Cardiac Emergencie s

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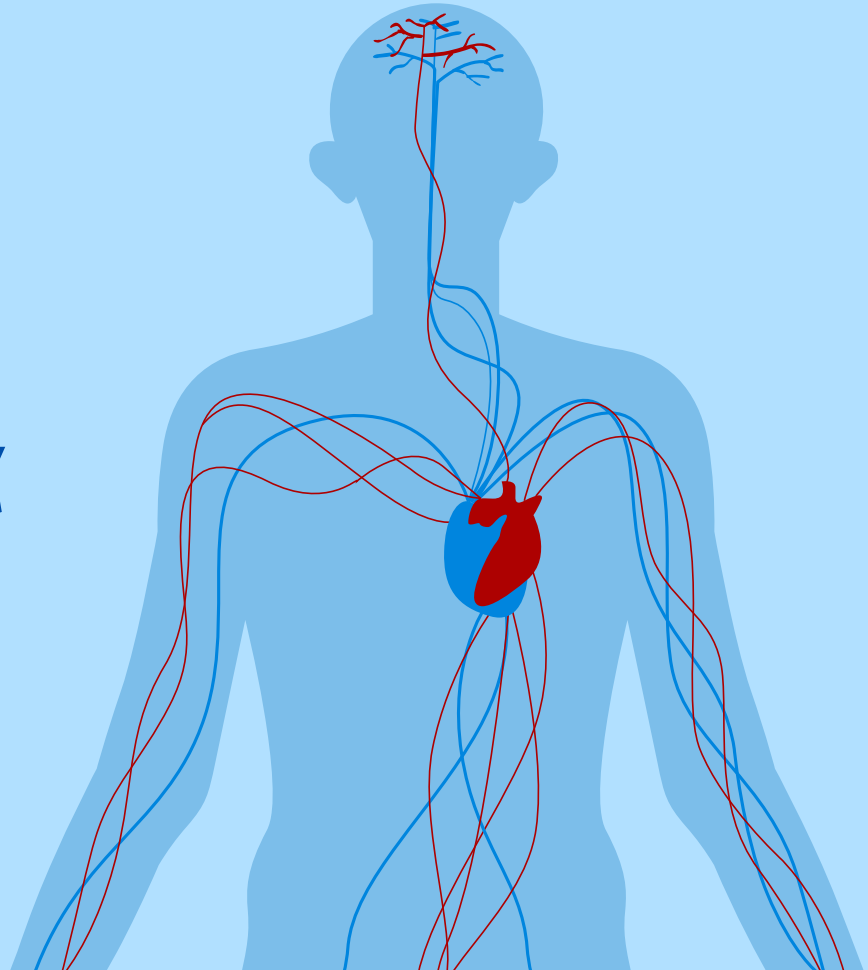
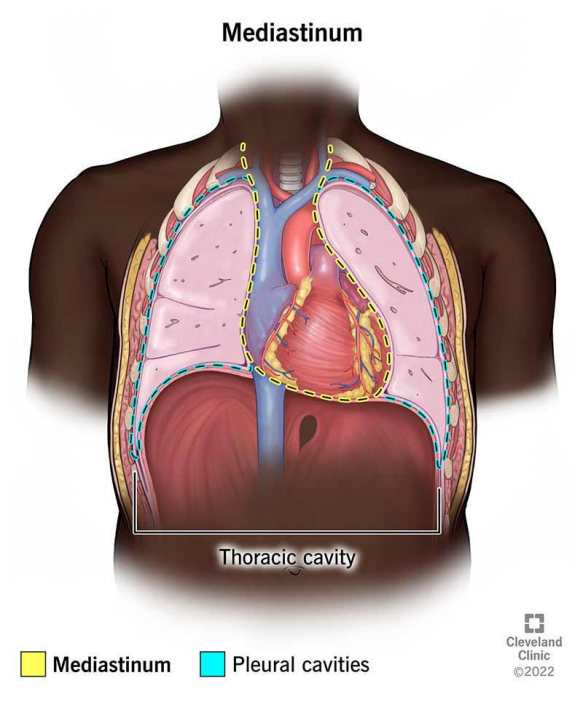
01

Anatomy & Physiology



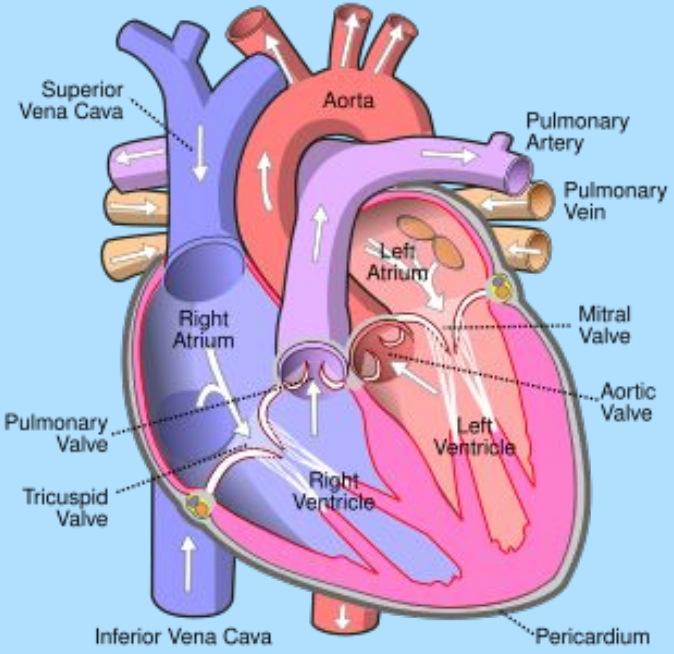
Location + Function of Heart



- Heart is located in the mediastinum, behind sternum
- Protected by ribs and pericardium

Function: Pumps blood throughout the body to deliver oxygen and nutrients to organs and tissues. Also removes wastes and carbon dioxide.

Chambers/Structures



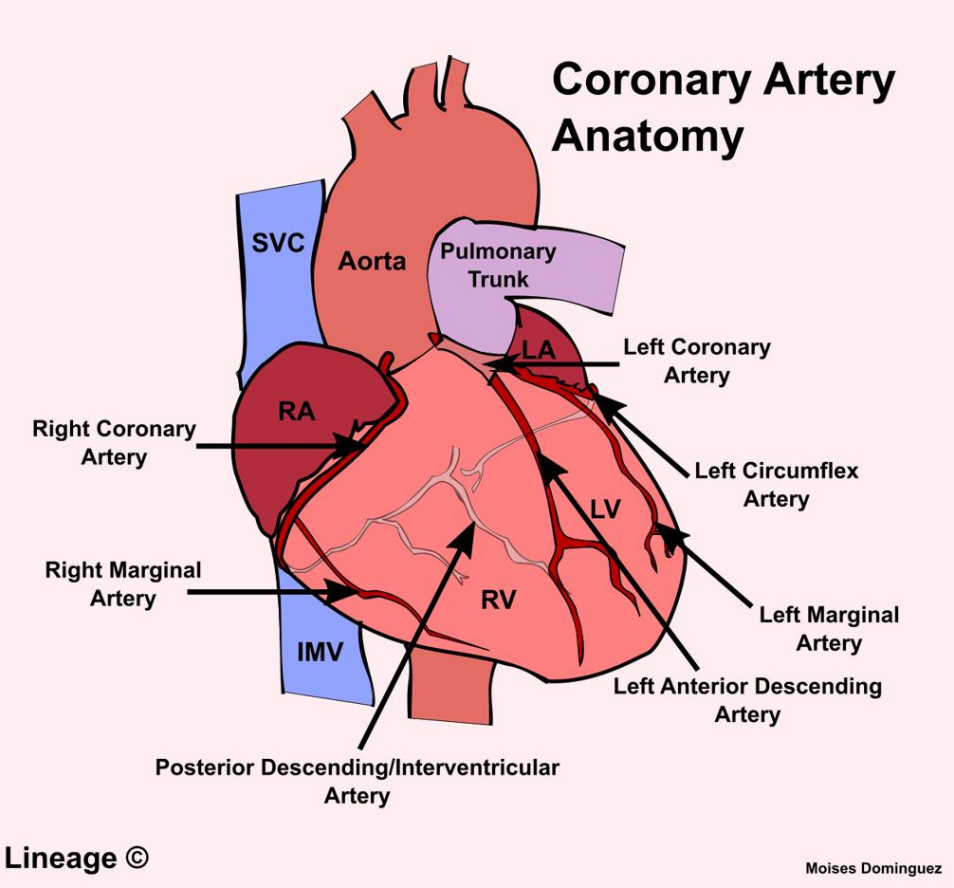
Heart has four chambers:
-Right and left Atria (upper chambers)
-Right and left ventricles (lower chambers)

2 valves:
-Tricuspid
-Mitral (bicuspid)

Pulmonary Vein: carries oxygenated blood from lungs to left atrium

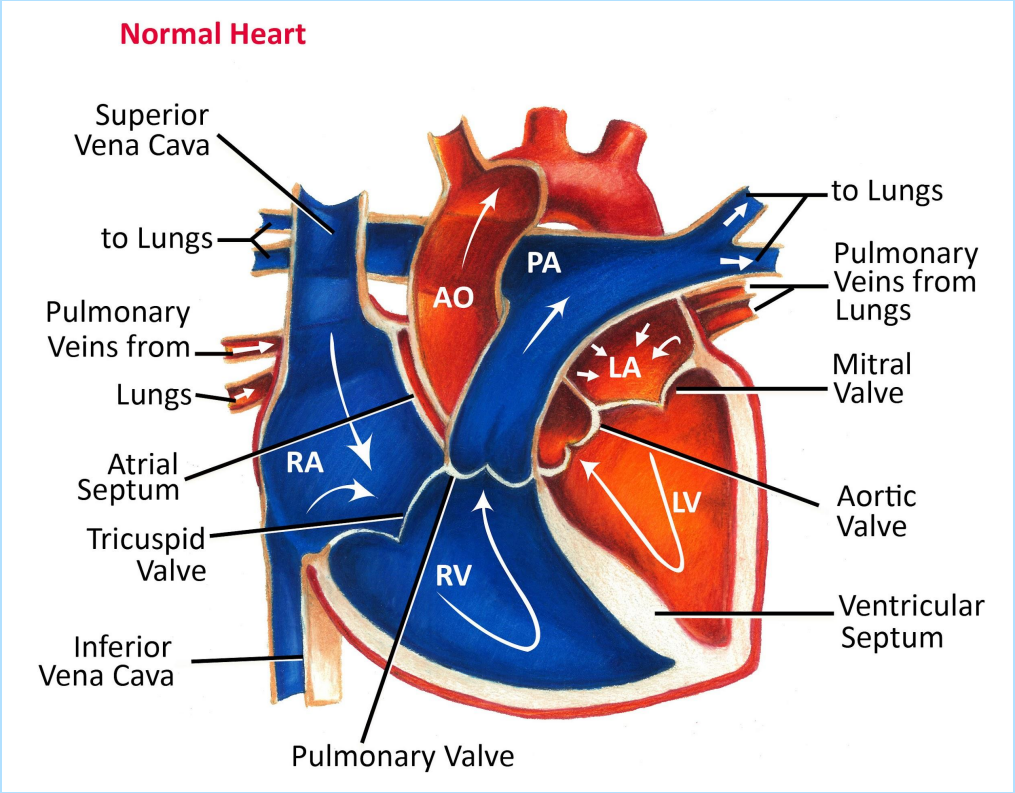
Pulmonary Artery: carries deoxygenated blood from right ventricle to lungs

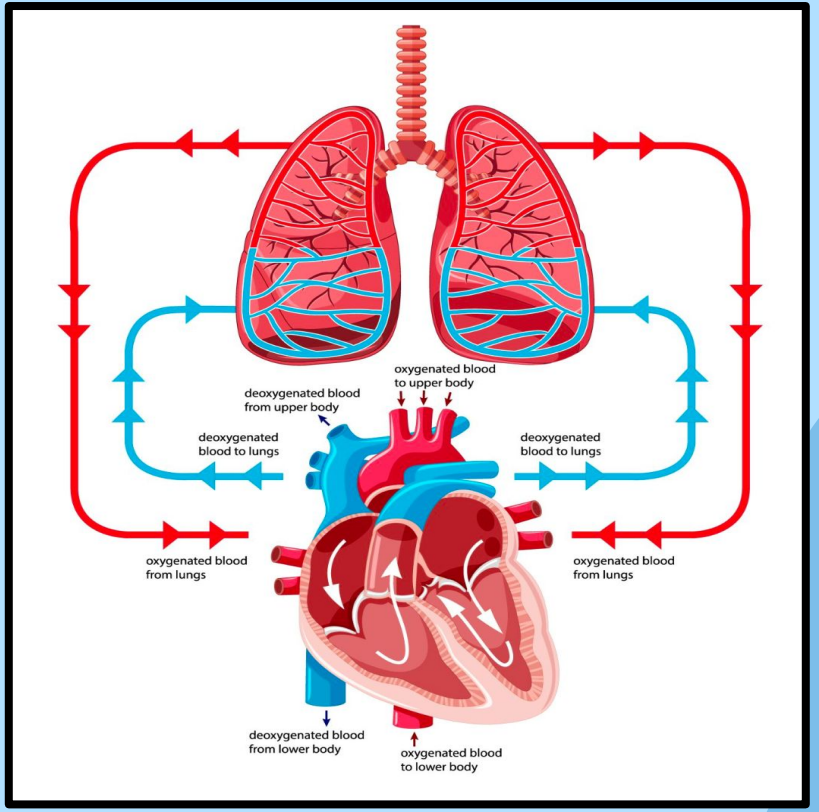
Vena Cava: Blood from body to heart.
Aorta: Blood from heart to body.



Coronary Arteries: blood vessels that supply the muscle of the heart (myocardium).

Blood Flow

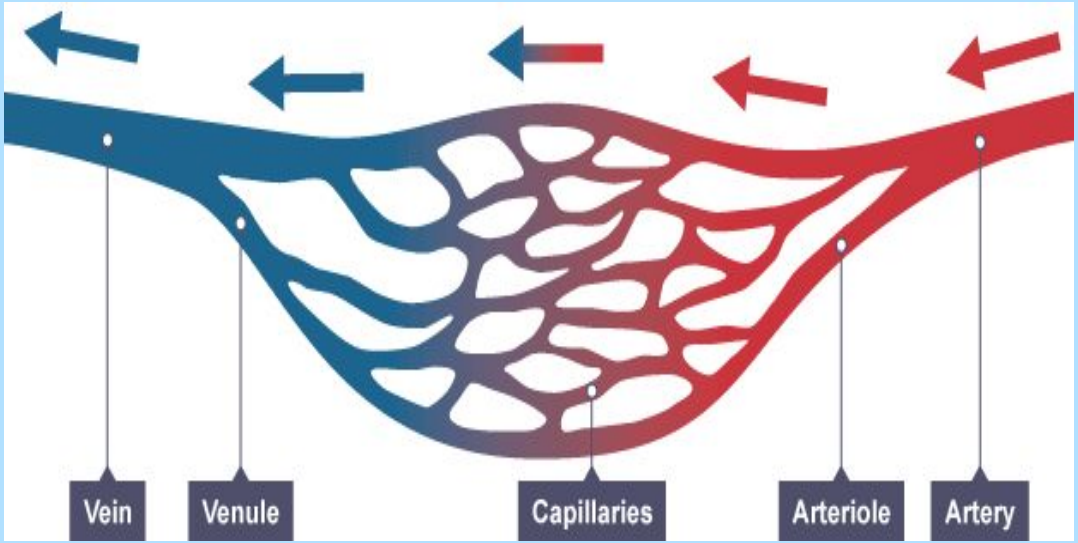

Normal Heart
Superior Vena Cava
to Lungs
Pulmonary Veins from Lungs
Atrial Septum
Tricuspid Valve
Inferior Vena Cava
AO
PA
RA
RV
LA
LV
to Lungs
Pulmonary Veins from Lungs
Mitral Valve
Aortic Valve
Ventricular Septum
Pulmonary Valve


oxygenated blood to upper body
deoxygenated blood from upper body
deoxygenated blood to lungs
deoxygenated blood to lungs
oxygenated blood from lungs
oxygenated blood from lungs
deoxygenated blood from lower body
oxygenated blood to lower body

Blood Vessels + Gas Exchange

Veins: Oxygen poor blood from body to heart.

Venules: Small branch of veins.

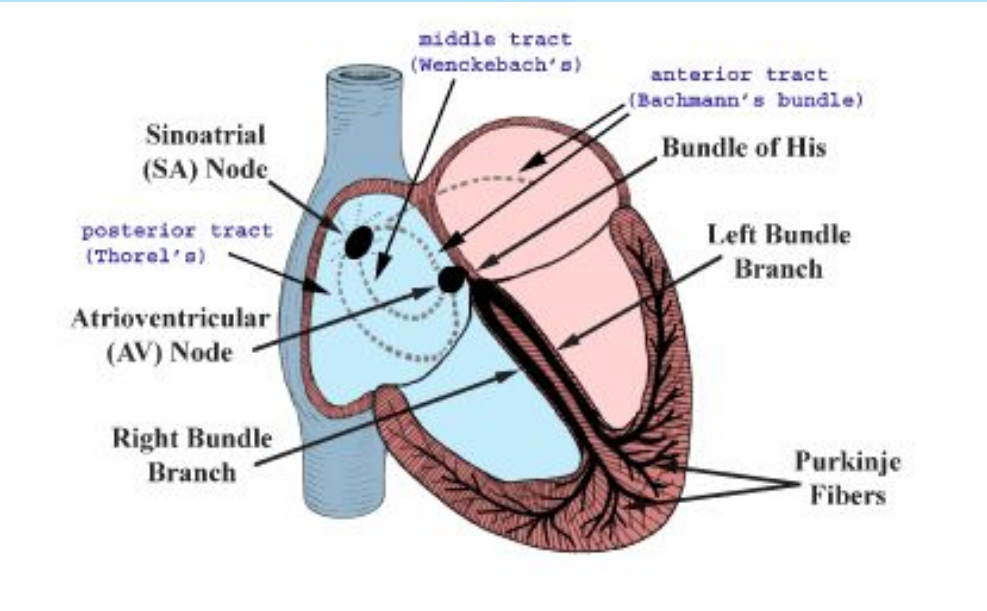


Arteries: Oxygen rich blood away from heart to body.

Arterioles: Small branch of arteries.

Capillaries: Thin walled vessels where oxygen/carbon dioxide exchange with the body's cells takes place.

Electrical Impulse Structure



SA Node (sinoatrial): acts as pacemaker, sends electrical signal causing atria to contract.

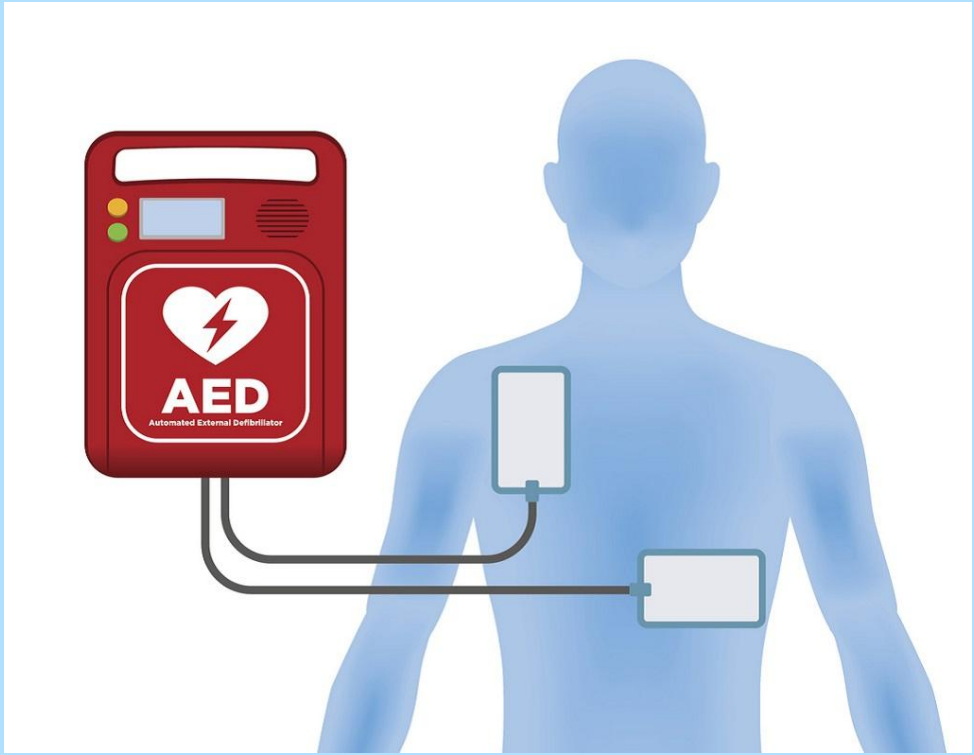
AV Node (atrioventricular): briefly delays contraction of ventricles allowing atria to contract

Bundle of His: Transmits the electrical impulse from the AV node to the bundle branches.

Purkinje Fibers: Spread impulse through ventricles allowing them to contract.

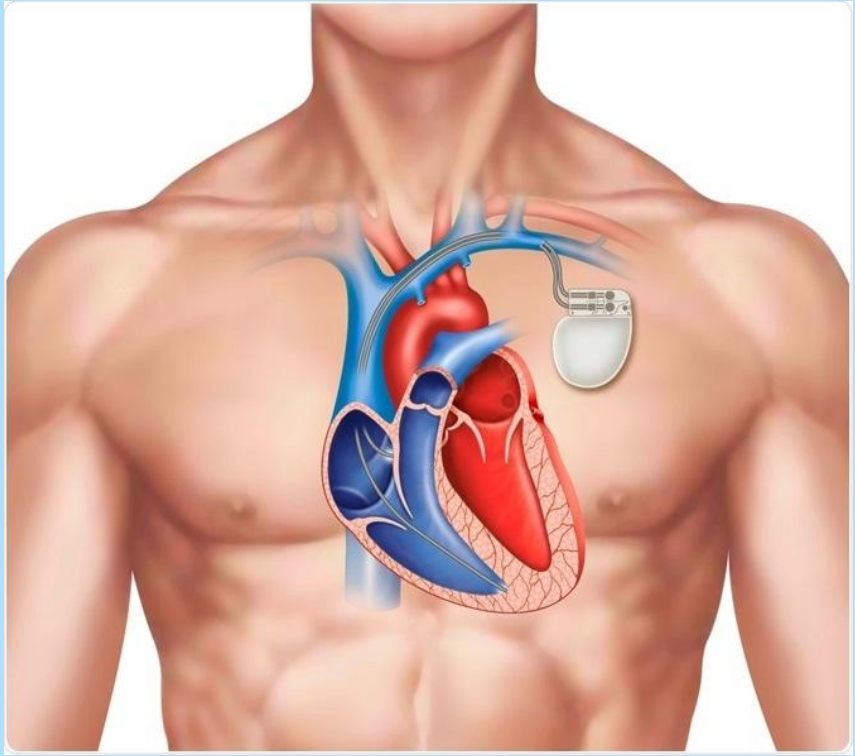
https://www.youtube.com/watch?v=vzTXCpCV8rU&rco=1

External Devices

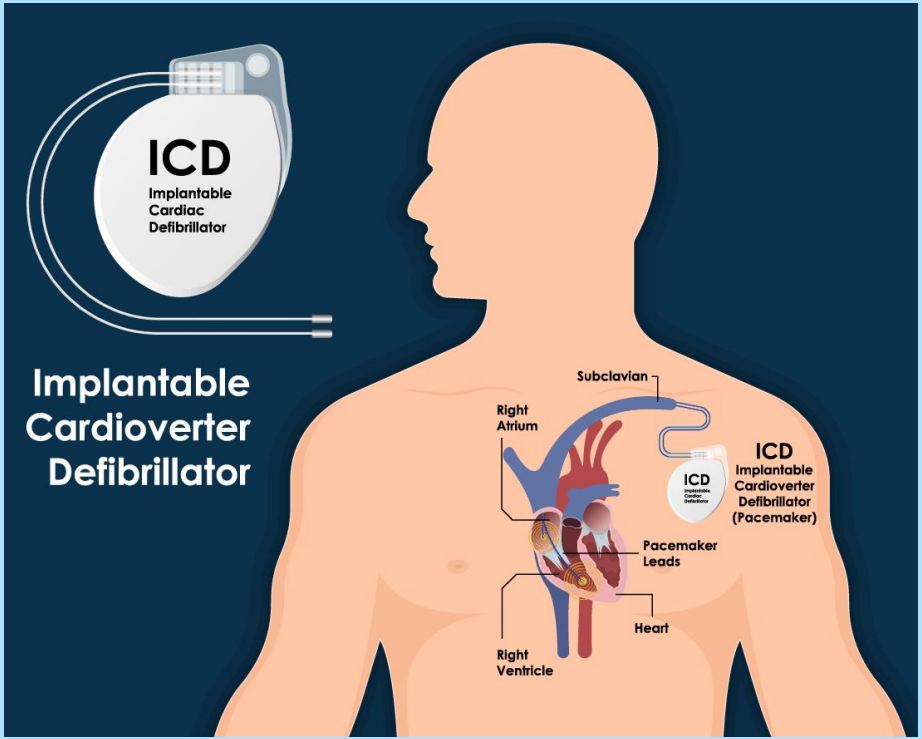


Automated External Defibrillator (AED): Device that delivers an electric shock to the heart when an abnormal rhythm is detected.

Two Rhythms to apply shock through AED: Ventricular fibrillation and pulseless ventricular tachycardia



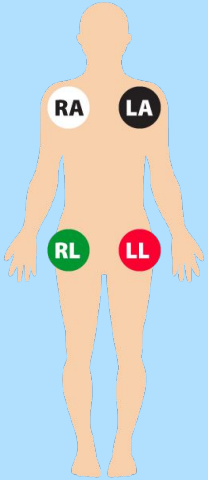
Pacemaker: Send electrical impulses that regulate heart rhythm.



Implantable Cardioverter Defibrillator (ICD): Detects abnormal heartbeats and sends electrical signals or or defibrillating. Basically a pacemaker and AED in one.

EKGs (Electrocardiogram)

A test that records the electrical activity of the heart to detect problems with rhythm and rate.

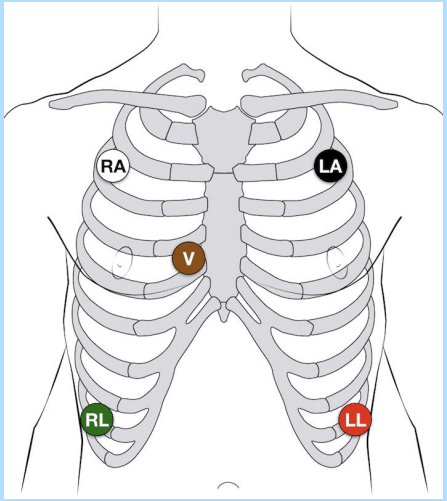


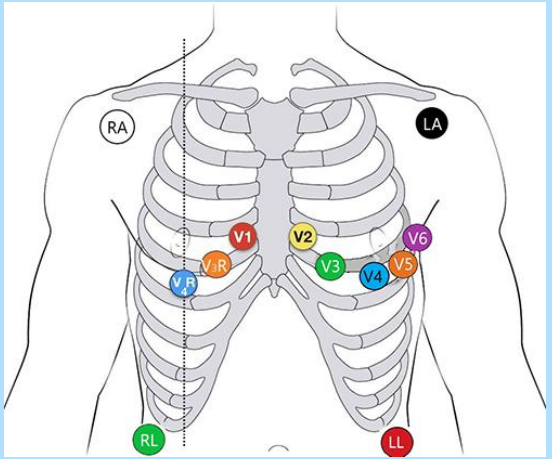
RA Right Arm

LA Left Arm

LL Left Leg

RL Right Leg



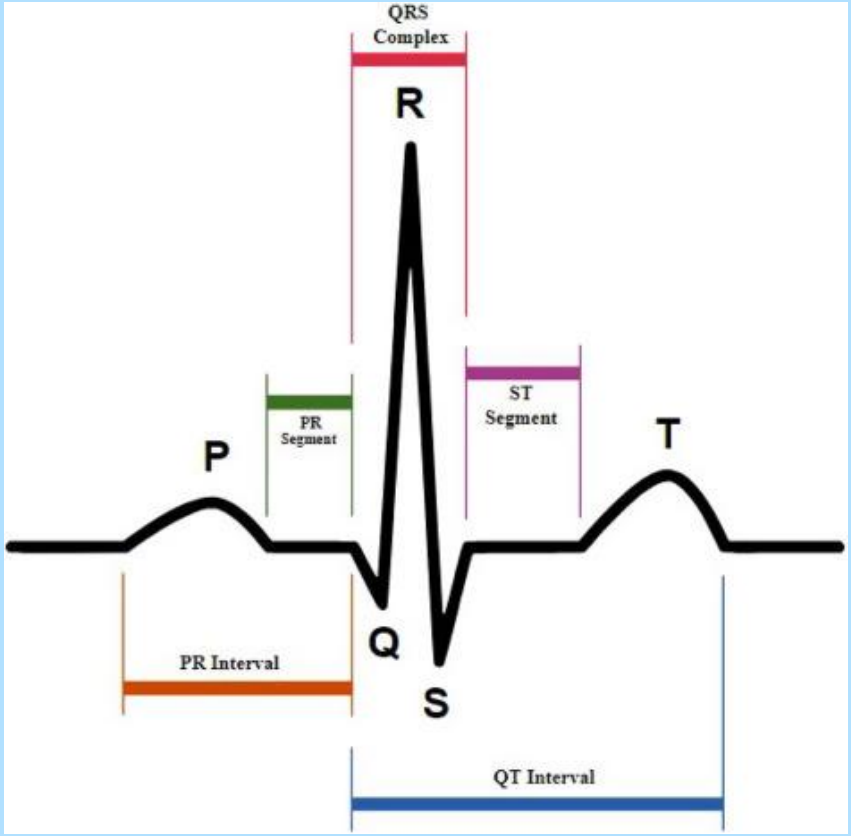


4 Lead (4 electrodes)

5 Lead (1 chest lead)

12 Lead (4 limb +8 chest)

PQRST Waves



-Standard waves seen on an EKG

-Represents the sequence of electrical activity during each cardiac cycle

P: Atrial depolarization (atria contract)

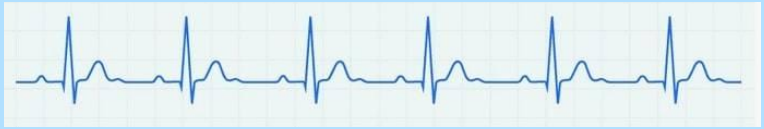
QRS: Ventricular depolarization (ventricles contract)

ST: Period when ventricles are fully contracted

T: Ventricular repolarization (reset)

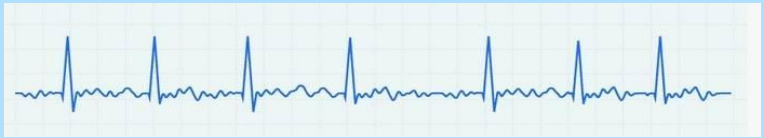
Rhythms

Sinus



Sinus Rhythm: Normal, upright P waves before each QRS

A- Fib

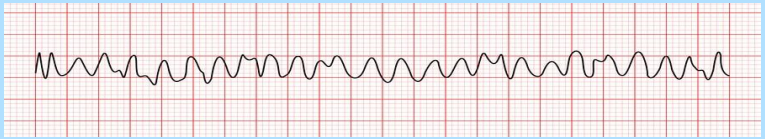


A-Fib: Irregular, no distinct P waves

V-Tach

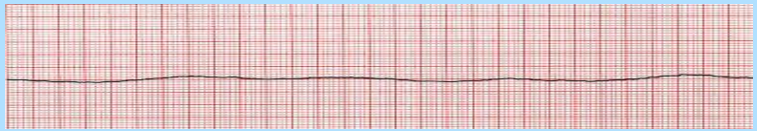
V-Tach: Wide, fast QRS complexes, unstable rhythm

V-Fib



V-Fib: Chaotic, no organized rhythm → no pulse

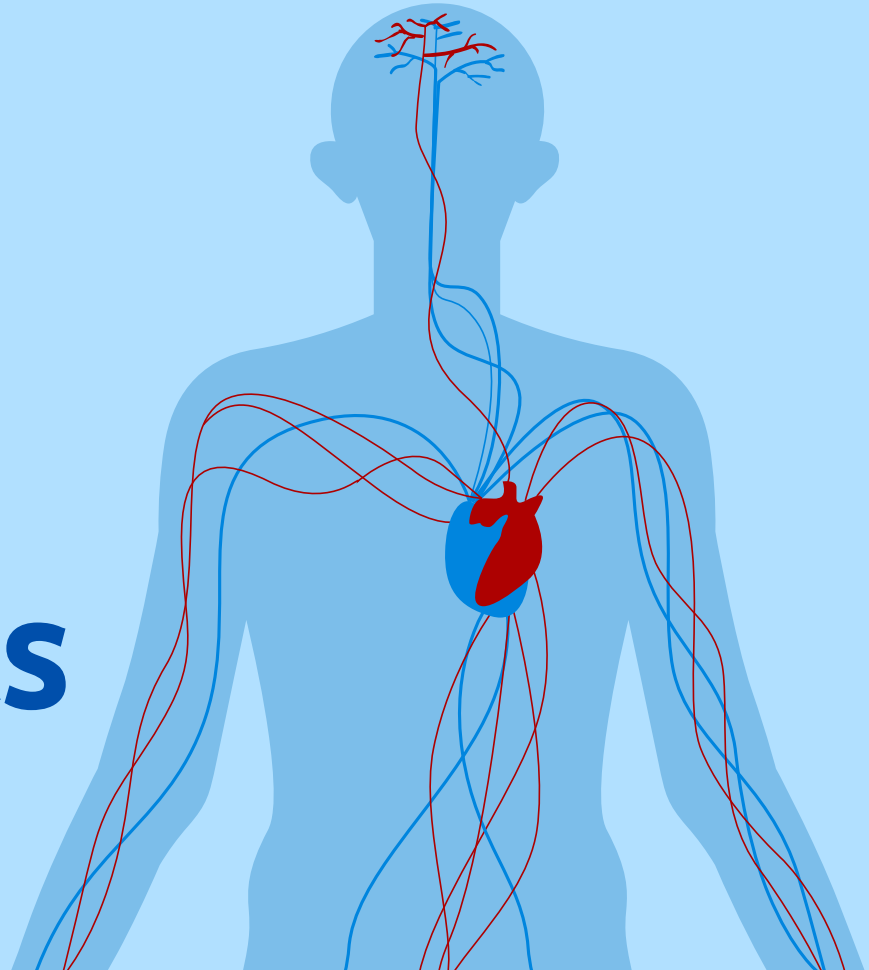
Asystole



Asystole: Flatline, no electrical activity

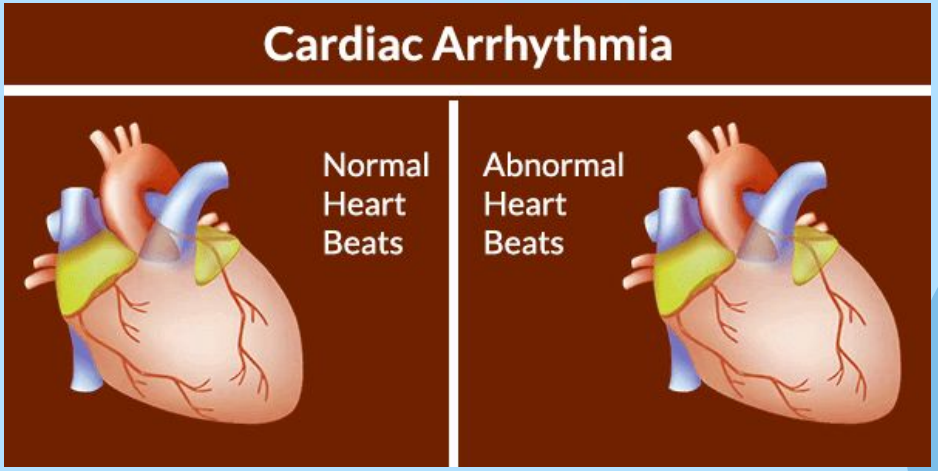
02

Common Cardiac Emergencies



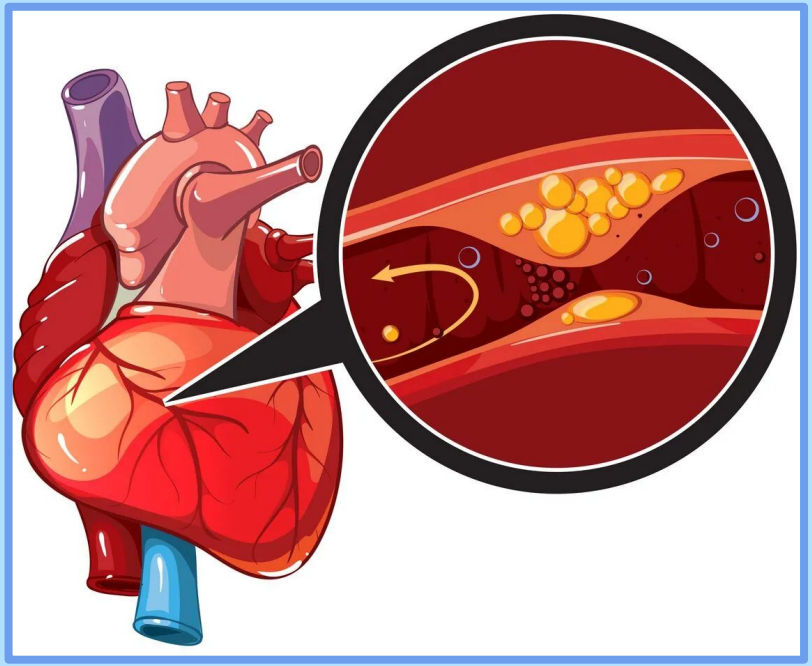
Arrhythmia + Dysrhythmia

- Abnormal heart rhythm
    - Bradycardia
    - Tachycardia
    - Irregular rhythms
    - Lethal rhythms
- Some arrhythmias are benign!
- Others are signs of cardiac events
    - Recognize interventions



Coronary Artery Disease

- Coronary Artery Disease
  - Narrowing of the arteries supplying your heart with oxygenated blood
  - Plaque buildup
  - Atherosclerosis
- Acute Coronary Syndrome
  - Unstable angina
  - NSTEMI
  - STEMI
- **TX:**
  - Not specified in protocols
  - O2
  - Aspirin or Nitro



Myocardial Infarction

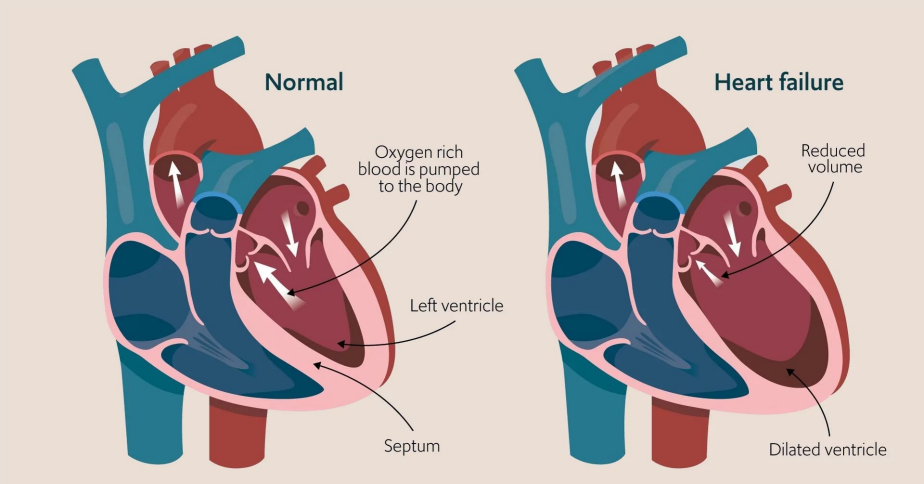
- Sudden blockage of blood flow
- Circulation and electrical
- Angina vs. MI
- **TX:**
    - CPR
    - Aspirin
    - Nitro
    - O2
    - Monitor for shock

- Men:
    - Sweating
    - Pain in chest, arms, neck
    - SOB
    - Heartburn or indigestion
- Women:
    - Dizziness
    - Pain between shoulder blades
    - SOB
    - Gas-like pain
    - Unexplained fatigue

Myocardial Infarction OPQRST

O	Sudden
P	Nothing
Q	Pressure, Squeezing
R	Radiates to left side
S	High severity: 8-10
T	More than 30 mins

Congestive Heart Failure (Left vs Right)



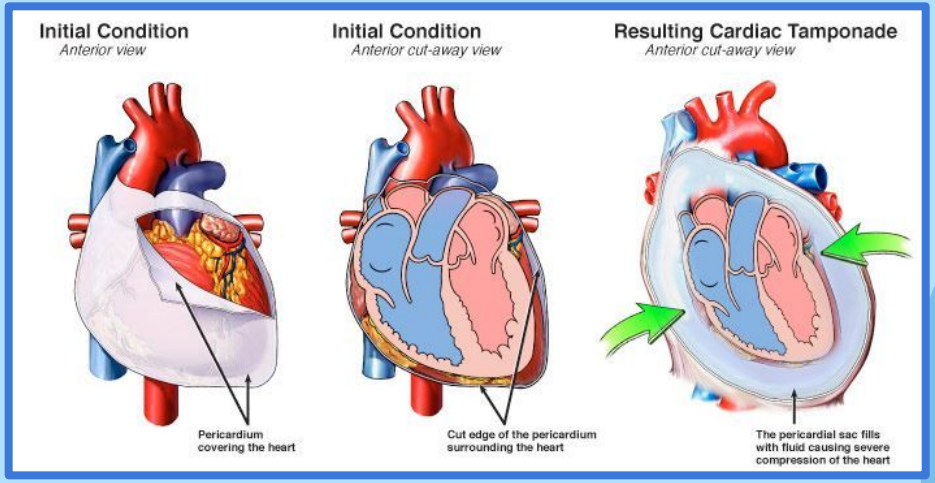
- Failure of the heart to pump blood with normal efficiency
- Right:
  - Pressure builds up in the right atrium and in the superior and inferior vena cava
  - JVD
  - Pedal Edema
- Left:
  - Pressure builds in the left atria and then in the pulmonary vein
  - Pulmonary edema
  - Crackles

TX:

- O2
- Consider Aspirin and Nitro
- If BP < 90 treat for cardiogenic shock
- Rapid Transport

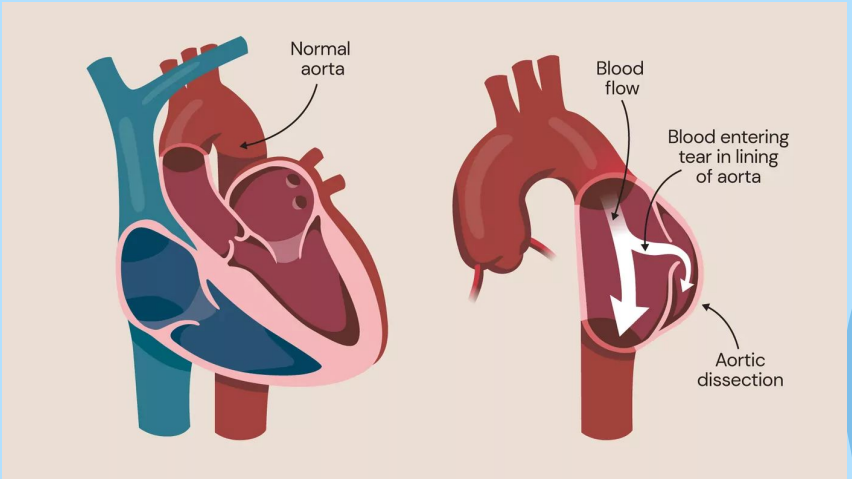
Cardiac Tamponade

- Fluid accumulates in the pericardial sac, preventing it from pumping effectively
  - Trauma
  - Infection
  - Myocardial Infarction
- Beck's Triad
  - Hypotension
  - JVD
  - Muffled heart sounds
- **TX:**
  - O2
  - Rapid transport



Aortic Dissection, Abdominal Aortic Aneurysm

- Dissection: Inner layer of the aorta, tears and separates from the other layers
- Abdominal Aortic Aneurysm (AAA): A enlargement (buldge) of the aorta at the level of the abdomen
  - Palpable heartbeat in abdomen
- Ripping Sensation
- **TX:**
  - Monitor for shock
  - O2
  - Rapid transport



Aortic Aneurysm OPQRST

O	Sudden Intense Pain
P	Nothing
Q	Tearing
R	Abdomen, chest, lower back
S	High severity: 8-10
T	Constant from onset of pain

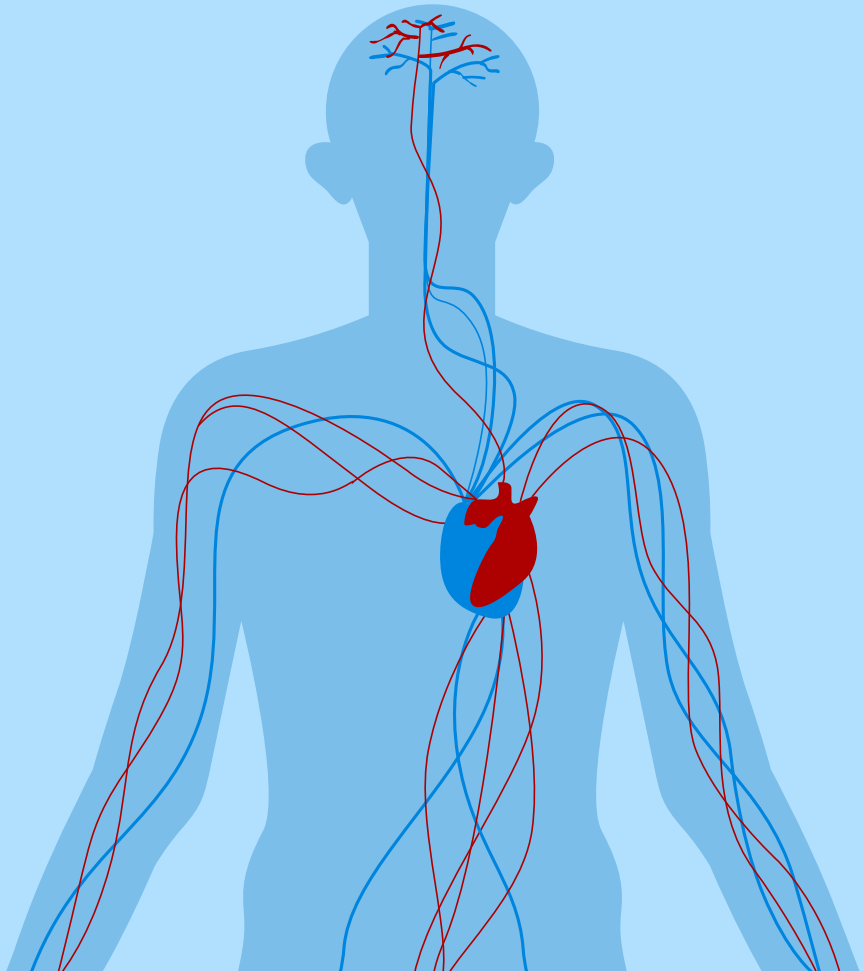
Commotio Cordis

- Sudden, blunt impact to the chest resulting in ventricular fibrillation
  - Sports Injuries
  - Accidents
  - Falls
- Signs and Symptoms:
  - Sudden collapse
  - Loss of consciousness
  - Absent Pulse
  - Irregular/Absent breathing
- Damar Hamlin: Video
- Treatment: CPR

TX:
- Not specified in protocols
- CPR
- AED
- Rapid Transport

03

Assessment and Signs



*Always ask for consent if not implied

Medical Assessment

Scene Size Up – BSI/PENMAN

General Impression – Identify Age, Position, MOI/NOI, Life Threats

ABCs – Assess Airway, Breathing, Circulation, etc.

SAMPLE/OPQRST/PASTE

Vitals

***Unconscious pt**
Run AVPU → Access carotid pulse

Normal HR:

- Adult: 60 – 100 bpm
- Peds: 80 – 120 bpm
- Infant: 80 – 160 bpmc

Normal BP (Adult):

- ≤120/≤80 mmHg

Peds:

- Systolic: 90 – 120 mmHg
- Diastolic: 50 – 80 mmHg

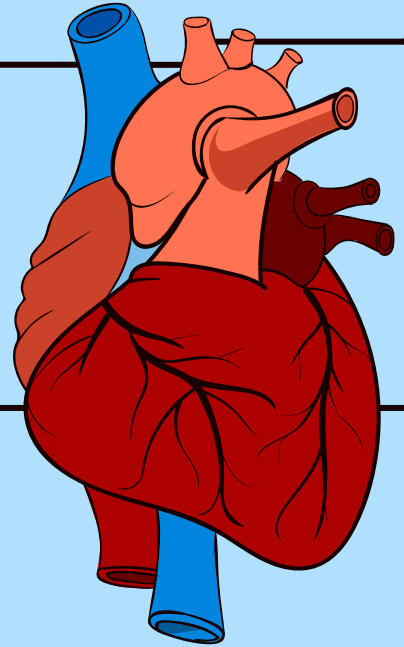
Irregular Vitals

Tachycardia

HR > 100 bpm

Bradycardia

HR < 60 bpm



Hypertensive

BP > 130/90 mmHg

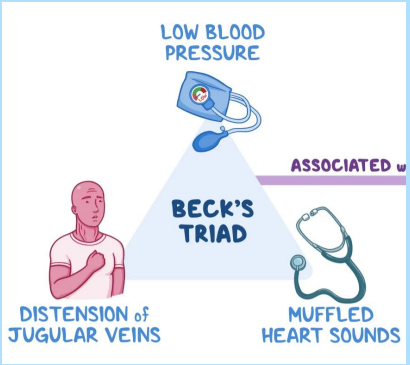
Hypotensive

BP < 90/60 mmHg

Additional Signs

Levine Signs

Clenched fist across chest indicating ischemic chest pain



Beck's Triad

Composed of three signs:

- Muffled heart sounds
- Hypotension
- JVD (right side heart failure)

Impending Sense of Doom

Body's signal that something is wrong – chest pain, SOB, diaphoretic, cool skin

53BASH
5: Last dose taken < 5 mins ago
3: > 3 doses taken for this episode
B: BP systolic < 100 mmHg
A: ALOC
S: Sexual enhancement drugs in last 48 hrs
H: Head injury

Medications

ALWAYS DICCCE MEDS

Nitroglycerin

Administration
Sublingually
Dose
0.4 mg tablet or metered dose spray
Indications
Acute chest pain, prescribed medication
Contraindications
53BASH

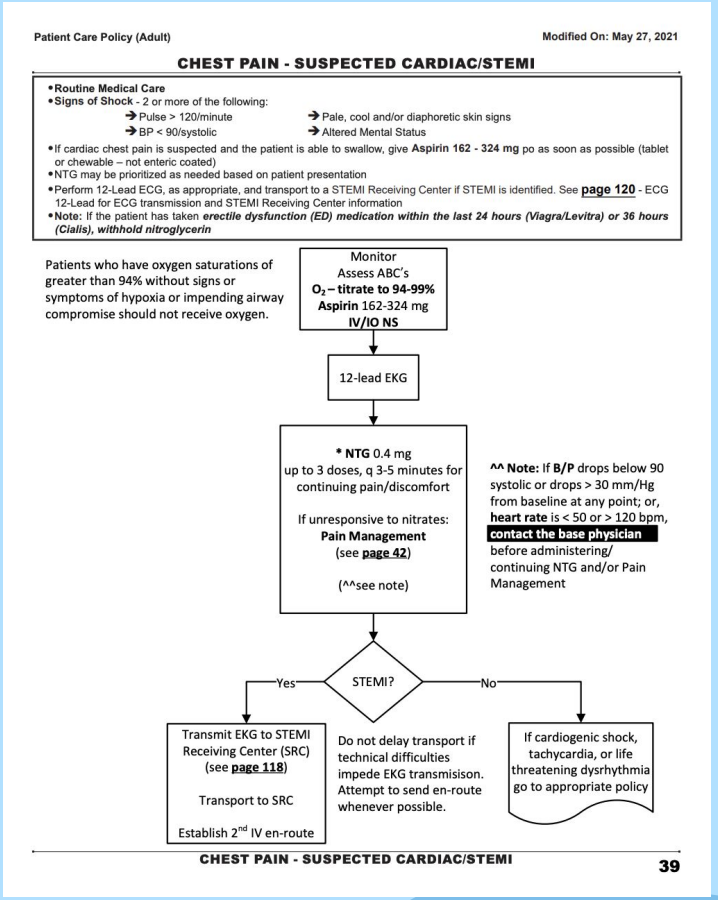
Aspirin

Administration
Sublingually
Dose
162 mg chewable or 324 mg (5gr.) tablet
Indications
Acute chest pain
Contraindications
Bleeding disorder/risk, Allergy, Age (<16 yrs), pt can't swallow

Treatment (ALCO Protocols)

- Oxygen
  - Get up to 94%
  - Patients with saturation of >94% without s/s of hypoxia should not be given O2
- Aspirin
  - 162-324 mg
  - Able to swallow
- Nitroglycerin (NTG)
  - 0.4mg up to 3 doses, 3-5 minutes for continuing pain
  - IMPORTANT: if B/P drops below 90 systolic or HR <50 or >120 bpm, contact the base physician
  - Contraindications
- CPR
- Defibrillation

Treatment (ALCO Protocols)



Patient Care Policy (Adult) Modified On: May 27, 2021

CHEST PAIN - SUSPECTED CARDIAC/STEMI

- **Routine Medical Care**
- **Signs of Shock** - 2 or more of the following:
  - → Pulse > 120/minute
  - → Pale, cool and/or diaphoretic skin signs
  - → BP < 90/systolic
  - → Altered Mental Status
- If cardiac chest pain is suspected and the patient is able to swallow, give **Aspirin 162 - 324 mg** po as soon as possible (tablet or chewable – not enteric coated)
- NTG may be prioritized as needed based on patient presentation
- Perform 12-Lead ECG, as appropriate, and transport to a STEMI Receiving Center if STEMI is identified. See **page 120** - ECG 12-Lead for ECG transmission and STEMI Receiving Center information
- **Note:** If the patient has taken ***erectile dysfunction (ED) medication within the last 24 hours (Viagra/Levitra) or 36 hours (Cialis), withhold nitroglycerin***

Patients who have oxygen saturations of greater than 94% without signs or symptoms of hypoxia or impending airway compromise should not receive oxygen.

Monitor
Assess ABC's
O_2 – titrate to 94-99%
Aspirin 162-324 mg
IV/IO NS

12-lead EKG

*** NTG** 0.4 mg
up to 3 doses, q 3-5 minutes for continuing pain/discomfort

If unresponsive to nitrates:
Pain Management
(see **page 42**)

(^^see note)

^^ Note: If **B/P** drops below 90 systolic or drops > 30 mm/Hg from baseline at any point; or, **heart rate** is < 50 or > 120 bpm, **contact the base physician** before administering/ continuing NTG and/or Pain Management

STEMI?

Yes

Transmit EKG to STEMI Receiving Center (SRC) (see **page 118**)

Transport to SRC

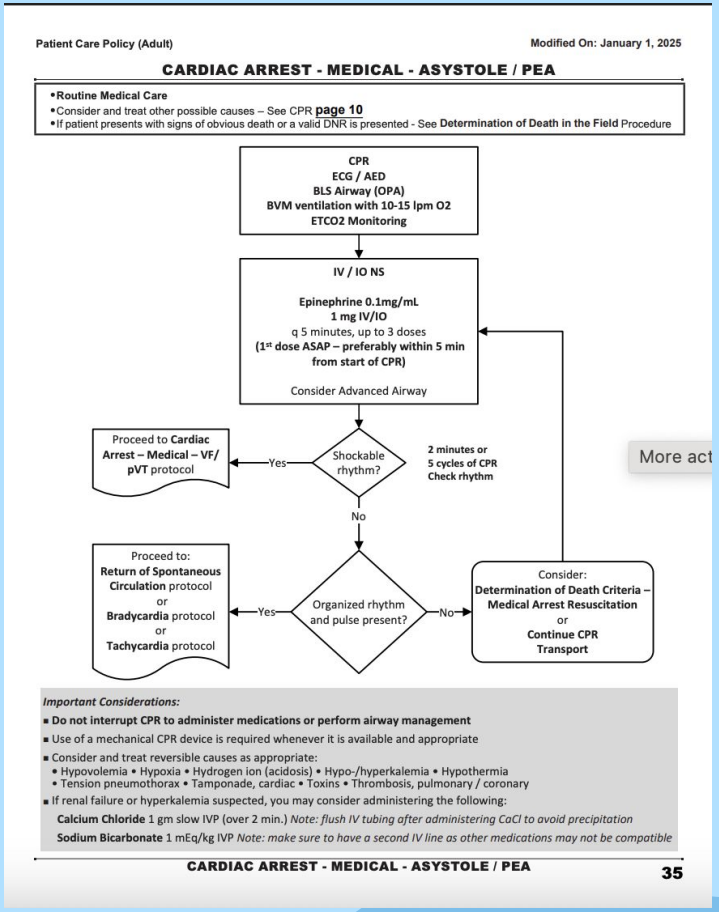
Establish 2nd IV en-route

Do not delay transport if technical difficulties impede EKG transmisison. Attempt to send en-route whenever possible.

No

If cardiogenic shock, tachycardia, or life threatening dysrhythmia go to appropriate policy

Treatment (ALCO Protocols)



Patient Care Policy (Adult) Modified On: January 1, 2025

CARDIAC ARREST - MEDICAL - ASYSTOLE / PEA

- **Routine Medical Care**
- Consider and treat other possible causes – See CPR page 10
- If patient presents with signs of obvious death or a valid DNR is presented - See **Determination of Death in the Field** Procedure

CPR
ECG / AED
BLS Airway (OPA)
BVM ventilation with 10-15 lpm O2
ETCO2 Monitoring

IV / IO NS

Epinephrine 0.1mg/mL
1 mg IV/IO
q 5 minutes, up to 3 doses
(1st dose ASAP – preferably within 5 min from start of CPR)

Consider Advanced Airway

Shockable rhythm?

Yes → Proceed to **Cardiac Arrest – Medical – VF/ pVT** protocol

2 minutes or 5 cycles of CPR Check rhythm

No

Organized rhythm and pulse present?

Yes → Proceed to:
Return of Spontaneous Circulation protocol
or
Bradycardia protocol
or
Tachycardia protocol

No → Consider:
Determination of Death Criteria – Medical Arrest Resuscitation
or
Continue CPR
Transport

Important Considerations:

- **Do not interrupt CPR to administer medications or perform airway management**
- Use of a mechanical CPR device is required whenever it is available and appropriate
- Consider and treat reversible causes as appropriate:
  - Hypovolemia • Hypoxia • Hydrogen ion (acidosis) • Hypo-/hyperkalemia • Hypothermia
  - Tension pneumothorax • Tamponade, cardiac • Toxins • Thrombosis, pulmonary / coronary
- If renal failure or hyperkalemia suspected, you may consider administering the following:

  Calcium Chloride 1 gm slow IVP (over 2 min.) *Note: flush IV tubing after administering CaCl to avoid precipitation*

  Sodium Bicarbonate 1 mEq/kg IVP *Note: make sure to have a second IV line as other medications may not be compatible*

Kahoot!