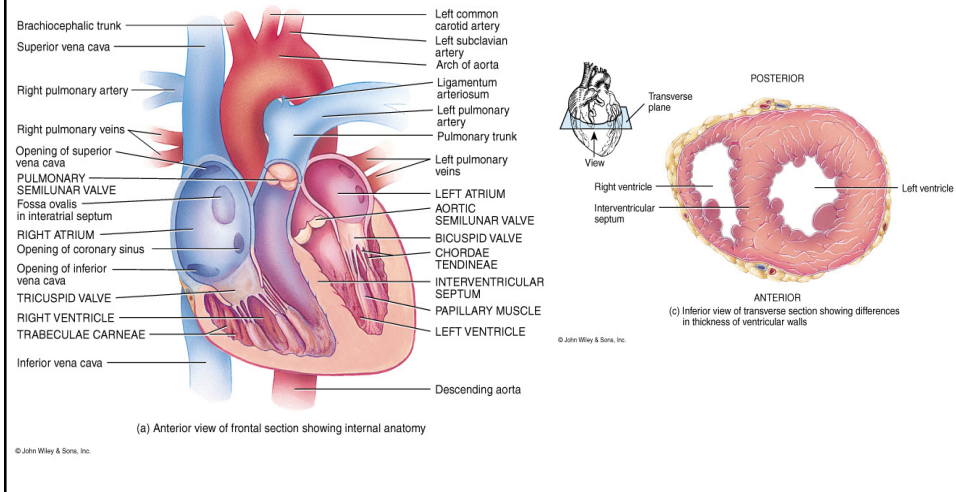
# External Anatomy of the Heart



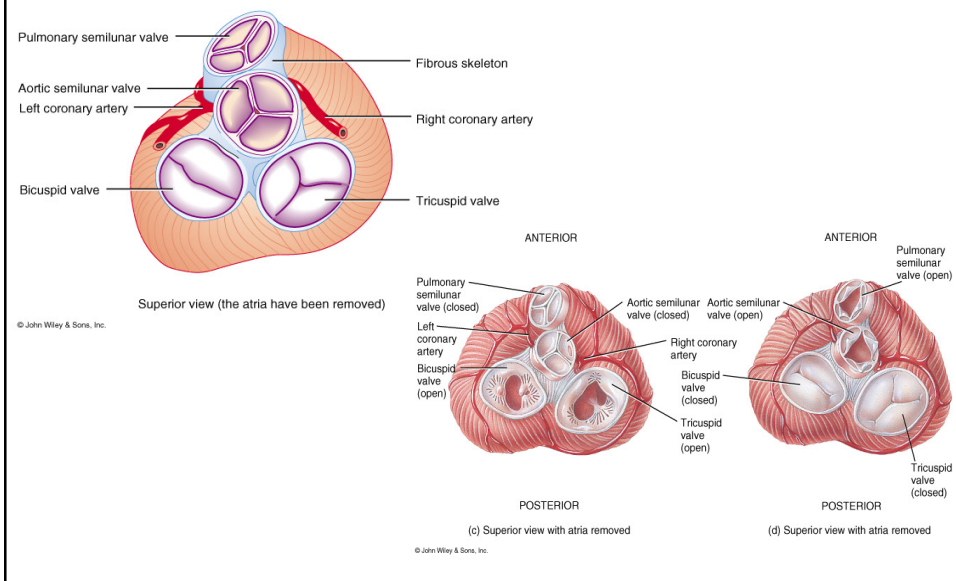
(c) Posterior external view showing surface features

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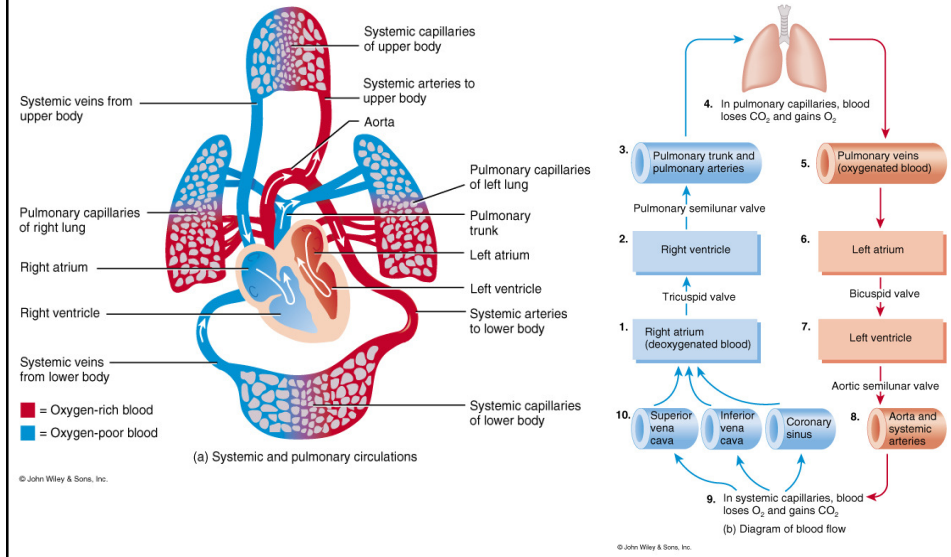
# Internal Anatomy of the Heart



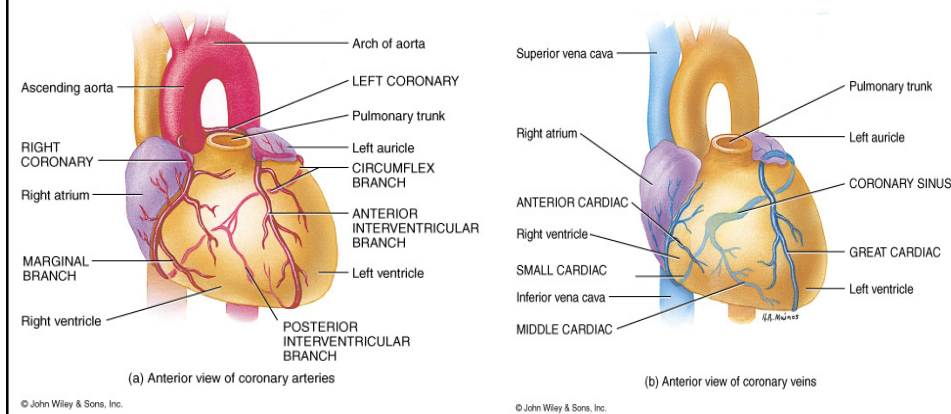
# Position and Function of the Cardiac valves



## Circulations Patterns of the Heart

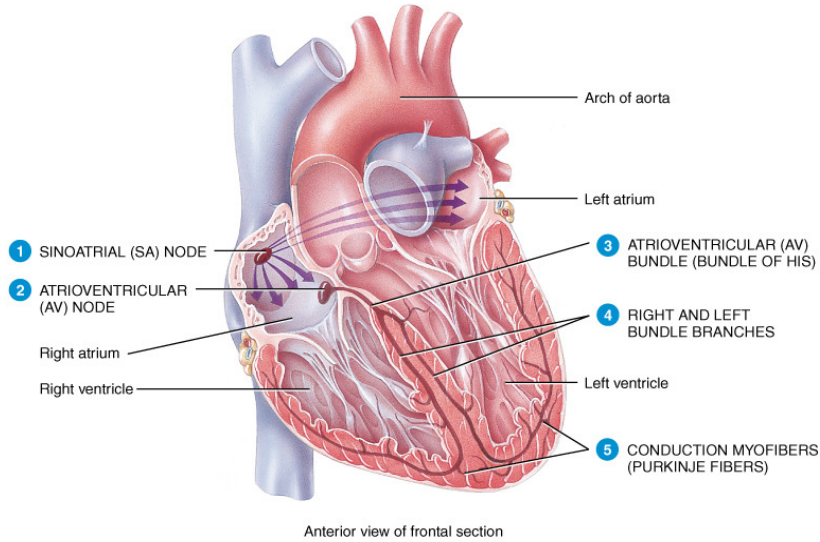


## Coronary Vessels and circulation





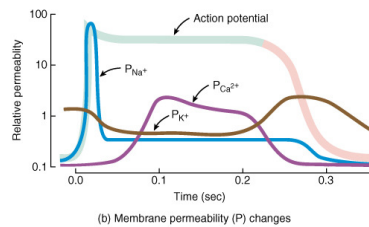
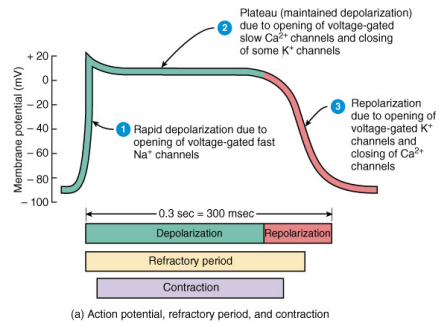
## Cardiac Conduction Systems: the Heart pacemaker



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## Physiology of Cardiac Muscle Contraction

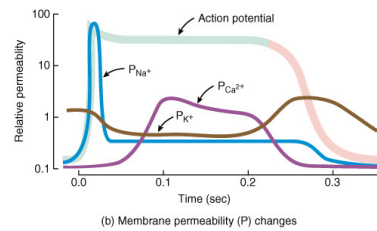
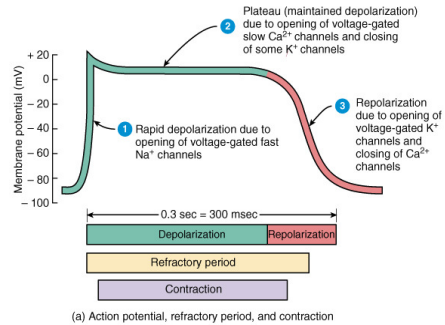
1. Action potential initiated by the SA node
2. Action potential conducted to the purkinje fibers
3. Depolarization of sarcolemma opens voltage-gated fast Na<sup>+</sup> channels causing rapid depolarization
4. Prolonged depolarization called the "plateau" involves opening of voltage-gated slow Ca<sup>2+</sup> channels



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## Physiology of Cardiac Muscle Contraction

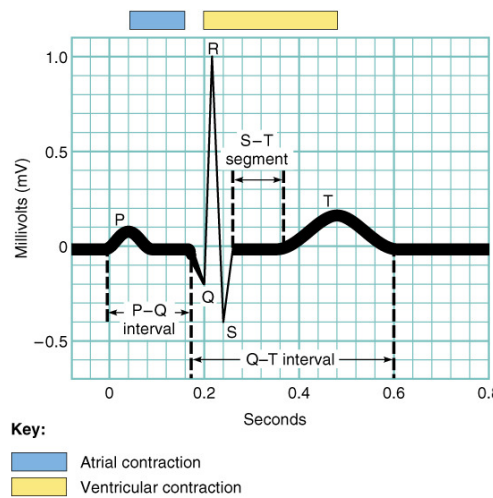
5. Repolarization is caused by opening of voltage-gated K<sup>+</sup> channels
6. The prolonged depolarization causes an absolute refractory period where the cardiac muscle can not respond to additional stimulus.



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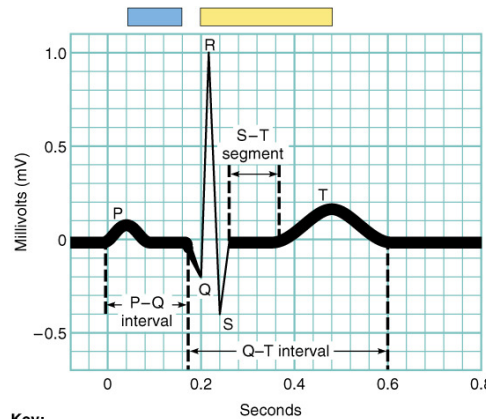
## The parts of an Electrocardiogram (EKG) during a cardiac cycle

- P wave = atrial depolarization (Large P = atrial enlargement)
- QRS complex = ventricular depolarization (Large Q = myocardial infarction)
- T Wave = ventricular repolarization (Flat T = coronary artery disease)
- P-Q interval = Time required for conduction from SA node to Purkinje fibers



## The parts of an Electrocardiogram (EKG) during a cardiac cycle

- **S-T segment =**  
**Time when ventricular myocardia is depolarized**  
 (elevated S-T indicates acute myocardial infraction)
- **Q-T interval=**  
**time form start of ventricular depolarization to ventricular repolarization.**  
 (Lengthened by myocardial damage)

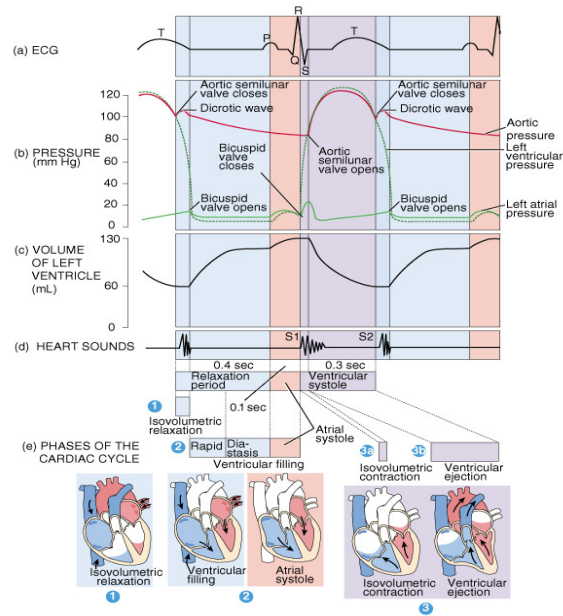


**Key:**  
 Atrial contraction  
 Ventricular contraction

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### The Cardiac Cycle:

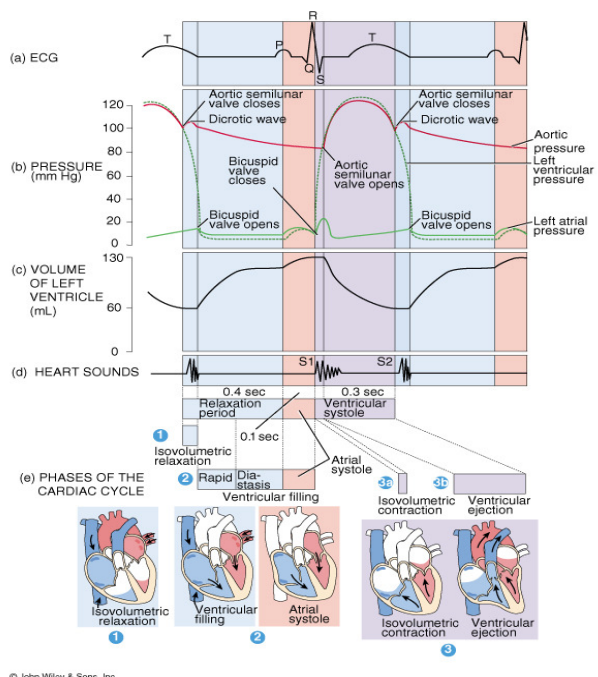
- Atrial Systole**
- Atrial Diastole**
- Ventricular filling**
- Ventricular Ejection**
- Ventricular Systole**
- Ventricular Diastole**
- Isovolumetric Contraction**
- Isovolumetric Relaxation**



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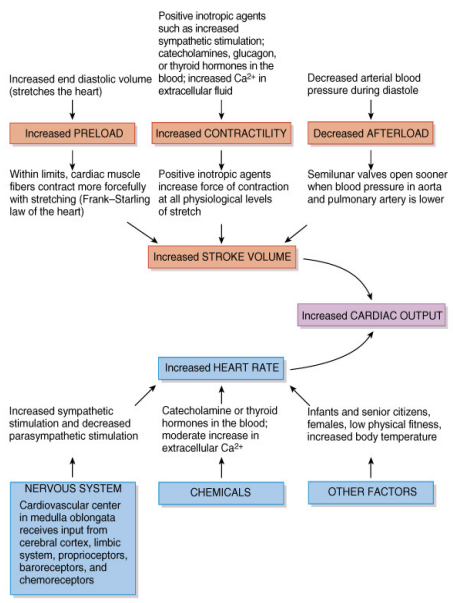
**The Cardiac Cycle:**  
**End-diastolic volume**  
**End-systolic volume**



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**Cardiac Output (CO)**

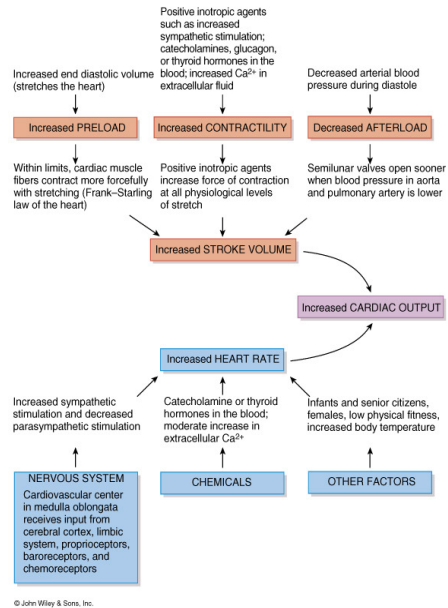
- **CO = volume of blood ejected from the left ventricle into the Aorta each minute.**
- **CO = SV x HR**
- **SV = stroke volume, volume of blood ejected from ventricle (70 ml)**
- **HR = Heart rate, heartbeats per minute**



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## Cardiac Output (CO)

- **Factors the effect SV**
  - 1. Preload: degree of stretch of the myocardium before contraction**
  - 2. Contractility: force of contraction of the ventricular myocardium**
  - 3. Afterload: Force or pressure that the ventricular myocardium must exceeded to open the semilunar valves.**



## Nervous Control of Cardiac Activity

