Understanding Cardiac Arrhythmias

Biomedical Engineering - URJC

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Introduction to Cardiac Arrhythmias

Definition

Abnormalities in the heart's rhythm (too fast, too slow, or irregular).

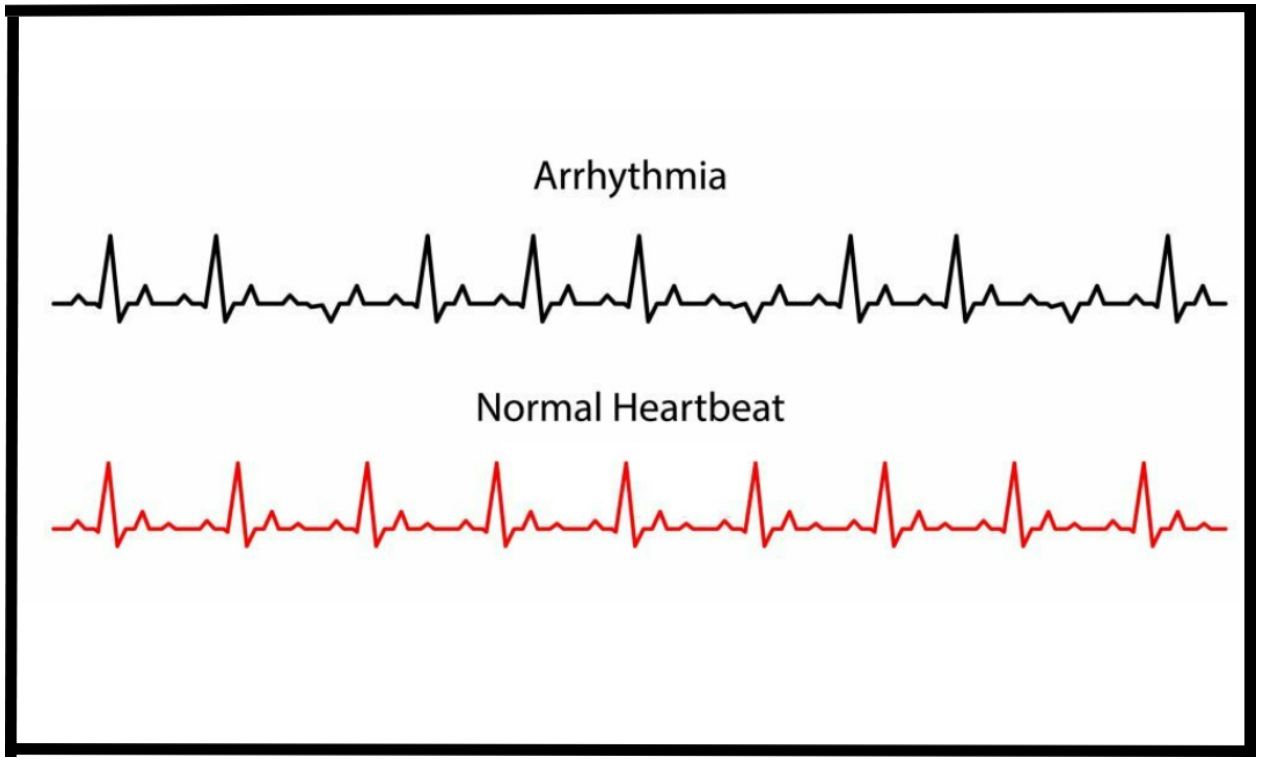
Importance

Range from harmless to life-threatening.

Relevance

Common cause of cardiovascular morbidity and mortality.

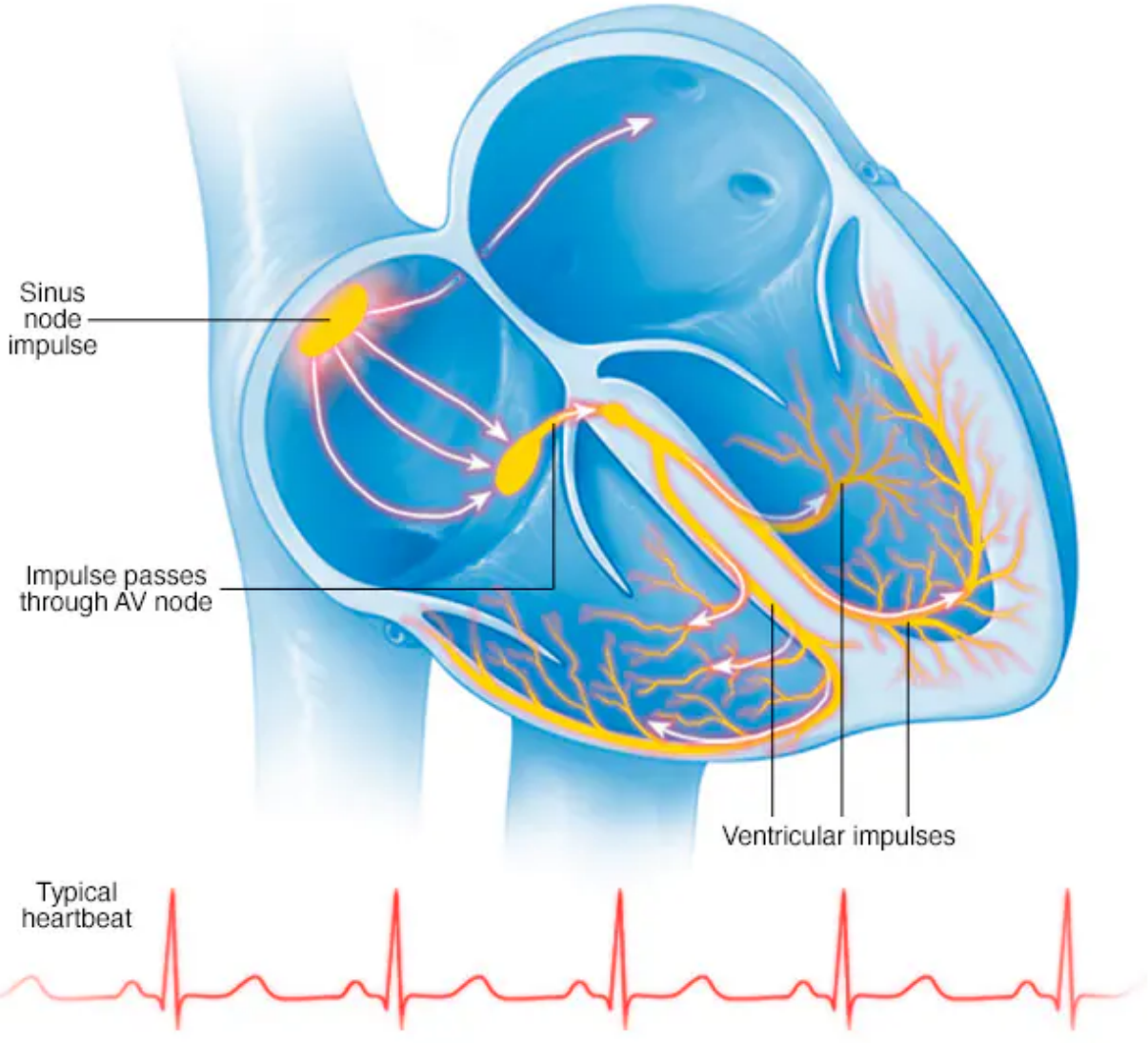
Introduction to Cardiac Arrhythmias



Normal Cardiac Physiology

- **Cardiac Conduction System**:
  - SA Node: Pacemaker.
  - AV Node: Delays impulse.
  - Bundle of His and Purkinje Fibers: Conduct impulses to ventricles.
- **Normal Heart Rate**: 60–100 bpm.
- **ECG Basics**:
  - P wave: Atrial depolarization.
  - QRS complex: Ventricular depolarization.
  - T wave: Ventricular repolarization.

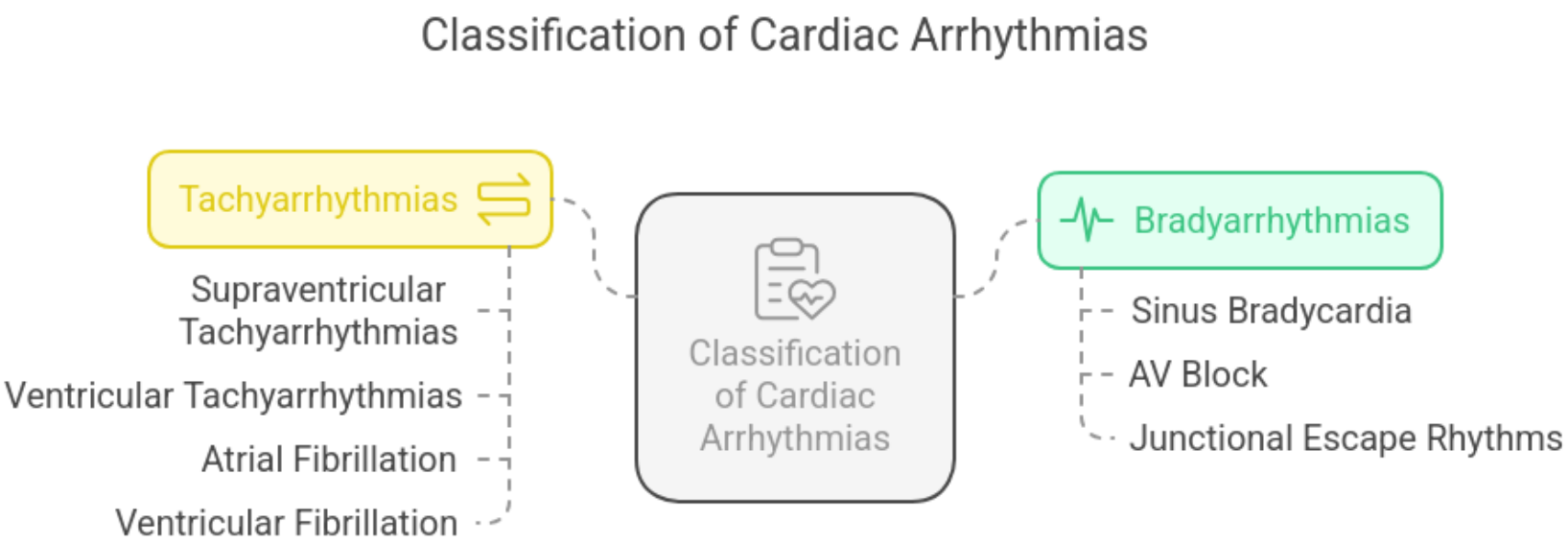
Normal Cardiac Physiology



Classification of Arrhythmias

- **Based on Heart Rate**:
  - Tachycardia: >100 bpm.
  - Bradycardia: <60 bpm.
- **Based on Origin**:
  - Supraventricular: Atrial fibrillation, atrial flutter.
  - Ventricular: Ventricular tachycardia, ventricular fibrillation.
- **Based on Regularity**:
  - Regular: Sinus tachycardia.
  - Irregular: Atrial fibrillation, ventricular fibrillation.

Classification of Arrhythmias



Classification of Arrhythmias Based on Heart Rate

How to classify cardiac arrhythmias based on heart rate?

Bradyarrhythmias

Characterized by a heart rate less than 60 bpm, involving conditions like sinus bradycardia and AV blocks.

Tachyarrhythmias

Involves a heart rate exceeding 100 bpm, including atrial and ventricular tachycardias.

Classification of Arrhythmias Based on Origin

How to classify cardiac arrhythmias?

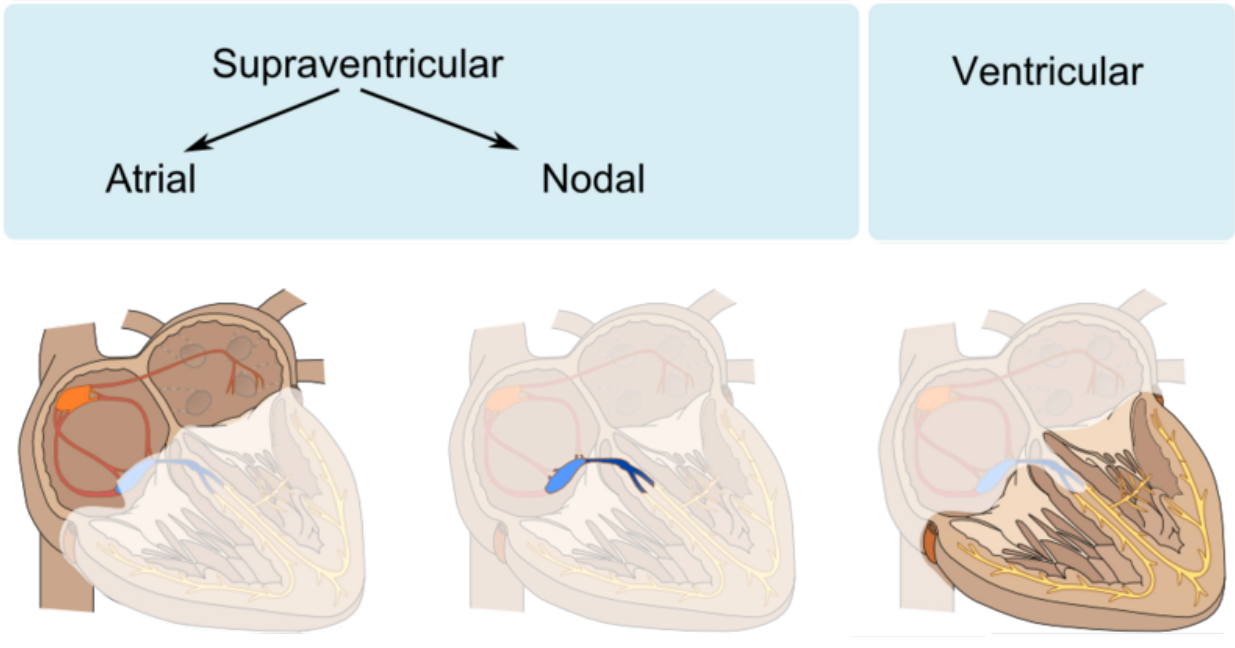
Supraventricular Arrhythmias

Characterized by rapid heart rates originating above the ventricles, including conditions like sinus tachycardia and atrial fibrillation.

Ventricular Arrhythmias

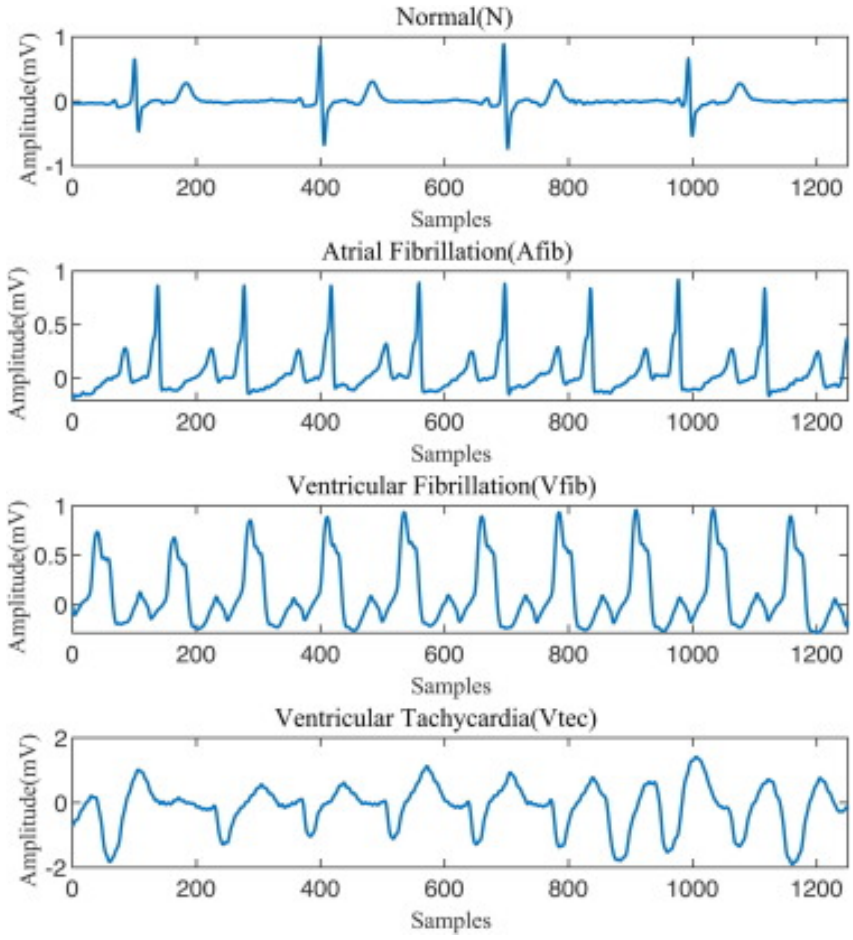
Involves irregularities originating in the ventricles, such as ventricular tachycardia and fibrillation, often more severe.

Classification of Arrhythmias Based on Origin



Common Types of Arrhythmias

- **Atrial Fibrillation (AFib)**:
  - Irregular, rapid heart rate.
  - Risk: Stroke, heart failure.
- **Ventricular Tachycardia (VT)**:
  - Rapid ventricular rhythm.
  - Life-threatening.
- **Ventricular Fibrillation (VF)**:
  - Chaotic ventricular activity.
  - Requires defibrillation.



Causes and Risk Factors

- **Structural Heart Disease**: Coronary artery disease, cardiomyopathy.
- **Electrolyte Imbalances**: Hypokalemia, hyperkalemia.
- **Lifestyle Factors**: Alcohol, caffeine, stress.
- **Genetic Predisposition**: Long QT syndrome, Brugada syndrome.

Symptoms and Diagnosis

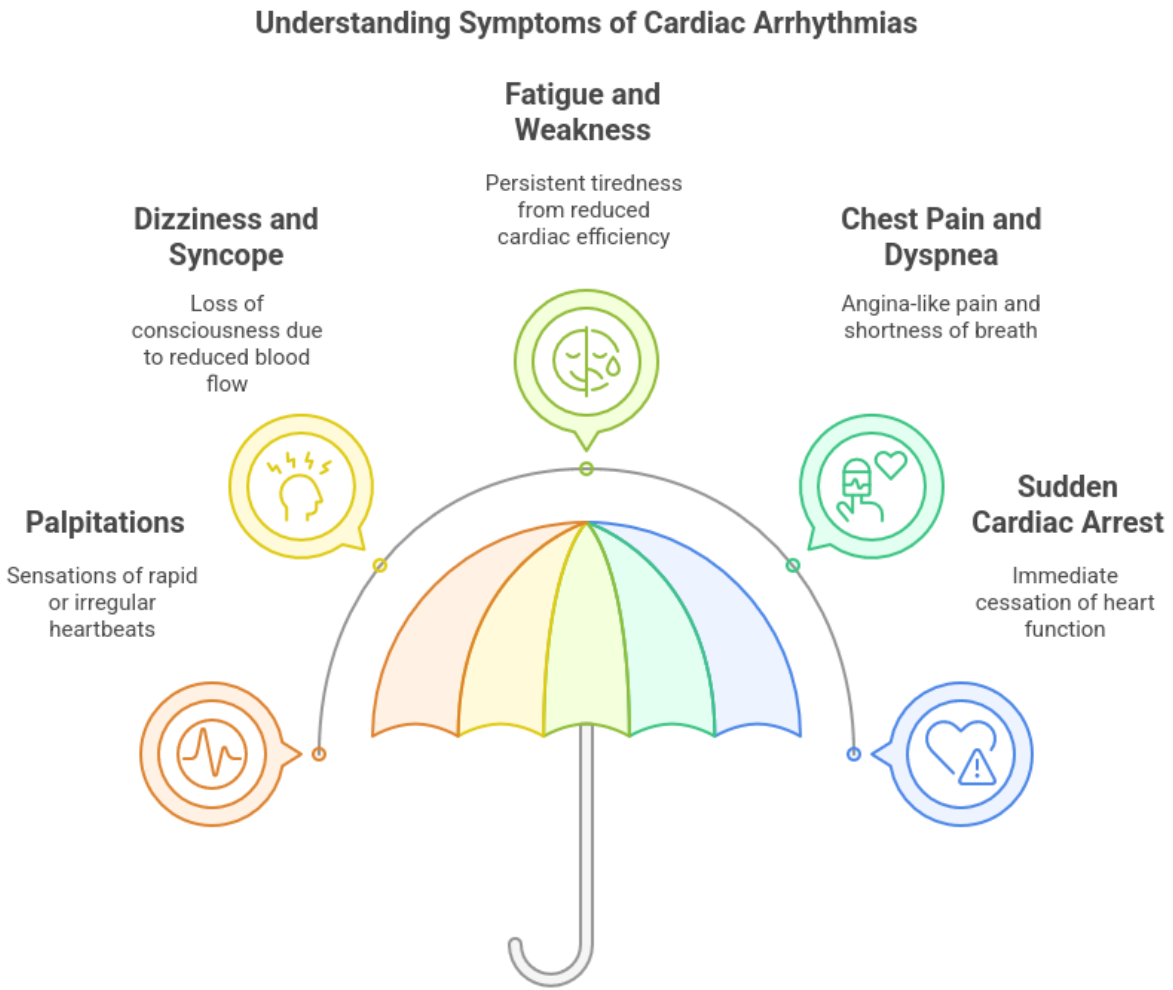
Symptoms

- Palpitations, dizziness, syncope, chest pain.

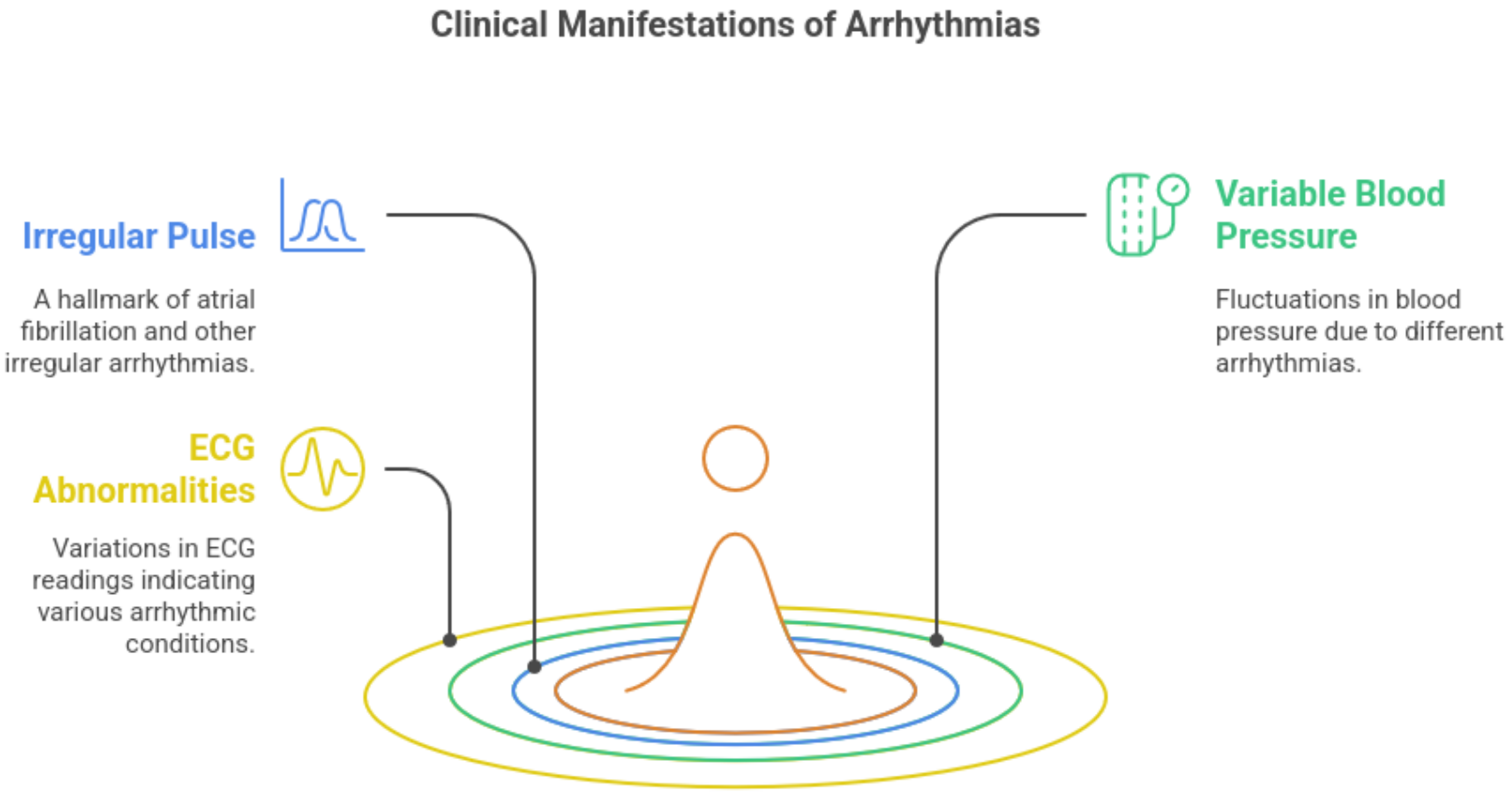
Diagnostic Tools

- ECG, Holter monitor, laboratory workout, electrophysiology.

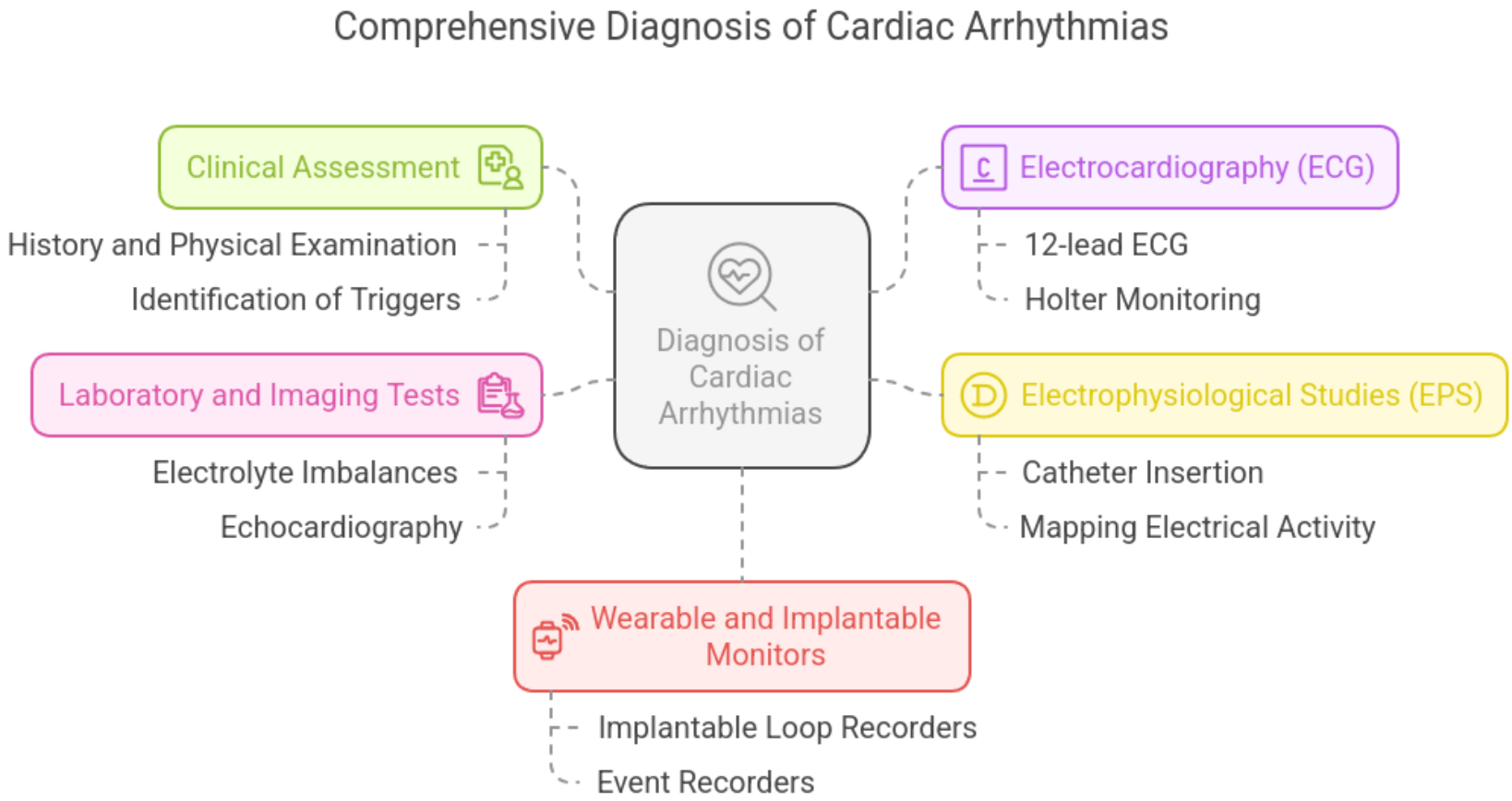
Symptoms and Diagnosis



Symptoms and Diagnosis



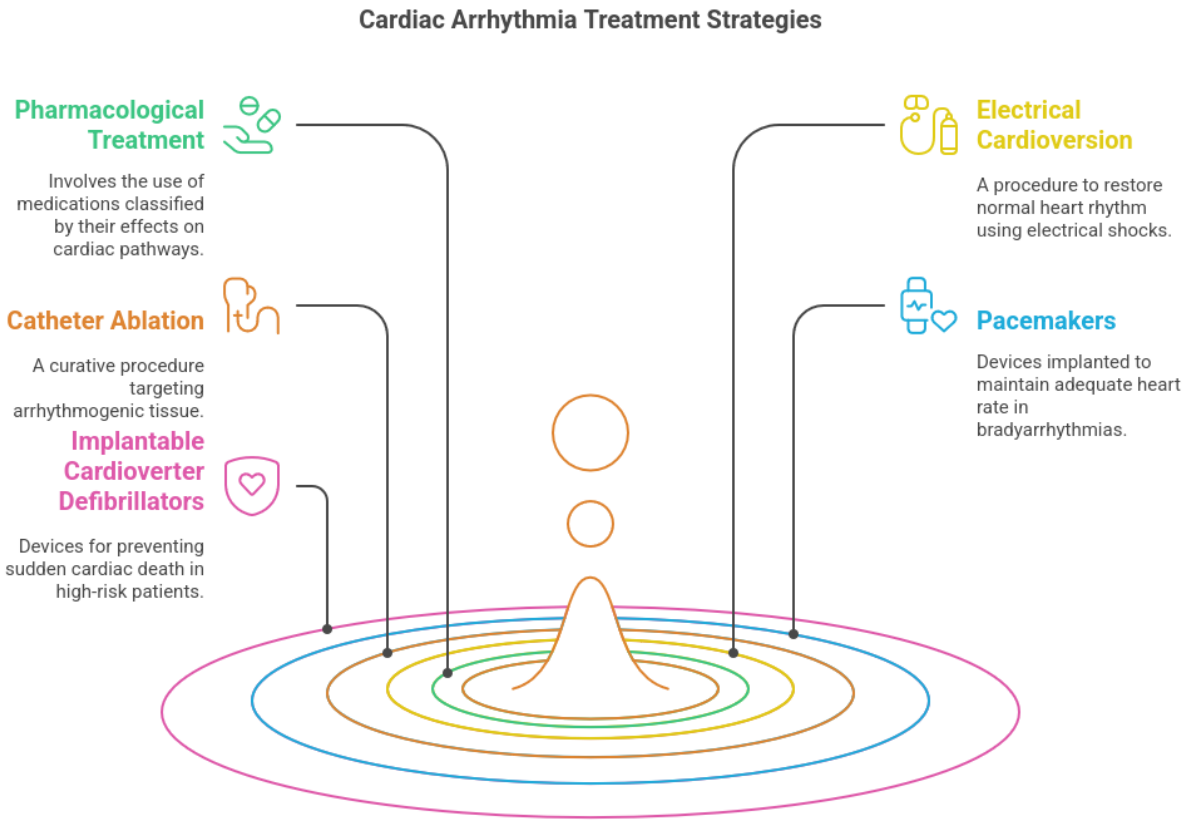
Symptoms and Diagnosis



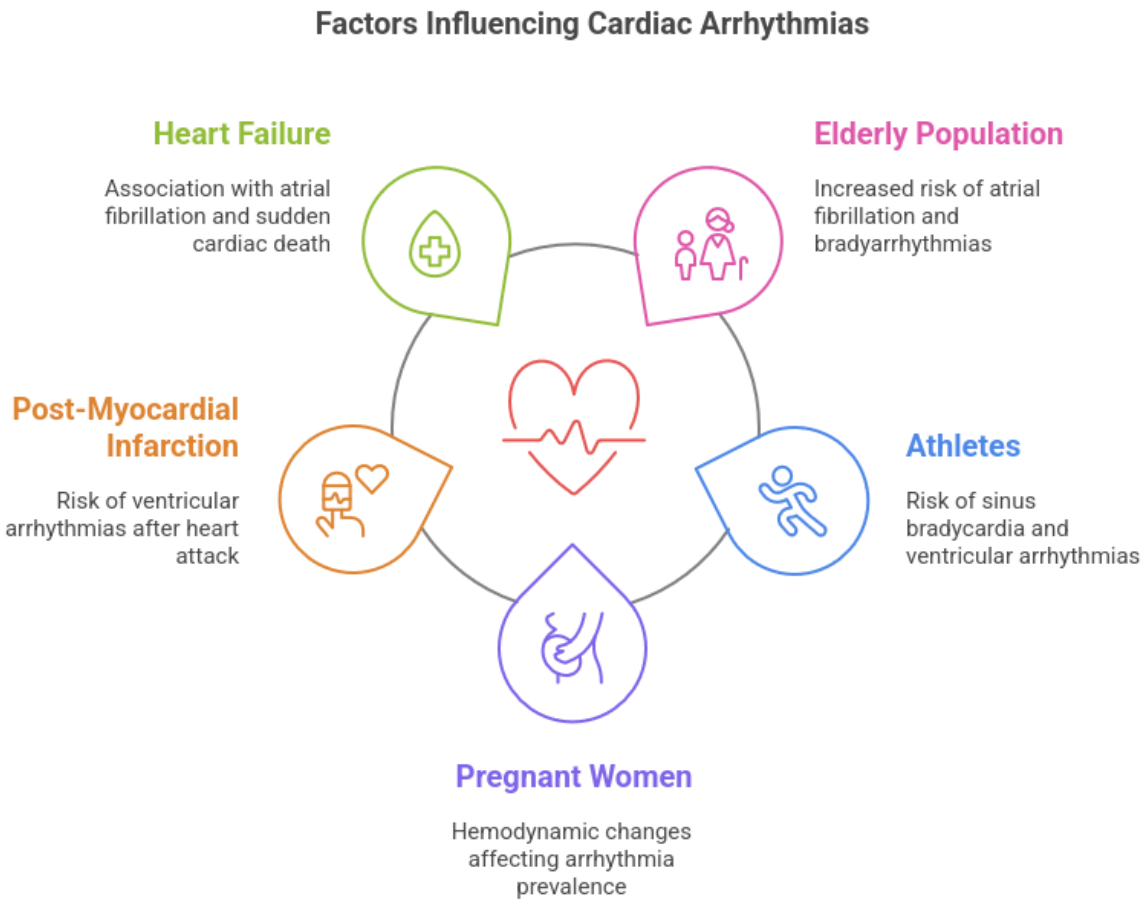
Management and Treatment

- **Acute Management**:
  - Cardioversion, defibrillation.
- **Long-Term Management**:
  - Medications, ablation therapy, implantable devices.
- **Prevention**:
  - Manage underlying conditions, lifestyle changes.

Management and Treatment



Special Considerations



Conclusion and Key Takeaways

- Arrhythmias are diverse and require thorough understanding.
- Early diagnosis and treatment are crucial.
- Advances in technology have improved outcomes.