

CARDIO PT. 1

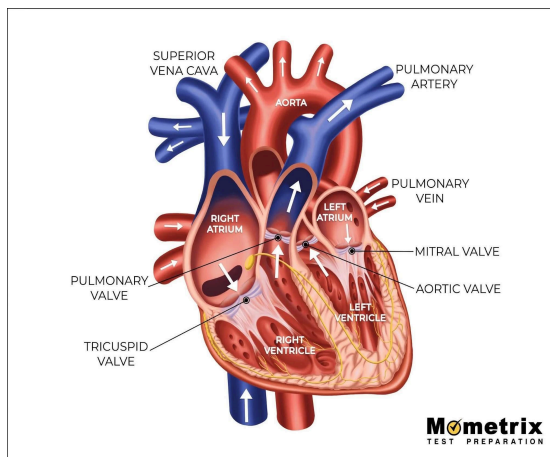
CARDIAC CYCLE & PHYSIOLOGY

- **Diastole (Relaxation Phase):**
 - Ito ang period ng **ventricular filling** kung saan ang apat na chambers ay nag rerelax simultaneously.
- **Systole (Contraction Phase):**
 - Refers to the events sa puso tuwing nagko-**contract** ang chambers.

Note: Hindi sabay ang atrial at ventricular systole! Unang nangyayari ang **Atrial Systole** (sa huling bahagi ng diastole), at susundan ng **Ventricular Systole** para ma-eject o maipush ang dugo.

Note: Ang **Left Ventricle** ay **2-3x MORE muscular kaysa Right Ventricle!** kase kailangan ng LV na labanan ang **high-pressure system** sa **Aorta at systemic arteries**, ang RV naman ay nagko-contract lang against sa **low-pressure system** ng **pulmonary arteries at capillaries**.

STEP-BY- STEP BLOOD FLOW PROCESS



- **Valves Order: TP MA (Toilet Paper My Ass)**
 1. **T** - Tricuspid Valve
 2. **P** - Pulmonary Valve
 3. **M** - Mitral (Bicuspid) Valve
 4. **A** - Aortic Valve

Arteries = Away (Lumalabas sa puso)

Veins = Visit (Pumapasok/Pabalik sa puso)

I. DEOXYGENATED BLOOD (*Right Side / Blue Blood*)

- Galing sa katawan ang dugo, puno ng **CO₂** at walang oxygen.
 1. **Superior Vena Cava (SVC):** Dito dumadaan ang deoxygenated blood mula sa upper body (head, neck, brain, at upper extremities).
 2. **Inferior Vena Cava (IVC):** Dito naman dumadaan ang deoxygenated blood mula sa lower body (mula sa toes, legs, trunk, at lower extremities).
 3. **Coronary Sinus:** Dito naman duma-drain ang deoxygenated blood na galing mismo sa muscle ng puso (coronary circulation).

4. **Right Atrium (RA):** Unang kwarto. Dito direktso at nag-iipon ang dugo galing sa SVC, IVC, at Coronary Sinus.
5. **Tricuspid Valve (AV Valve):** Unang pinto na may **3 cusps/leaflets**. Papasok dito ang dugo mula RA papuntang Right Ventricle.

Note: Nagco-close ang valves pagkalusot ng dugo para maiwasan ang **regurgitation (backflow)** at panatiliing **one-way** lang ang daloy.

6. **Right Ventricle (RV):** Pangalawang kwarto. Pagkapasa ng dugo dito, magco-contract ang RV para maipasa at maipush ang dugo pataas.
7. **Pulmonic / Pulmonary Valve (Semilunar Valve):** Pangalawang pinto na may 3 leaflets (half-moon shape). Bubukas ito sa ventricular systole para makalunsad ang dugo papuntang Pulmonary Artery.

II. OXYGENATION PROCESS

8. **Pulmonary Artery:** Dito dadaan ang dugo papunta sa lungs.

Note: Ito ang tanging artery sa buong katawan na nagdadala ng deoxygenated blood!

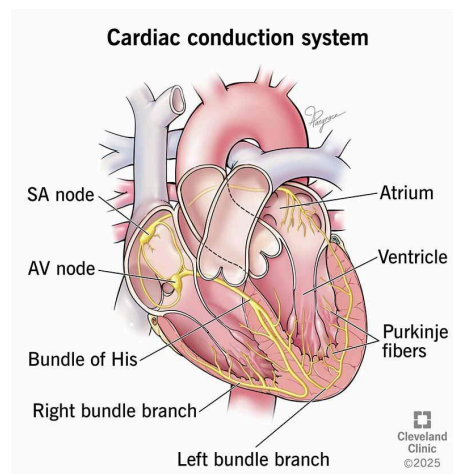
8.1 Lungs:

- Dito nagaganap ang **gas exchange** sa alveoli (air sacs ng lungs). Itinatapon ang **Carbon Dioxide (CO₂)** at kumukuha ng sariwang **Oxygen (O₂)**.

III. OXYGENATED BLOOD (Left Side / Red Blood)

- Puno na ng **Oxygen** ang dugo at ready nang idistribute sa buong katawan.
9. **Pulmonary Veins (4 Veins):** Dito dadaan ang dugo pabalik sa puso (oxygenated na ito).
Note: Ito ang tanging veins sa katawan na nagdadala ng oxygenated blood!
 10. **Left Atrium (LA):** Pangatlong kwarto. Dito pumapasok ang dugo galing sa 4 na Pulmonary Veins.
 11. **Mitral Valve / Bicuspid Valve (AV Valve):** Pangatlong pinto na may **2 cusps/leaflets** lang. Papasok dito ang dugo mula LA patungong Left Ventricle.
 12. **Left Ventricle (LV):** Pang-apat na kwarto. Dito napupunta ang dugo. Ito ang pinakamakapal ang muscle wall dahil kailangan nito ng napakalakas na contraction para mai-push ang dugo sa buong katawan.
 13. **Aortic Valve (Semilunar Valve):** Pang-apat at huling pinto (may 3 leaflets). Bubukas ito kapag nag-contract ang LV para maipush ang dugo sa Aorta.
 14. **Aorta:** Ang pinakamalaking artery sa buong katawan. Dito na mapu-push ang dugo para ma-distribute sa mga arteries at capillaries papunta sa systemic circulation.

CARDIAC ELECTROPHYSIOLOGY



Nakakagawa ang puso ng kuryente dahil sa **three physiologic characteristics of cardiac electrical cell** (Nodal cells at Purkinje cells):

1. **Automaticity**: mag-initiate ng sariling electrical impulse.
2. **Excitability**: mag-respond sa isang electrical impulse.
3. **Conductivity**: mag-transmit o magpasa ng electrical impulse mula sa isang cell papunta sa iba.

CARDIAC CONDUCTION PATHWAY

Mnemonic: *Send A Big Posi*

S - SA Node

A - AV Node

B - Bundle of His (Right & Left Bundle Branches)

P - Purkinje Fibers

Step-by-Step Flow:

1. Sinoatrial (SA) Node (*Primary Pacemaker*)

- Nasa **junction ng superior vena cava at right atrium**.
- Nag-i-initiate ng **electrical impulse** na dumadaloy sa myocardial cells ng atria sa pamamagitan ng internodal pathways.
- Firing Rate: **60 to 100 impulses** per minute sa normal resting adult heart.
- Effect: **Atrial Contraction (atrial systole)**.

2. Atrioventricular (AV) Node (*Secondary Pacemaker*)

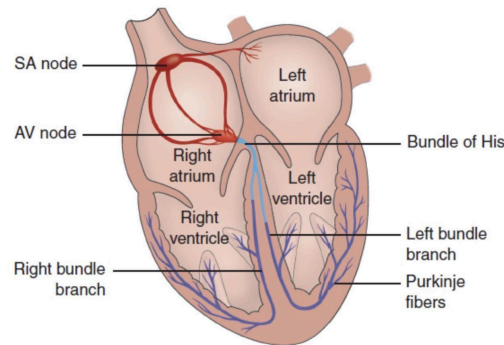
- Nasa right atrial wall na malapit sa tricuspid valve.
- Tumatanggap ng impulse mula sa atria at nagbibigay ng slight delay bago ipasa sa ventricles.
 - **Why the Delay?** Para magkaroon ng sapat na oras ang atria na **mag-contract at mapuno nang husto ang ventricles** bago ito mag complete ventricular filling.
- Firing Rate: **40 to 60 impulses per minute** (kapag nasira o nag-malfunction ang SA node, ang AV node ang nagses-step up).

3. Bundle of His

- Isang bundle ng **specialized conducting tissue**, dito pumupunta ang impulse galing sa AV node.
- Nagho-horn o naghahati sa dalawang branches:
 - **Right Bundle Branch**: Nagdadala ng impulse sa right ventricle.
 - **Left Bundle Branch**: Nagdadala ng impulse sa left ventricle (ang pinakamalaking chamber). Nahahati pa ito sa left anterior at left posterior bundle branches.

4. Purkinje Fibers

- **Terminal point** ng conduction system na binubuo ng **Purkinje cells**.
- Mabilis na **nagpapadala ng impulse** sa whole thick walls ng ventricles.
- Effect: **Stimulates ventricular myocardial cells to contract** (*ventricular systole*).
- **Firing Rate** (*Ventricular Pacemaker Site*): **30 to 40 impulses per minute** (pinakamababang inherent rate kapag parehong nag-fail ang SA at AV nodes).



CARDIAC ACTION POTENTIAL (5 PHASES)

- Paulit-ulit na **cycle ng depolarization** (electrical stimulation/contraction) at **repolarization** (electrical relaxation/resting state) dulot ng palitan ng mga ions (**Na⁺**, **K⁺**, **Ca⁺⁺**) sa cell membrane.
- **Resting State**: Ang **Sodium (Na⁺)** ang **primary extracellular ion** at ang **Potassium (K⁺)** ang **primary intracellular ion**. Negative ang charge sa loob ng cell kumpara sa labas.

Phases

1. **Phase 0 (Rapid Depolarization)**: Pumasok ang Na⁺ (Sodium) >> Nag-contract ang cells.
2. **Phase 1 (Early Repolarization)**: Lumabas ang K⁺ (Potassium) >> Nagsimulang mag-relax.
3. **Phase 2 (Plateau Phase)**: Pumasok ang Ca⁺⁺ (Calcium) >> Mabilis na bumagal ang relaxation para mag-pantay ang charge.
4. **Phase 3 (Final Repolarization)**: Tuloy-tuloy ang labas ng K⁺ >> Complete relaxation/resting state.
5. **Phase 4 (Resting Phase)**: Pahinga ang cell bago ang susunod na tibok.

REFRACTORY PERIOD

Period na kailangang **fully** mag-repolarize ang myocardial cells bago sila pwedeng mag-depolarize o ma-stimulate uli.

- **Absolute / Effective Refractory Period (Phase 0 to Mid-Phase 3)**:
 - Kahit anong lakas ng kuryente ang dumating, **HINDI** magre-respond/magko-contract ang puso. (**Protected phase**).
- **Relative Refractory Period (End of Phase 3)**:
 - Kapag may dumating na sobrang lakas na kuryente, **PWEDE** itong mag-contract nang maaga.
 - **Clinical Risk**: Ito ang dahilan ng delikadong **Arrhythmias (VTach/VFib)**.

CARDIAC PHYSIOLOGY

- **Cardiac Output (CO)**: Ang kabuuang dami ng dugo na nai-eject ng puso sa loob ng isang minuto.

- Cardiac Output is computed by multiplying Stroke Volume by Heart Rate (**CO = SV x HR**).
 - *Normal CO Value: 4 to 6 L/min* sa isang resting adult.
 - **Stroke Volume (SV):** Ang dami ng dugo na nai-eject bawat isang tibok ng puso (per heartbeat).
 - *Normal SV Value: 60 to 130 mL per beat.*
 - **Ejection Fraction (EF):** Ang percentage ng end-diastolic blood volume na nai-eject sa bawat heartbeat.
 - *Normal EF Value: 55% to 65%* para sa left ventricle. Kapag ang EF ay mababa sa 40%, ibig sabihin ay may decreased left ventricular function at posibleng Heart Failure.
 - **Baroreceptors (Blood Pressure Control)**
 - Specialized nerve cells na matatagpuan sa **aortic arch at carotid arteries**.
 - **Sensitive** sila sa pagbabago ng **Blood Pressure (BP)** at nagpapadala ng impulses sa **medulla oblongata**.
 - **Hypertension:** Tumatas ang discharge rate ng baroreceptors para i-stimulate ang **parasympathetic activity** at i-inhibit ang sympathetic activity, kaya bumababa ang Heart Rate at Blood Pressure.
 - **Hypotension:** Bumababa ang stimulation sa baroreceptors, kaya bumababa ang parasympathetic activity at tumataas ang **sympathetic activity**. Ito ay nagdudulot ng **vasoconstriction** at pagtaas ng Heart Rate para maitaas ang BP.
 - **Preload:** Degree ng **stretch** ng **ventricular cardiac muscle fibers** sa dulo ng diastole (**filling phase**).
 - **Frank-Starling Law:** Kapag **mas mataas ang venous return, mas tumataas ang preload (muscle stretch)**, na nagdudulot ng **mas malakas na contraction at mas mataas na stroke volume**.
 - **Pampataas ng Preload:** Blood transfusions at intravenous (IV) fluid administration.
 - **Pambaba ng Preload:** Diuresis, vasodilating agents tulad ng nitrates, dehydration, vomiting, diarrhea, at diaphoresis.
 - **Afterload: Force o resistance** na kailangang labanan ng ventricle para maishoot o mai-eject ang dugo during systole.
- >>> Kapag mas mataas ang afterload, mas bumababa ang stroke volume.
- **Resistance against left ventricle: Systemic Vascular Resistance (SVR)**
 - **Resistance against right ventricle: Pulmonary Vascular Resistance (PVR).**
 - Ang **arterial vasoconstriction** ay nagpapataas ng afterload, ang **arterial vasodilation** naman ay nagpapababa ng afterload.
 - **Contractility:** Force na ginagawa ng **contracting myocardium** (heart muscle)
 - **Pampalakas ng Contractility:** Circulating catecholamines, sympathetic neuronal activity, at mga gamot tulad ng digoxin, dopamine, at dobutamine.
 - **Pampahina ng Contractility:** Hypoxemia, acidosis, at mga beta-adrenergic-blocking agents tulad ng metoprolol.

COMMON ASSESSMENT FINDINGS IN CARDIOVASCULAR DISEASE

1. Nail Clubbing

- Pagkapal ng balat sa ilalim ng kuko ng daliri sa kamay o paa.
- **Associated Condition / Cause:** Chronic hemoglobin desaturation; karaniwang nakikita sa congenital heart disease o advanced pulmonary diseases.

2. Cold Skin and Diaphoresis

- Malamig at pawisan na balat.
- **Associated Condition / Cause:** Low cardiac output (cardiogenic shock o acute myocardial infarction) na nag-i-stimulate sa sympathetic nervous system para magkaroon ng vasoconstriction.

3. Pain and Pallor of the Fingertips or Toes

- Masakit, maputla, o namumutlang mga daliri sa kamay o paa.
- **Associated Condition / Cause:** Intermittent arteriolar vasoconstriction, karaniwang kaugnay ng Raynaud disease. Pwede rin itong senyales ng acute obstruction of arterial blood flow (kabilang sa 6 Ps).

4. Central vs. Peripheral Cyanosis

- **Central Cyanosis:**
 - Bluish discoloration o bluer tinge sa dila at buccal mucosa.
 - **Associated Condition / Cause:** Serious cardiac disorders (pulmonary edema, cardiogenic shock, o congenital heart disease) kung saan ang venous blood ay dumadaan sa pulmonary circulation nang hindi na-o-oxygenate nang maayos.
- **Peripheral Cyanosis:**
 - Bluish discoloration sa nail beds, ilong, labi, ears, at extremities.
 - **Associated Condition / Cause:** Peripheral vasoconstriction dahil sa mababang cardiac output, exposure sa malamig na kapaligiran, o anxiety.

5. Edema

- Pag-iipon ng **fluid sa interstitial spaces**, lalo na sa lower extremities (paa, ankle, binti) o sa sacral area para sa mga bedridden patients.
- **Associated Condition / Cause:** Indication ng Heart Failure (HF) o mga vascular problems tulad ng Peripheral Arterial Disease (PAD), chronic venous insufficiency, o Deep Vein Thrombosis (DVT).

6. Rubor

- **Reddish-blue discoloration** sa binti na mabilis na lumalabas (within 20 seconds to 2 minutes) kapag inilagay ang binti sa dependent position.
- **Associated Condition / Cause:** Filling ng deoxygenated blood sa mga dilated capillaries, na isang malinaw na sign ng Peripheral Arterial Disease (PAD).

7. Feet and Ankle Ulcers

- **Venous Ulcers:**
 - Mababaw (superficial), irregular ang hugis na sugat sa medial malleolus na may red to yellow granulation tissue.
 - **Cause:** Pagputok ng maliliit na capillaries dahil sa chronic venous insufficiency.
- **Arterial Ulcers:**
 - Masakit, malalim, bilog na sugat sa paa o daliri na may pale to black wound base.
 - **Cause:** Malalang pagkabawas ng blood flow (prolonged tissue ischemia) mula sa Peripheral Arterial Disease (PAD) na pwedeng magdulot ng gangrene.

8. Xanthelasma

- Yellowish at protruded na plaques sa nasal portion ng eyelids.
- **Associated Condition / Cause:** Mataas na cholesterol sa dugo (hypercholesterolemia).

9. Dyspnea and Orthopnea

- Hirap sa paghinga (dyspnea) o pagkahirap huminga kapag nakahiga (orthopnea).
- **Associated Condition / Cause:** Elevated filling volumes/pressures at fluid congestion sa baga (halimbawa: pulmonary edema o left-sided heart failure).

10. Jugular Venous Distention (JVD)

- Pag-protrude o paglaki ng ugat sa leeg (jugular vein).
- **Associated Condition / Cause:** Elevated atrial and ventricular filling volumes and pressures, na karaniwang nakikita sa right-sided heart failure o fluid overload.

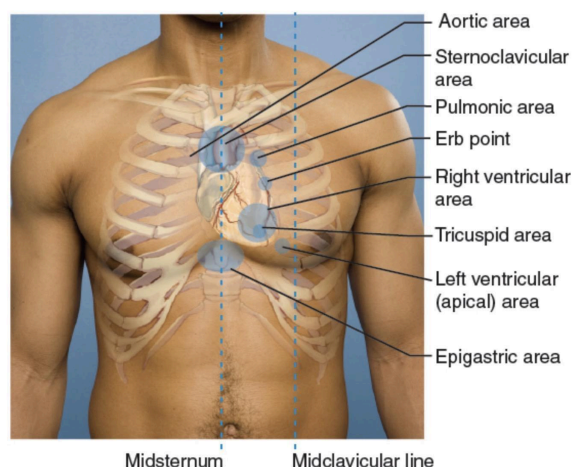
11. Heart Murmurs and Extra Heart Sounds

- Hindi normal na tunog sa puso tulad ng gallop sounds (S3, S4) o murmurs.
- **Associated Condition / Cause:** Sign na may problema sa valvular function o pagbabago sa kakayahan ng puso na mag pump.

12. Changes in Vital Signs (V/S)

- Changes sa Blood Pressure (reduced pulse pressure, hypotension, o hypertension) at Heart Rate (like tachycardia).
- **Associated Condition / Cause:** Indication ng mababang cardiac output o pag-activate ng compensatory mechanisms (tulad ng sympathetic nervous system at baroreceptor response).

PRECORDIAL LANDMARKS



Mnemonic: *All People Enjoy Toxic Men*

1. **Aortic Area:** Right sternal border, 2nd intercostal space

2. **Pulmonic Area:** Left sternal border, 2nd intercostal space
3. **Erb's Point:** Left sternal border, 3rd intercostal space
4. **Tricuspid Area:** Left sternal border, 4th intercostal space. **Note:** Pwede rin hanggang 5th ICS sa left sternal border based sa textbook reference.
5. **Mitral (Apical / Left Ventricular) Area:** Left 5th intercostal space sa midclavicular line. **Note:** Dito pinaka accurate na naririnig at napalpate ang Point of Maximal Impulse (PMI).

Normal Heart Sounds Baseline:

S1: Due to closure ng AV valves; pinakamalakas sa apex.

S2: Due to closure ng semilunar valves; pinakamalakas sa base ng puso (aortic at pulmonic areas).

Abnormal Heart Sound:

S3 (Ventricular Gallop):

- Naririnig pagkatapos ng S2.
- Sound Pattern: "Ken-tuck-y".
- Due to rapid ventricular filling / volume overload.
- Common Condition: Heart failure & fluid overload.

S4 (Atrial Gallop):

- Heard before ang S1.
- Sound Pattern: "Ten-nes-see".
- Due to Atrial contraction against stiff ventricle.
- Common Condition: Hypertension, Left Ventricular Hypertrophy (LVH), at stiff ventricles.

Friction Rub: Harsh, grating sound dahil sa friction ng inflamed pericardial surfaces sa pericarditis.

Heart Murmurs: Dahil sa turbulent blood flow sa loob ng puso.

Grading System of Murmur Intensity: Use Diaphragm and Bell of Stethoscope

1. **Grade 1:** Very faint; mahirap marinig para sa baguhang clinician.
2. **Grade 2:** Quiet pero agad na naririnig.
3. **Grade 3:** Moderately loud.
4. **Grade 4:** Loud at minsan may kasama nang thrill (palpable vibration).
5. **Grade 5:** Very loud; marinig kahit nakalapat lang nang bahagya ang stethoscope; may thrill.
6. **Grade 6:** Extremely loud; marinig kahit nakatagilid o malayo nang kaunti ang stethoscope sa dibdib; may thrill.

DIAGNOSTIC STUDIES

1. Laboratory Tests

a. Cardiac Biomarker Analysis

- Test ng dugo para sa mga proteins at enzymes na lumalabas kapag may sira ang muscle ng puso. Para malaman at ma-diagnose kung may Myocardial Infarction (MI / Heart Attack) or severe heart damage.
- 1. *Proteins*: **Myoglobin, Troponin T, at Troponin I.**
- 2. *Enzymes*: **Creatine Kinase (CK) at CK isoenzymes (CK-MB).**
- **Troponin (T at I)**: Gold standard at pinaka-accurate / specific sa puso; hindi ito basta-basta tumataas sa ibang tissue damage.
- **CK-MB**: Specific sa cardiac muscle pero nakikita din sa severe skeletal muscle damage.
- **Myoglobin**: Tumataas nang napakabilis pero non-specific (pwedeng galing sa kahit anong nasirang muscle sa katawan).

Note: Ang mga ito ay galing sa necrotic myocardial cells (namamatay na cells ng puso); marerelease sa bloodstream papuntang interstitial spaces at pumasok sa dugo sa pamamagitan ng lymphatic system.

b. Lipid Profile

- Blood test that evaluates the rate ng iba't ibang lipid sa dugo after mag-fasting nang 12 hours.
- Tinetest ang Total Cholesterol, Triglycerides, at Lipoproteins (LDL at HDL).
- Ineevaluate ang risk ng pasyente sa pagkakaroon ng Coronary Artery Disease (CAD), stroke, o atherosclerotic diseases.
- Direct at accurate na indicator para sa long-term cardiovascular risk, PERO nakadepende ang accuracy nito sa strict adherence sa 12-hour fasting bago kuhanan ng dugo.

c. Brain (B-Type) Natriuretic Peptide (BNP)

- Diagnostic blood test para suriin ang pressure at fluid overload sa puso (hindi brain, nadiscovered lang una sa brain of pig kaya brain nakalagay).
- Measures the BNP neurohormone sa dugo (Cut-off: > 100pg/mL = Heart Failure). Directly secreted by ventricles kapag sobra ang stretching o elevated ang pressure dahil sa fluid overload (increased preload).

d. C-Reactive Protein (CRP / hs-CRP)

- Tests the C-Reactive Protein (ginagamit ang high-sensitivity CRP o hs-CRP para sa cardiac risk) na pinoproduce at inilalabas ng liver in response sa systemic inflammation.
- To predict the risk of Cardiovascular Disease (CVD) at ma-detect ang inflammation relating to severe inflammation of atherosclerosis.
- Nonspecific marker (hindi lang sa puso galing ang inflammation; pwedeng tumaas kahit sa simpleng infection o arthritis). Pero kapag pinagsama sa ibang cardiac tests, napakagandang indicator ito para sa pagdetermine ng cardiovascular risk.

e. Homocysteine

- Risk assessment blood test na nangangailangan din ng 12-hour fasting. Tinetest ang amino acid na homocysteine (byproduct of protein metabolism; affect and process by B-complex vitamins like Folate, B6 & B12) sa serum (High risk kapag >15 mcmmol/L).
- Evaluates the risk of CAD, stroke, at peripheral vascular disease, dahil high levels nito ay sumisira sa endothelial lining ng arteries at nagdudulot ng clot (thrombus).

- Hindi ito independent predictor ng CAD dahil malaki ang epekto ng genetics at kakulangan sa Vitamin B/Folate sa pagtaas nito.

2. Chest X-Ray:

- Views the size, contour, at position ng puso, pati ang pagpwesto ng pacemakers at catheters.
- Sinusukat ang structure, HINDI function (hindi nakakapag-diagnose ng acute MI pero nakikita ang komplikasyon tulad ng Heart Failure).

3. Fluoroscopy:

- Continuous, real-time x-ray imaging para makita ang cardiac/vascular pulsations at iguide ang pagpapasok ng catheters sa cardiac catheterization.
- Moving x-ray beam at contrast dye na nagpapakita ng live motion ng puso at blood vessels.
- Accurate visual guide para sa invasive procedures.

4. Electrocardiography (ECG)

a. 12-Lead ECG:

- Nagbibigay ng 12 distinct views ng electrical activity ng puso para mag-diagnose ng arrhythmias, ischemia, infarction, at electrolyte imbalances.
- Measures the electrical currents of heart sa pamamagitan ng electrodes sa balat.
- Gold standard para sa mabilisang structural at electrical diagnosis ng puso.

b. **Hardwire Cardiac Monitoring:** Real-time ECG monitoring na nakaconnect sa bedside monitor at central station; para sa high-risk arrhythmia patients.

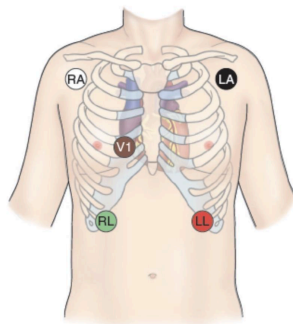
c. **Telemetry:** Wireless, battery-powered rhythm monitoring; para sa stable na patient na kailangang mag-ambulate.

d. **Holter Monitor:** Portable ECG device na isinusuot nang 24–48 hours habang nagrerecord ang pasyente sa diary niya about sa kanyang activities at symptoms.

e. **ECG Patch:** Waterproof, single-use patch na isinusuot nang 7–14 days pwede isend and data via Bluetooth.

f. **Cardiac Implantable Electronic Devices (Pacemakers & ICDs):** Surgically implanted devices na may leads papuntang puso para i-monitor at i-regulate ang rhythm at i-prevent ang sudden cardiac death sa pamamagitan ng electrical pulses o shocks.

12-Lead ECG Electrode Placements



RA – Right arm (white)
 LA – Left arm (black)
 RL – Right leg (green)
 LL – Left leg (red)
 V₁ – Chest or precordium (brown)

Limb Leads: *Clouds (white) over Grass (green), Smoke(black) over Fire (red)*

- RA: Right Arm — WHITE
- LA: Left Arm — BLACK
- RL: Right Leg (Ground / Reference point) — GREEN
- LL: Left Leg — RED

Chest (Precordial) Leads:

- V1: 4th ICS, Right sternal border
- V2: 4th ICS, Left sternal border
- V3: Midway sa pagitan ng V2 at V4
- V4: 5th ICS, Midclavicular Line (MCL)
- V5: 5th ICS, Anterior Axillary Line (AAL)
- V6: 5th ICS, Midaxillary Line (MAL)

Nursing Interventions for Cardiac Monitoring

- Perform proper skin preparation before applying electrodes and change them every 24 hours to eliminate artifacts
- Assess skin for allergic responses like redness or itching, switch to hypoallergenic electrodes, and rotate sites to prevent breakdown
- Follow standard color-coded lead placement and select Lead II and V1& for optimal arrhythmia tracing
- Individualize ECG alarm parameters to meet patient needs and respond immediately to all alarms to prevent alarm fatigue
- Remove all metal-containing electrodes before sending a patient for any magnetic resonance scan
- Keep reusable cables and equipment clean to prevent infections, secure monitoring devices in place, and never submerge them in water
- Ensure all surrounding electrical equipment is functioning properly and inspected by medical engineering

5. Cardiac Stress Testing

- Noninvasive test para makita kung may myocardial ischemia at kung paano nagre-respond ang heart kapag tumataas ang workload at O₂ demand.
- Normally, ang coronary arteries ay nagdi-dilate para madagdagan ang blood flow.
 - Sa atherosclerosis, hindi sapat ang dilation → ↓ blood flow → myocardial ischemia.

Main types

1. Exercise stress test
2. Pharmacologic stress test
3. Puwedeng sabayan ng ECG, echocardiography, or radionuclide imaging

a. Exercise Stress Test

- Most common type.
- Patient naglalakad/tumatakbo sa treadmill or nagpe-pedal sa stationary bike.
- Gradually pinapataas ang workload habang mino-monitor ang heart.
- Minomonitor ang ECG, HR, BP, symptoms, at signs of ischemia.
- **Abnormal findings**

1. Chest pain
2. ST-segment depression
3. Ventricular arrhythmias
4. Inadequate HR response
5. Abnormal BP response

Nursing interventions

1. Mag-fasting bago ang test at iwasan ang stimulants tulad ng caffeine at tobacco.
2. Per physician order, i-hold ang beta-blockers, calcium channel blockers, at digitalis hanggang 48 hr bago ang test.
3. Magsuot ng comfortable exercise clothes + sneakers/rubber-soled shoes.
4. Kunin ang baseline BP, HR, SpO₂, at 12-lead ECG.
5. Establish IV access.
6. Sabihan ang patient na i-report agad ang chest pain, unusual SOB, dizziness, palpitations, at iba pang symptoms.
7. After test, observe until HR and BP return toward baseline.

b. Pharmacological Stress Test

- Para sa patients na hindi kayang mag-exercise adequately, gaya ng physically disabled, deconditioned, o hindi makasunod sa instructions.
- **IV drugs** ang ginagamit para i-mimic ang effects ng exercise.
- **Vasodilators**
 1. Adenosine
 2. Regadenoson
 3. Dipyridamole
 - Pinapa-dilate ang normal coronary arteries → ang stenotic arteries ay hindi makasabay → mag coconstrict sila(opposite) → mas madaling makita ang ischemia.
- Possible **transient effects** (normal, nawawala din) → flushing, nausea, headache, dyspnea, chest discomfort, heart block.
- **Adenosine** → very short half-life <10 sec, kaya mabilis ding nawawala ang effects.
- **Aminophylline IV (antidote)** → ginagamit para i-reverse ang persistent/severe effects ng **vasodilator agents**.
- **Dobutamine**
 - **Not vasodilator.**
 - Sympathomimetic drug na nagpapataas ng HR + contractility + BP.
 - Result → ↑ myocardial O₂ demand, kaya parang nag-exercise ang heart.
 - Particularly useful kapag echocardiography ang gamit dahil pinapakita nito ang abnormal myocardial wall motion.
 - Excessive effects ng dobutamine → maaaring i-reverse gamit ang **beta-blocker**.

Nursing interventions

1. **NPO ≥3 hr** bago ang test.
2. No caffeine/stimulants for 24 hr.
3. I-hold ang **aminophylline, theophylline, at dipyridamole** for 24–48 hr if tolerated and ordered. **Bakit?** Caffeine/theophylline at ibang xanthine derivatives ay nakaka-block ng effect ng vasodilator drugs.
4. I-explain na possible ang flushing at nausea, pero usually temporary lang.
5. Closely observe for side effects at cardiac symptoms.
6. Test usually takes around 1 hr, pero puwedeng umabot ng 3 hr kapag may imaging.

6. Radionuclide Imaging /Nuclear Cardiology Imaging

- Noninvasive diagnostic test na gumagamit ng small amounts ng radioactive materials or radiotracers para ma-evaluate ang heart.
 - Assess coronary artery perfusion
 - Detect myocardial ischemia and infarction
 - Assess left ventricular function
- Ang radiotracers ay ini-inject sa bloodstream at naglalabas ng energy bilang **gamma rays** habang nagde-decay. Ito ang dini-detect ng imaging equipment para makagawa ng **cardiac images**.

Myocardial Perfusion Imaging

- Ginagawa ito usually kasabay ng stress testing para ma-compare ang blood flow ng heart kapag at rest vs during stress.
- Kapag stressed ang heart, tumataas ang **myocardial oxygen** demand, kaya dapat tumataas din ang **coronary blood flow**.
- Kapag may CAD, maaaring hindi sapat ang pag-increase ng blood flow dahil narrowed ang coronary arteries → nagkakaroon ng perfusion defect.
- Ginagamit din after acute MI para malaman kung compromised ang arterial perfusion at gaano kalawak ang myocardial damage.
- **Two major techniques**
 1. SPECT
 2. PET
- **Perfusion Defects**
 - **Perfusion defect** = area ng myocardium na may **reduced or absent blood flow**.
 - Importanteng i-compare ang resting images at stress images para malaman kung ischemia ba o permanent myocardial damage.
 - 1. **Fixed defect**
 - Present sa **rest AND stress**.
 - **Hindi nagbabago nang significant ang size**.
 - Usually **indicates infarcted/scarred myocardium** dahil permanent ang pagkawala ng perfusion.
 - 2. **Reversible defect**
 - Lumalabas or lumalaki during stress, **pero nababawasan or nawawala kapag rest**.
 - Indicates **myocardial ischemia**.
 - Ibig sabihin, **okay or relatively adequate ang blood flow at rest pero hindi sapat kapag tumataas ang cardiac demand**.

a. SPECT

- **Single Photon Emission Computed Tomography**
- Most common and widely available technique for myocardial perfusion imaging.
- Important radiotracer → Technetium-99m: binibigay at **peak stress and again at rest** para ma-compare ang perfusion.
- Patient is positioned **supine**, usually with arms over the head.
- A **gamma camera moves around the chest** para i-capture ang radiation emitted by the tracer at makagawa ng images ng heart.
- Around **80–90%** ang ability nito to detect myocardial ischemia.
- Painless at noninvasive ang procedure.
- Ang scan ay approximately **30 minutes**, at inuulit ang scan **after exercise or pharmacologic stress**.

- **Nursing Interventions**

1. Prepare the patient and establish or assess IV access/patency dahil dito ibinibigay ang radiotracer.
2. Explain the procedure para mabawasan ang anxiety ng patient.
3. Reassure the patient na ang radiation exposure ay considered similar to other diagnostic X-ray studies.
4. Usually, no special postprocedure radiation precautions are needed.
5. Ensure na maayos ang positioning at remain still ang patient para malinaw ang images.

b. PET

Positron Emission Tomography

- Isa ring noninvasive radionuclide imaging technique.
- Higher resolution than SPECT, kaya mas detailed ang images.
- Gumagamit ng 2 tracers/compounds
 1. For **blood flow sa myocardium**
 2. For **metabolic function**
- Useful din sa pag-assess ng **myocardial viability** — kung buhay pa at potentially recoverable ang damaged myocardium.
- Makakatulong ito sa decision kung maaaring helpful sa patient ang **revascularization tulad ng angioplasty or surgery.**
- Mas **expensive** ang PET at mas likely available sa large or academic medical centers.
- **Nursing Interventions**
 1. Iwasan ang alcohol at caffeine for 24 hours bago ang test dahil maaaring maapektuhan ang heart.
 2. Sa diabetic patients, kailangang i-coordinate ang insulin at food restrictions with the healthcare provider.
 3. Dapat nasa normal range ang blood glucose bago ang testing dahil sinusuri ng PET ang glucose metabolism.
 4. Assess for claustrophobia dahil kailangang pumasok ang patient sa donut-shaped scanner.
 5. Establish or assess IV access/patency para sa tracer administration.
 6. Patient should remain still habang ginagawa ang scan.
 7. Maaaring umabot ng 1–3 hours ang buong PET procedure.

7. Coronary CT Angiography (Coronary CTA)

- Noninvasive imaging gamit ang X-rays + computer para makita nang detailed ang **coronary arteries at heart structures.**
- Detect coronary stenosis/blockage, aortic aneurysm/dissection, check graft patency after CABG, at congenital abnormalities.
- IV contrast → nagpapalinaw ng cardiac structures.
- **Beta-blocker** may be given → pababain ang HR para mabawasan ang motion artifact.
- **EBCT / Coronary calcium scoring:** sinusukat ang **calcium deposits** sa coronary arteries; mas mataas na calcium score → mas mataas na risk for future CAD events.
- **Nursing Interventions:**
 - Assess renal function + history of contrast reaction.
 - Establish IV access if contrast is needed.
 - Teach breath-holding and staying still.
 - Explain **possible** contrast effects: flushing, metallic taste, nausea.

8. Magnetic Resonance Angiography (MRA)

- Noninvasive, painless imaging gamit ang **magnetic field** para makita ang heart, aorta, at major vessels.
- **No ionizing radiation.**
- Useful for aortic, myocardial, pericardial, and congenital abnormalities.
- **Limitations:** affected by movement/heartbeat and some metallic implants; less accurate for small distal coronary arteries.
- **Nursing Intervention:**
 1. Screen for metal implants/devices and other contraindications.
 2. Remove jewelry, watches, and metal objects.
 3. Assess for claustrophobia.
 4. Explain loud clicking/thumping sounds.
 5. Instruct patient to remain still.

9. Echocardiography

- Noninvasive ultrasound na ginagamit para makita ang heart structure, function, valves, wall motion, EF, at blood flow.
- **Doppler** → assesses **direction and velocity** ng blood flow.
- Usually may ECG simultaneously.

a. TEE – Transesophageal Echocardiography

- **Probe** ay ipinapasok through the **mouth** → **esophagus** para makakuha ng clearer images ng heart.
- Useful for valvular disease, thrombi, arrhythmias, at during cardiac surgery.
- Usually may **sedation + topical anesthesia**.
- **Nursing Interventions:**
 1. NPO ≥6 hrs
 2. Secure consent + IV access
 3. Remove dentures
 4. Left lateral position
 5. Monitor VS, consciousness, SpO₂
 6. After: HOB 45°
 7. No food/fluids until gag reflex returns
 8. Monitor for sore throat, dysphagia, bleeding, aspiration

b. TTE – Transthoracic Echocardiography

- **Transducer** ay inilalagay sa chest wall; **no sedation usually needed**.
- Assesses EF, chambers, valves, wall motion, and blood flow.
- Usually takes 30–45 min.
- **Nursing Interventions:**
 1. Position supine or left lateral
 2. Ensure proper ECG electrodes
 3. Apply ultrasound gel
 4. Assist with breath-holding/position changes.

10. Cardiac Catheterization

- Procedure kung saan ang **radiopaque catheter** ay ipinapasok sa heart through a **peripheral blood vessel, guided by fluoroscopy**.
- Ginagamit para:

- Diagnose structural at functional heart diseases
- Assess the great vessels
- Guide treatment decisions, including need for revascularization such as PCI or CABG
- **Pre-procedure**
 - Labs: **CBC, BUN/Creatinine, coagulation profile**
 - Assess **allergies** lalo na sa iodine/contrast media at shellfish.
- **Types**
 - **Right Heart Catheterization** → catheter enters through brachial, internal jugular, or femoral vein → RA → RV → pulmonary artery → pulmonary arterioles.
 - **Left Heart Catheterization** → catheter through radial or femoral artery → aorta → LV; usually uses contrast for angiography.
- **Nursing Interventions:**
 1. Obtain informed consent.
 2. NPO 8–12 hrs before procedure.
 3. Establish IV access.
 4. Check baseline VS, ECG, and peripheral pulses.
 5. Hold **metformin** 24–48 hrs before and 48 hrs after as ordered because of risk related to contrast and renal function.
 6. Monitor for contrast reaction.
 7. Assist patient with coughing/deep breathing when instructed, especially after contrast injection.
 8. Monitor insertion site for bleeding and maintain hemostasis.
 9. Assess distal pulses, skin color, and temperature after procedure:
 - q15 min × 1 hr
 - q30 min × 1 hr
 - then hourly × 4 hrs or until discharge
 10. Maintain bed rest 2–6 hrs and immobilize the access site.
 11. Encourage oral fluids unless contraindicated → helps clear contrast.
 12. Monitor for arrhythmias and vasovagal response.

Contrast-Induced Nephropathy (CIN)

- Rare complication **after contrast exposure**.
- Characterized by ≥25% increase in baseline serum creatinine within 48–72 hrs.
 - Monitor renal function, especially in patients at risk.
 - Vasovagal Response – Management
 - Elevate lower extremities above heart level.
 - Give IV fluid bolus.
 - IV atropine may be given for significant bradycardia.

11. Electrophysiologic Studies (EPS)

- Procedure kung saan **1 or more catheters ay ipinapasok sa vein papunta sa heart** para evaluate at treat abnormal heart rhythms (arrhythmias).
- Tinatawag ding “**mapping study**” dahil hinahanap nito kung saan nagmumula ang abnormal electrical rhythmg heart.
- **Indications**
 1. Syncope – unexplained fainting
 2. Palpitations
 3. History of ventricular fibrillation

4. Arrhythmias

- **Procedure**

- Ang electrodes/catheters ay inilalagay sa specific locations ng heart para i-record at i-map ang electrical signals.
- Maaaring magkaroon ng pacing/stimulation, kaya maaaring makaramdam ang patient ng palpitations.

- **Nursing Interventions**

1. Obtain informed consent.
2. NPO 6–8 hrs before procedure.
3. Obtain baseline ECG, electrolytes, and coagulation profile.
4. Withhold certain medications as ordered.
5. Prepare skin for electrode/catheter insertion.
6. Ensure emergency equipment is readily available.
7. Provide comfort and reassurance, especially kapag nakaramdam ng palpitations during pacing.
8. After procedure, apply firm pressure sa insertion site.
9. Maintain bed rest ~4–6 hrs; keep affected limb straight.
10. Monitor vital signs and insertion site for bleeding/complications.
11. If outpatient, remind patient not to drive after the procedure.

12. Hemodynamic Monitoring

- **Continuous measurement at interpretation ng circulatory function**, especially sa critically ill patients.

- Usually, **catheter ay ipinapasok sa vena cava/right atrium and connected to a pressure-monitoring system.**

a. **Central Venous Pressure (CVP)**

- Measures **pressure** sa thoracic vena cava/right atrium.
- Reflects right ventricular preload → basically, gaano karaming blood ang bumabalik sa right heart.
 - **Normal CVP:** 2–6 mmHg
 - **↑ CVP:**
 - Hypervolemia
 - Right-sided heart failure
 - Cardiac tamponade
 - **↓ CVP:**
 - Hypovolemia

Note:

- **High CVP** = too much volume / impaired right-heart filling or emptying
- **Low CVP** = kulang sa circulating volume

b. **Pulmonary Artery Pressure Monitoring**

- Uses a pulmonary artery (Swan-Ganz) catheter.
- Measures **pressures sa right heart and pulmonary circulation.**
- Balloon-tipped, flow-directed catheter:
 - Distal lumen → pulmonary artery
 - Proximal lumen → right atrium
- Less frequently used nowadays.

c. **Intra-Arterial Blood Pressure Monitoring (A-line)**

- Provides **direct and continuous BP measurement**.
- Useful sa **critically ill patients** with severe hypertension or hypotension.
- Helpful kapag kailangan ng **frequent ABG measurements and blood sampling**.
- Most common access site: **radial artery**.
- Before arterial-line insertion: Check circulation using **Doppler ultrasound or modified Allen's test**.
- **Nursing Interventions:**
 1. Prevent Intravascular Catheter-Related Bloodstream Infection
 2. Hand hygiene before and after catheter handling.
 3. Use sterile gloves when changing dressing.
 4. Use **chlorhexidine-impregnated dressing** at insertion site.
 5. Cover site with sterile gauze or sterile transparent semipermeable dressing.
 6. Keep dressing clean, dry, and intact.
 - Gauze dressing: change **every 2 days**
 - Transparent dressing: at least **every 7 days**
 7. Label dressing with date, time, and initials.
 8. Assess catheter site regularly for signs of infection/complications.
 9. Scrub ports, connectors, and hubs with appropriate antiseptic before and after access.
 10. Replace IV tubing sets every 96 hrs.
 11. Do not submerge the catheter or insertion site in water.

ARRHYTHMIAS & CONDUCTION PROBLEMS

1. Arrhythmias

- Disorders ng **formation or conduction ng electrical impulse sa heart**.
- In simple terms: abnormal ang paggawa o pagdaan ng electrical signal → maaaring maging too fast, too slow, or irregular ang heartbeat.

2. Electrocardiogram (ECG)

- Recording ng electrical activity ng heart.
- Ginagamit para makita ang heart rate, rhythm, at conduction abnormalities.

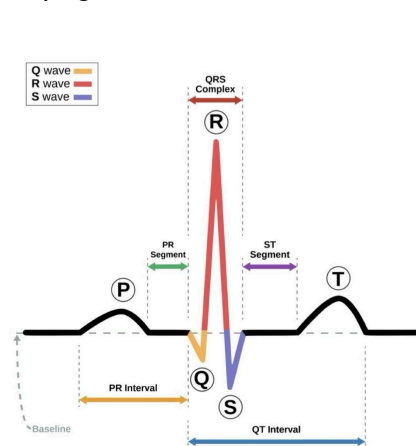
Waves, Complexes, & Intervals

Depolarization = Contraction

Repolarization = Relaxation

Kapag may wave formation = Electrical Activity

Kapag flat isometric lines = No electrical Activity



a. P Wave

- Represents **atrial depolarization**
- **Nagde-depolarize/na-a-activate** ang atria → leading to **atrial contraction**.
- *Normal duration: ≤ 0.12 sec*
- Equivalent to **< 3 small boxes**

b. PR Interval

- Represents **AV nodal delay**
- Sinusukat mula **beginning ng P wave** → **beginning ng QRS complex**.
- Normal: **0.12–0.20 sec**

Purpose ng AV delay: nagbibigay ng time para **magcontract** muna ang **atria** at **mapuno** ang **ventricles** bago mag-ventricular depolarization.

c. QRS Complex

- Represents **ventricular depolarization**
- **Electrical activation** ng ventricles → ventricular contraction.
- *Normal duration: < 0.12 sec*

d. ST Segment

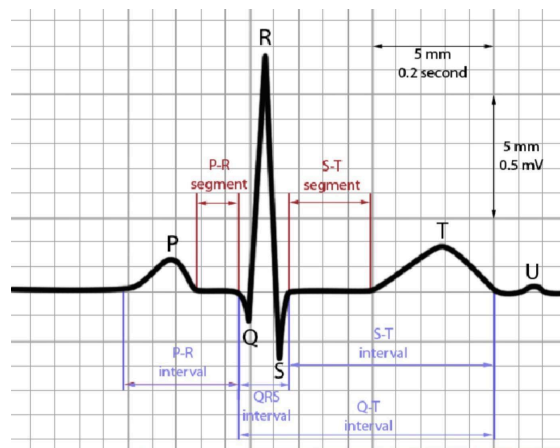
- Time **between ventricular depolarization and repolarization**.
- Normally **isoelectric/flat**.
- **Note:** Changes sa ST segment can suggest myocardial ischemia/injury.

e. T Wave

- Represents **ventricular repolarization**
- Ito ang phase kung saan ang **ventricles** ay bumabalik sa resting electrical state.

f. QT Interval

- Represents the **total time ng ventricular depolarization + repolarization**.
- *Normal: 0.32–0.40 sec*



3. Determining Heart Rate from ECG

a. Regular Rhythm

Kapag pantay/consistent ang R-R intervals:

$1500 \div \text{number of small boxes within one R-R interval}$

OR

$300 \div \text{number of large boxes within one R-R interval}$

Note:

Small boxes → 1500

Large boxes → 300

Example: 4 large boxes between R waves → $300 \div 4 = 75$ bpm

b. Irregular Rhythm

1. Count the number of R-R intervals in 6 seconds
2. Then $\times 10$
3. Gives the approximate heart rate in beats/minute.

Example:

7 R-R intervals in 6 sec → $7 \times 10 = 70$ bpm

Important Note: 3-second interval = 15 large boxes

4. Determining Heart Rhythm from ECG

- **R-R Interval**

- Used to determine **ventricular rhythm**.

Note: *Pantay ba ang pagitan ng R waves?*

Same spacing → regular ventricular rhythm

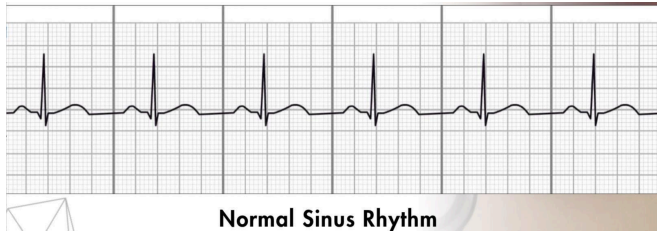
Varying spacing → irregular ventricular rhythm

- **P-P Interval**

- Used to determine **atrial rhythm**.

Note: *Pantay ba ang pagitan ng P waves?*

- **Regular Rhythm: same intervals** throughout the ECG strip (approx 0.6–1.2 sec intervals throughout the strip)
 - *Visual clue: evenly spaced ang beats/R waves.*



SINUS BRADYCARDIA



- **HR < 60 bpm** dahil ang SA node ay gumagawa ng impulse na **mas mabagal kaysa normal**.
- **Note:** Mabagal ang rate pero galing pa rin sa SA node, kaya generally preserved ang normal ECG pattern.
- **Causes — “B-R-A-D-Y”**
 - B** – Beta-blockers, calcium channel blockers, antiarrhythmics
 - R** – Rest → athletes, sleep, ↑ vagal tone
 - A** – Acute MI → especially inferior wall MI
 - D** – Damaged SA node → sick sinus syndrome
 - Y** – Your electrolytes / other conditions
 - ↑ potassium
 - ↑ intracranial pressure
 - Hypothyroidism
- **ECG Characteristics**
 - *Atrial & ventricular rate:* **< 60 bpm in adults**
 - *Atrial & ventricular rhythm:* **Regular**
 - *QRS:* **Usually normal** ang shape and duration, pero **maaaring regularly abnormal**
 - P wave:** Normal, consistent shape and followed by QRS
 - PR interval:** Consistent, 0.12–0.20 sec
 - P:QRS ratio:** 1:1
- **Note:** *Normal-looking ECG, pero mabagal.*
- **Symptoms — kapag SYMPTOMATIC**
 - “Slow Pulse → Low Perfusion”

- Kapag masyadong mabagal ang HR → maaaring **bumaba ang cardiac output/perfusion**
- Dizziness / lightheadedness
- Weakness / fatigue
- Hypotension
- Chest discomfort
- Syncope → maaaring mahimatay

Note: *Hindi lahat ng sinus bradycardia ay symptomatic. Treat the patient, not just the number.*

- **Management**

1. **Resolve** the causative factor

- **Ex:** medication effect, electrolyte problem, etc.

2. **Atropine**

- **IV bolus: 0.5 mg**
- Repeat every **3–5 min**
- **Maximum: 3 mg**

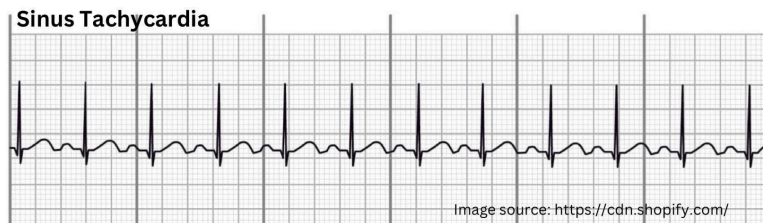
3. **If atropine is ineffective**

- **Transcutaneous pacing or dopamine/epinephrine infusion**

4. **Monitor**

- Vital signs (VS)
- ECG

SINUS TACHYCARDIA



- **HR > 100 bpm** dahil ang **SA node** ay gumagawa ng **electrical impulse** na mas mabilis kaysa normal.

Note: *Same sinus rhythm pa rin, pero mabilis ang rate.*

- **Causes — “F-A-S-T-H-E-R”**

F – Fever / infection

A – Anxiety, stress, pain

S – Shock, hypotension, hypovolemia

T – Thyrotoxicosis / hyperthyroidism

H – Hypoxia

E – Exercise

A – Anemia

R – Response to drugs

Temperature → ↑ temperature can increase HR

- **ECG Pattern**

- **Heart rate: >100 bpm**
- **Rhythm remains sinus**
- **P waves are present** and associated with QRS.
- **R-R intervals:** usually **regular**

- **Main difference from sinus bradycardia:**
 - **Bradycardia** → same sinus pattern, <60 bpm
 - **Tachycardia** → same sinus pattern, >100 bpm

Note: *Sinus tachycardia* = “normal pathway, mabilis lang.

- **Management**

1. **Resolve** the causative factor

- *Priority: treat the underlying cause.*
- **Example:**
 - Fever → manage fever*
 - Hypovolemia → address fluid loss*
 - Hypoxia → improve oxygenation*
 - Pain/anxiety → manage trigger*

2. **Vagal maneuvers**

- **Stimulate vagal activity** → helps **slow** the heart rate.
- Used **as indicated**, especially in certain **tachyarrhythmias**.

3. **Adenosine**

- Can be used to **slow/interrupt certain tachyarrhythmias** as ordered.

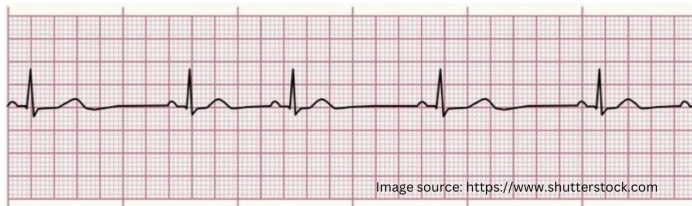
4. **IV beta-blockers / calcium channel blockers**

- **Antiarrhythmics** used for **hemodynamically stable sinus tachycardia**, as ordered.

5. **Cardioversion**

- Controlled **electrical shock** delivered to the heart synchronized with the R wave of the QRS complex.
- Used for **persistent tachycardia with hemodynamic instability**.

SINUS ARRHYTHMIA



- Ang **SA node** ay gumagawa pa rin ng impulses pero irregular ang rhythm.
- **Classic pattern:**
 - ↑ heart rate during inspiration
 - ↓ heart rate during expiration
- **Usually benign / rarely pathologic** → commonly normal physiologic finding.
- **Characteristics**
 - Atrial & ventricular rate: **60–100 bpm**
 - Atrial & ventricular rhythm: **Irregular**

Note: *nagbabago ang pagitan ng beats kasabay ng breathing, kahit irregular, sinus pa rin siya dahil SA node pa rin ang source ng impulse.*

ATRIAL ARRHYTHMIAS

- **Abnormal rhythms** na nagmumula sa **foci** within the atria, **hindi sa SA node**.
- **Examples:**
 1. Premature Atrial Complexes (PACs)
 2. Atrial Fibrillation (AF)
 3. Atrial Flutter

Note:

Sinus arrhythmia → SA node pa rin ang source, irregular rhythm.

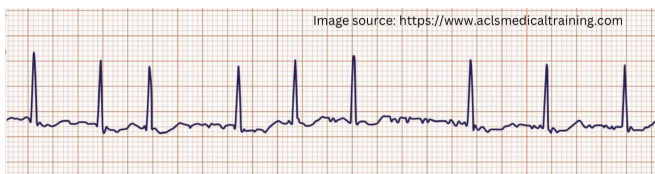
Atrial arrhythmia → ibang focus sa atria ang nag-o-originate ng electrical impulse.

a. PREMATURE ATRIAL COMPLEXES (PACs)



- **Early heartbeat** na nanggagaling sa atria bago ang expected normal heartbeat.
- **Causes:**
 - Physical/emotional stress, anxiety
 - Alcohol, caffeine, nicotine
 - Chemical imbalance: $\downarrow K^+$, $\downarrow Mg^{2+}$
 - Elevated temperature, hyperthyroidism
 - Stimulant drugs / digoxin toxicity
- **Characteristics:**
 - **Rhythm:** Irregular dahil sa **early P wave** → shorter PP interval, followed by **longer-than-normal PP interval**
 - **QRS:** **Usually normal** ang shape at duration
 - **P wave:** **Early and different;** maaaring makita or **hidden sa T wave**
 - **Other P waves sa strip = consistent**
 - **PR interval:** **Early P wave has shorter-than-normal PR**, pero within 0.12–0.20 sec
- **Management:**
 - **Asymptomatic + infrequent** → **No treatment**
 - **Resolve** the causative factor

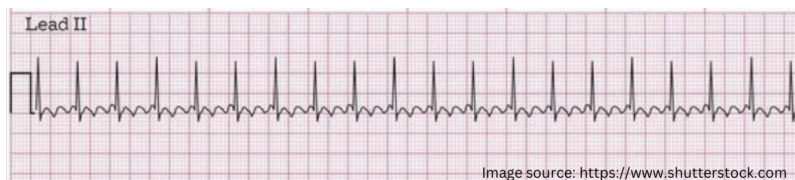
b. ATRIAL FIBRILLATION (AFib)



- **Supraventricular arrhythmia** kung saan ang atria ay nanginginig/fibrillate instead na effective na mag-contract → chaotic + irregular heartbeat.
- **Note:** “No P, just F” → walang discernible P waves, fibrillatory (F) waves lang.
- **High risk for clot formation** → thromboembolism/stroke
- **Classification:**
 - **Paroxysmal:** Sudden onset; kusang nawawala or after intervention; <7 days, pero maaaring umulit.
 - **Persistent:** Continuous, >7 days
 - **Long-standing persistent:** Continuous, >12 months
 - **Permanent:** Persistent; decision made not to restore/maintain sinus rhythm
 - **Nonvalvular:** Walang moderate–severe mitral stenosis or mechanical heart valve
- **Causes:**
 - **Cardiac:** Hypertension, CAD, MI, valvular disease (especially mitral)

- **Non-cardiac:** Hyperthyroidism, COPD, alcohol, smoking, stress, post-surgery, family history
- **Characteristics:**
 - *Atrial rate:* **300–600 bpm**
 - *Ventricular rate:* **120–200 bpm**
 - *Rhythm:* **Highly irregular / chaotic**
 - *QRS:* **Usually normal**
 - *P wave:* **No discernible P waves**
 - *PR interval:* **Cannot be measured**
- **Medical Management (AFib)**
 - **Goal:** Control ventricular rate + prevent thromboembolism
 - 1. **Antithrombotic drugs**
 - **Warfarin** → monitor INR, **target 2.0–3.0**
 - **DOACs:** dabigatran, rivaroxaban, apixaban
 - **Aspirin** → low-risk patients
 - 2. **Antiarrhythmics / rate control**
 - **Beta-blockers:** metoprolol, propranolol
 - **Non-DHP calcium channel blockers:** diltiazem, verapamil
 - **Amiodarone** → restores normal rhythm
 - 3. **Electrical cardioversion**
 - **Synchronized shock**
 - For hemodynamically unstable patient
 - 4. **Catheter Ablation Therapy**
 - Special catheter → origin of arrhythmia
 - Causes thermal injury + localized cell destruction
 - Can use extremely cold temperature → **cryoblation**
 - Procedure:**
 - **Moderate sedation + IV heparin** before procedure
 - **EP study** → maps source of arrhythmia
 - Catheters inserted via **femoral vein** (sometimes jugular/subclavian), guided by **fluoroscopy**
 - **Monitor patient 30–60 min**, then **retest** to ensure arrhythmia does not recur
 - **Nursing management:** similar to cardiac catheterization
 - 5. **Maze Procedure**
 - **Small transmural incisions** throughout the atria
 - Forms scar tissue → prevents **reentry/conduction of abnormal electrical impulse**
 - **Mini-maze:** minimally invasive; smaller incisions between ribs + video-guided instruments
 - 6. **Convergent Procedure**
 - **Hybrid ablation** method
 - Small **subxiphoid incision** → access posterior wall of left atrium
 - **Ablation of epicardial wall** around the veins
 - Also ablates **around the endocardial area** of pulmonary veins

c. ATRIAL FLUTTER

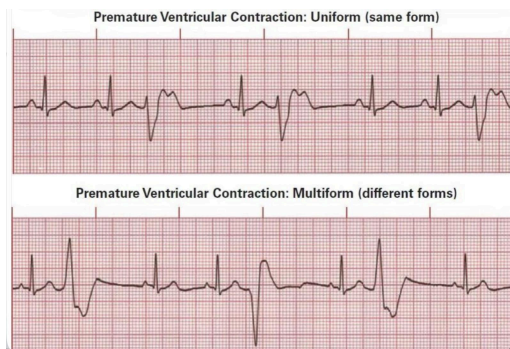


- **Rapid, regular atrial contraction** dahil sa conduction defect.
- **Atrial rate: 250–350 bpm**
- **ECG hallmark: “Saw-tooth” wave pattern → F waves**
- **Characteristics:**
 - **Atrial rate: 250–400 bpm**
 - **Ventricular rate: 75–150 bpm**
 - **Atrial rhythm: Regular**
 - **Ventricular rhythm: Usually regular**
 - **QRS: Usually normal**
 - **P wave: Saw-toothed shape (F waves)**
 - **PR interval: Difficult to determine**
 - **P:QRS ratio: 2:1, 3:1, or 4:1**
- **Management:**
 - **Similar to AFib**
 - **Rate control**
 - **Antithrombotic therapy** → prevent thromboembolism
 - **Electrical cardioversion** if indicated
 - **Catheter ablation** may be used to eliminate the abnormal rhythm

VENTRICULAR ARRHYTHMIAS

- Originates **from foci within the ventricles**
- **Mas life-threatening** kaysa atrial dysrhythmias

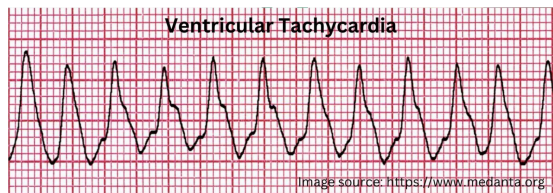
a. PREMATURE VENTRICULAR CONTRACTIONS (PVCs)



- **Extra/early heartbeat** na nagsisimula sa **ventricles** instead of the SA node.
- **ECG: wide, bizarre QRS complexes**
- **Characteristics:**
 - **Ventricular & atrial rate: depende sa underlying rhythm**
 - **Ventricular & atrial rhythm:**
 - **Usually regular** ang underlying rhythm
 - May premature beat → **early QRS**
 - Dahil dito, may isang **RR interval** na mas maikli kaysa sa iba
 - **QRS shape & duration:**

- **Wide > 0.12 sec**
- **Bizarre ang shape**
- Puwedeng:
 - **Unifocal** → same-looking PVCs, from same ventricular focus
 - **Multifocal** → different-looking PVCs, from different ventricular foci
- **P wave: maaaring absent bago ang QRS**
- **PR interval: not measurable** for PVC
- **P:QRS ratio: 0:1 or 1:1**
- **Management**
 1. **Remove** the precipitating cause
 - Ex: stress, caffeine
 - Potassium & magnesium replacement if low
 - Oxygen if may hypoxia
 2. **Beta-blockers**
 3. **Amiodarone**

b. VENTRICULAR TACHYCARDIA (VT)

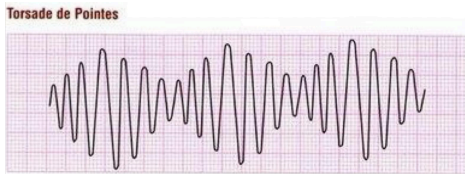


- **≥3 consecutive PVCs occurring at a rate >100 bpm.**
- **EMERGENCY** → maaaring mag-progress into **ventricular fibrillation (VF)**, which is life-threatening.
- **Patient is nearly always unresponsive and pulseless** in the dangerous/pulseless presentation.
- **Characteristics:**
 - **Ventricular & atrial rate: 100–250 bpm**
 - **Rhythm: Regular (monomorphic) or slightly irregular**
 - **QRS: >0.12 sec, bizarre/wide shape**
 - **P wave: Usually absent**
 - **PR interval: Not measurable**
 - **P:QRS ratio: Dissociated:** walang consistent relationship ang P waves at QRS complexes → **ventricular activity is independent from atrial activity.**
- **Management**
 1. **Stable? Continuous ECG monitoring and assessment**
 2. **Antiarrhythmics**
 - Procainamide
 - Amiodarone
 - Lidocaine
 3. **Defibrillation**
 - Treatment of choice for **PULSELESS VT**
 - **Pulseless VT = cardiac arrest** → **defibrillation (unsynchronized shock)**
 4. **Cardioversion**
 - Treatment of choice for **MONOMORPHIC VT kapag may pulse**
 - **Synchronized cardioversion** dahil may pulse pa ang patient.
 5. **Implantable Cardioverter Defibrillator (ICD)**
 - For long-term management of patients with **ejection fraction <35%**.

- ICD can detect and **terminate dangerous ventricular arrhythmias.**

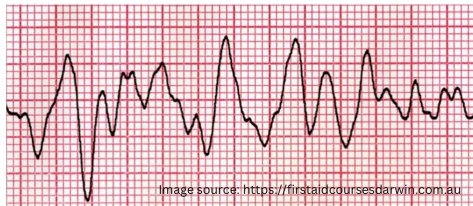
6. Magnesium Sulfate

- **DOC for Torsades de Pointes**



- A type of **polymorphic ventricular tachycardia.**
- Torsades de Pointes is French for “**twisting of the points.**”
- **ECG appearance: QRS complexes appear to twist around the baseline.**

c. VENTRICULAR FIBRILLATION (VF)



- **Life-threatening arrhythmia** kung saan ang **ventricles ay nanginginig/quivering instead na mag-contract nang maayos.**
- Dahil dito → **walang effective cardiac output** → maaaring mag-result sa **sudden cardiac arrest.**
- Most common cause: **CAD (coronary artery disease)**
- **ECG**
 - **Unidentifiable waves** → hindi na makilala nang maayos ang **P wave, QRS, at T wave.**
 - **QRS is irregular with changing amplitudes** → **chaotic at pabago-bago** ang itsura ng waveform.
 - **Clinical Signs**
 - No audible heartbeat
 - No pulse
 - No respiration
- **Management**
 1. **Defibrillation + CPR**
 - **Defibrillation = electrical shock** para ma-stop ang chaotic ventricular activity at maibalik ang organized rhythm.
 2. **Epinephrine q3–5 min**
 - Ibinibigay every **3–5 minutes during resuscitation.**
 3. **Amiodarone**
 - **Antiarrhythmic drug** na ginagamit sa VF kapag indicated during resuscitation.

d. VENTRICULAR ASYSTOLE



- **“FLATLINE”**

- Characterized by **absent QRS complexes dahil walang ventricular electrical activity.**
 - **No heartbeat, No palpable pulse, No respiration**
 - **Causes**
 - **H's:**
 - **Hypoxia** → kulang ang oxygen
 - **Hypovolemia** → kulang ang blood/fluid volume
 - **Hydrogen ion** → acid–base imbalance
 - **Hypo- or hyperglycemia** → sobrang baba o taas ng blood glucose
 - **Hypo- or hyperkalemia** → abnormal potassium level
 - **Hypothermia** → mababang body temperature
 - **T's:**
 - **Trauma**
 - **Toxins**
 - **Tamponade (cardiac)** → naiipit ang puso dahil sa fluid accumulation
 - **Tension pneumothorax** → trapped air na nagco-compress sa thoracic structures
 - **Thrombus** → blood clot
- Note:** *Sa asystole, importanteng hanapin ang reversible causes = H's & T's.*
- **Management**
 - a. CPR
 - b. Epinephrine
 - c. Maintain airway
 - d. Address reversible causes
 - e. Hanapin at i-correct ang H's & T's.

CONDUCTION ABNORMALITIES / ATRIOVENTRICULAR (AV) BLOCKS

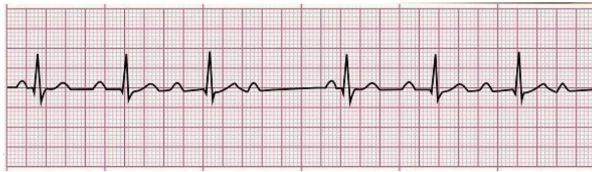
- **AV block** = may na-delay or na-block na electrical impulse sa AV node or His-Purkinje system bago ito makarating sa ventricles.
 - In short, may problema sa pagdaan ng electrical signal from atria → ventricles.
- a. FIRST-DEGREE AV BLOCK**



- Ang impulse galing sa **SA node** ay nade-delay sa **AV node**, pero nakakarating pa rin sa ventricles.
 - **Walang beat na nawawala — delayed lang ang conduction.**
 - **ECG Characteristics**
 - **PR interval: constant pero >0.20 sec**
 - *Normal PR = 0.12–0.20 sec*
 - *Dito, mahaba pero consistent ang PR.*
 - Generally **asymptomatic and benign.**
- b. SECOND-DEGREE AV BLOCK**
- Dito, hindi lahat ng atrial impulses ay nakakarating sa ventricles.
 - Kaya may mga **P waves** na walang kasunod na **QRS** → dropped beat.

May 2 types:

TYPE I — Mobitz I / Wenckebach



- May progressive delay sa AV conduction hanggang sa isang impulse ay completely blocked.
- PR gets longer → longer → longer → DROP QRS → repeat
- ECG Characteristics
 - PR interval progressively lengthens with each beat.
 - Eventually, isang QRS complex ang mawawala/dropped.
 - P:QRS ratio:
 - 3:2
 - 4:3
 - 5:4
 - and so forth

Note:

3:2 = may 3 P waves, pero 2 lang ang QRS

4:3 = 4 P waves, 3 QRS

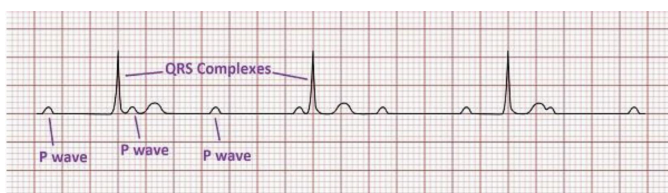
May isang P wave na hindi nasusundan ng QRS.

TYPE II — Mobitz II



- Some atrial impulses lang ang successfully nakakadaan through the AV node into the ventricles.
- May sudden dropped QRS pero WALANG prior PR prolongation.
- ECG Characteristics
 - PR interval: **CONSTANT**
 - Biglang may P wave na walang kasunod na QRS.
 - Unlike Mobitz I, hindi muna humahaba ang PR bago mag-drop.
 - P:QRS ratio
 - 2:1
 - 3:1
 - 4:1
 - 5:1
 - and so forth
- **MORE SERIOUS TYPE** - Can progress to complete heart block.

THIRD-DEGREE AV BLOCK



- **Complete heart block** → walang atrial impulse na nakakatawid sa AV node papuntang ventricles
- Kaya atria at ventricles beat independently → walang communication/synchronization.
- *PR interval*: walang consistent/fixed PR interval
- *ECG clue*: makikita ang P waves at QRS, pero hindi sila related sa isa't isa.

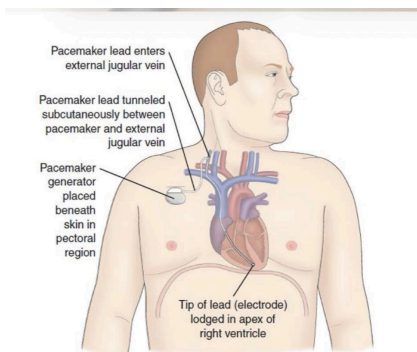
Note: P waves ≠ QRS timing → think 3rd-degree AV block.

ADJUNCT MODALITIES AND MANAGEMENT

1. CARDIOVERSION vs DEFIBRILLATION

- Parehong gumagamit ng electrical shock para ma-restore ang normal rhythm, pero magkaiba ang timing.
- a. **Cardioversion**
 - “IN SYNC” / synchronized shock
 - Shock is timed with the R wave.
 - Used for tachyarrhythmias WITH a pulse, especially kapag unstable.
- b. **Defibrillation**
 - “NOT SYNC” / unsynchronized shock
 - Used for VF and pulseless VT.
 - Emergency/life-saving intervention
 - **AED (Automated External Defibrillator)**
 - Important na may good contact between pads/paddles and patient's skin.
 - **NO ONE** should touch the patient or anything touching the patient habang nagdi-discharge ang shock.
 - **Safety steps**
 - Charge only when ready to shock.
 - Announce: “Charging to ___ joules.”
 - Before shock: “CLEAR!” ×3
 - Make sure walang humahawak sa patient/bed/equipment touching patient.
 - Record energy delivered + resulting rhythm.
 - If CPR is needed → after about 5 cycles (~2 min) CPR, reassess rhythm and shock again if indicated.
 - After procedure → check for burns.

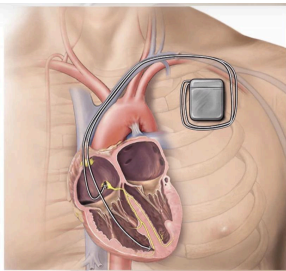
2. PACEMAKER



- Electronic device implanted under the skin na nagbibigay ng electrical impulses para ma-regulate ang heart rate.
- Leads are attached to the atrium and/or ventricle.

- **Indications :**
 - Bradycardia
 - Heart blocks
 - Tachyarrhythmias
 - Heart failure → CRT (Cardiac Resynchronization Therapy) - Biventricular pacing → coordinates ventricular contraction → better cardiac pumping.
- **Components:**
 - **Pulse generator** → **detects intracardiac electrical activity** and determines when pacing is needed.
 - **Electrodes/leads** → **nagdadala ng electrical impulse** mula generator papunta sa myocardium/heart.
 - **Pacemaker capture: successful delivery of pacing stimulus** that produces cardiac depolarization.
 - **Atrial pacemaker:** atrium ang paced.
 - **Ventricular pacemaker:** ventricle ang paced.
- **Nursing Interventions**
 1. **Protect incision site** → monitor for bleeding/infection.
 2. **Assess ECG + vital signs.**
 3. **Check for complications**, especially infection and failure to pace.
 4. **Educate the patient** about lifestyle & device care
 - a. Immobilize affected arm for 24–48 hrs → prevent lead displacement.
 - b. Avoid raising affected arm above shoulder for 1–2 weeks.
 - c. Avoid heavy lifting/strenuous activity on affected side.
 - d. Avoid strong magnets near device → possible electromagnetic interference.
 - e. Report SOB, dizziness, palpitations, or hiccups → possible lead displacement.
 - f. Check PR daily as instructed.
 - g. Carry pacemaker ID card at all times.

3. IMPLANTABLE CARDIOVERTER-DEFIBRILLATOR (ICD)



- **Electronic device implanted in a subcutaneous pocket**, usually below the left clavicle.
- Acts as a “**built-in defibrillator**” for high-risk patients.
- **Detects and terminates** life-threatening VTach or VFib.
- Indications for ICD:
 - **Patients who survived:**
 - Sudden cardiac arrest due to VFib
 - Sustained VT
 - **Patients at high risk for sudden cardiac death.**

MANAGEMENT OF PATIENTS WITH CORONARY VASCULAR DISORDER

1. CORONARY ARTERY DISEASE (CAD)

- Any disorder na nagdudulot ng **narrowing o occlusion ng coronary arteries**, kaya bumababa ang **blood flow at oxygen supply sa myocardium**.
- **Atherosclerosis — Major Cause of CAD**
 - **Buildup ng lipids/cholesterol, fibrous tissue, at cellular debris sa arterial wall**. Habang lumalaki ang plaque, **lumiliit ang lumen ng artery** → ↓ **blood flow** → **myocardial ischemia**.
- Risk Factors
 - **Non-modifiable — hindi mababago**
 - Family history → genetic predisposition
 - Age: >45 y/o men; >55 y/o women
 - Male sex → generally higher risk earlier in life
 - **Modifiable — puwedeng baguhin/manage**
 - **Dyslipidemia**: ↑ LDL, ↓ HDL, ↑ triglycerides
 - **Hypertension (HTN)** → persistent high pressure damages the arterial lining
 - **Diabetes mellitus (DM)** → promotes vascular/endothelial damage
 - Obesity
 - Sedentary lifestyle
 - Chronic inflammatory diseases
 - Chronic kidney disease
- **Pathophysiology**

Endothelial injury → **LDL enters** → **fatty streak** → **plaque/atheroma** → **fibrous cap + calcium** → **plaque rupture** → **thrombus** → ↓ **blood flow** → **ischemia** → **ACS** → **MI**

Clinical Manifestations of CAD

1. Endothelial injury

- **Nasasaktan/dinadamage ang inner lining (endothelium) ng coronary artery** dahil sa factors like HTN, high LDL, diabetes, smoking, etc.
- → Nagiging **more permeable ang vessel wall**.

2. Lipids + inflammatory cells enter

- **LDL at inflammatory cells** nakakapasok sa damaged endothelium.
- → Nagfo-form ng **fatty streaks** sa arterial wall.

3. Plaque formation

- **Lumalaki ang fatty streaks** → nagiging **atheroma/plaque**.
- **Smooth muscle cells proliferate** at gumagawa ng fibrous cap na tumatakip sa plaque.

4. Plaque becomes hardened

- Over time, **calcium deposits accumulate**.
- → **Plaque becomes hard and artery becomes stiff/narrower**.

5. Vulnerable plaque may rupture

- Kapag manipis ang fibrous cap, puwedeng **rupture ang plaque**.
- → Exposed plaque **attracts platelets**.
- → **Thrombus (blood clot) forms**.

6. ↓ Blood flow → ischemia

- Plaque + thrombus → severe narrowing/possible **blockage ng coronary artery**.
- → ↓ coronary blood flow → ↓ O₂ supply sa myocardium
- → **Myocardial ischemia** = heart muscle is not receiving enough oxygen.

7. Ischemia can progress to ACS → MI

- Severe/acute obstruction → **Acute Coronary Syndrome (ACS)**

- Kapag prolonged ang ischemia → **myocardial infarction (MI/heart attack)** due to myocardial cell death.

- **Clinical Manifestations**

- Angina pectoris: chest pain, pressure, or tightness na nangyayari kapag hindi sapat ang oxygen na natatanggap ng heart muscle.
- Shortness of breath: hirap sa paghinga, lalo na kapag nag-e-exert.
- Epigastric discomfort: parang indigestion, kabag, o discomfort sa upper abdomen.
- Fatigue: madaling mapagod o manghina, lalo na during physical activity.
- Maaaring **asymptomatic** : tinatawag itong **silent ischemia**, kaya important ang regular assessment lalo na sa high-risk patients.

- **Normal Lipid Profile**

- **Total cholesterol**: <200 mg/dL
- **Overall amount ng cholesterol sa blood.**
 - **Low-density lipoprotein (LDL)**: <100 mg/dL -“bad cholesterol”, kapag mataas, mas madaling mag-deposit sa arterial walls at makabuo ng plaque.
 - **High-density lipoprotein (HDL)**: >40 mg/dL for men; >50 mg/dL for women - “good cholesterol”, tumutulong mag-transport ng excess cholesterol away from the arteries.
- **Triglycerides**: <150 mg/dL
 - Isang uri ng fat sa blood.
 - Kapag mataas, associated ito sa **increased cardiovascular risk**.

- **Management of CAD**

- a. **Dietary & Lifestyle Changes**

- Eat more plant foods and fresh foods
- Eat fish
- Limit red meat
- Limit sweets

- b. **Regular moderate physical activity**

- c. **Stop smoking**

- d. **Antilipidemic Medications**

- **Statins**

- atorvastatin, simvastatin, rosuvastatin
- lower LDL cholesterol, help decrease total cholesterol and triglycerides.
- **Note**: Statins also **help stabilize atherosclerotic plaques**, making them less likely to rupture and form a dangerous blood clot.

- **Fibrates**

- fenofibrate, gemfibrozil
- useful for **high triglyceride levels**.
- ↓ triglycerides and can ↑ HDL.
- ginagamit kapag **triglycerides ang major lipid problem**.

- **Bile Acid Sequestrants**

- cholestyramine, colestipol, colesevelam
- bind bile acids in the intestine, dahil kailangan ng katawan ng cholesterol para gumawa ulit ng bile acids, mas maraming cholesterol ang nagagamit.
- ↓ LDL cholesterol.

- **Cholesterol Absorption Inhibitor**

- pezetimibe
- reduces absorption of cholesterol from the intestine, ginagamit kasama ng statin kapag hindi sapat ang LDL reduction from statin therapy alone.
- **Proprotein Convertase Subtilisin-Kexin Type 9 (PCSK9) Agents**
 - alirocumab, evolocumab
 - very effective in lowering LDL cholesterol.
 - given through subcutaneous injection.
 - considered for patients na very high pa rin ang LDL despite appropriate statin therapy, sometimes with ezetimibe.
- **Control Other Risk Factors**
 1. Manage hypertension
 2. High blood pressure continuously stresses and damages the arterial walls.
 3. Controlling blood pressure helps slow further vascular damage.
 4. Control diabetes
 5. High blood glucose can damage blood vessels and accelerate atherosclerosis.
 6. Good glucose control helps reduce the risk of further cardiovascular complications.

2. ANGINA PECTORIS

- Chest pain/discomfort caused by **temporary myocardial ischemia**.
- **Hindi sapat ang oxygen** na nakukuha ng heart muscle para sa oxygen demand nito.
- Karaniwang nangyayari kapag **tumataas ang oxygen demand ng puso**, tulad ng during exercise, physical activity, or emotional stress.
- **Note:** *Ang angina ay ischemia pero hindi pa permanenteng damage sa heart muscle.*
- **Types of Angina**
 1. **Stable Angina**
 - Lumalabas **during exertion** tulad ng walking, exercise, or stress.
 - **Nawawala with rest and/or nitroglycerin.**
 - Usually **predictable**: alam ng patient kung kailan ito lumalabas.
 - **Stable = predictable + relieved by rest/nitroglycerin**
 2. **Unstable Angina**
 - **New-onset, worsening, or more frequent/severe chest pain.**
 - Maaaring mangyari **kahit at rest**.
 - **Hindi reliably relieved by rest or nitroglycerin.**
 - Considered a **medical emergency** because it **can progress to myocardial infarction (MI)**.
 - **Unstable = worsening + may occur at rest + emergency**
 3. **Intractable/Refractory Angina**
 - **Chronic, severe, and disabling chest pain** na mahirap ma-control kahit may treatment.
 - **Persistent ang symptoms** at significantly nakakaapekto sa daily activities.
 4. **Variant Angina (Prinzmetal's Angina)**
 - Caused by **temporary coronary artery vasospasm**.
 - Usually **occurs at rest**.
 - May **show reversible ST-segment elevation** during the episode.
 - **Prinzmetal = vasospasm + pain at rest + temporary ST elevation**
 5. **Silent Ischemia**
 - May myocardial ischemia pero **walang chest pain**.
 - Important because the **patient may not realize na may problem na pala sa heart**.

- **Clinical Manifestations:**

- Main symptom: **Chest pain**
- Usually located in the retrosternal area (behind the sternum/breastbone).
- The pain may feel like:
 - Pressure
 - Squeezing
 - Heaviness
 - Tightness
 - Burning
- **Other possible manifestations:**
 - Dyspnea → shortness of breath
 - Dizziness
 - Diaphoresis → excessive/cold sweating
 - Nausea or vomiting
 - Palpitations → awareness of heartbeat
 - Anxiety or feeling of impending doom
 - Precipitating Factors

- **Precipitating Factors:**

1. Exercise
2. Eating → especially heavy meals
3. Extreme temperatures → very hot or cold environments
4. Emotional stress

- **Diagnostic Tests**

1. **12-lead ECG**

- Tinitingnan ang **electrical activity ng heart**.
- Possible findings include **T-wave inversion, ST-segment changes, or abnormal Q waves**, depending on the underlying condition.

2. **Cardiac Biomarkers**

- Blood tests used to help determine kung may **myocardial injury/MI**. Helpful in **distinguishing angina from an acute myocardial infarction**.

3. **Stress Test**

- Pinapagawa ang heart na **mag-work harder habang mino-monitor** ang ECG and symptoms.
- Goal: **provoke ischemia and detect abnormal coronary response**.

4. **Coronary Angiography**

- Imaging test na ginagamit para **makita mismo ang coronary arteries**.
- Helps identify **where and how severe the narrowing/blockage is**.

- **Management of Angina**

- **Main Goal: Increase oxygen supply to the myocardium + decrease oxygen demand.**

1. **Nitroglycerin — immediate relief**

- Usually given **sublingually (SL)** for rapid effect.
- Causes **vasodilation** → improves coronary blood flow.
- **Decreases preload and afterload**, so the heart does not have to work as hard.
- ↓ myocardial oxygen demand → relief of angina.

2. **Beta-Blockers**

- metoprolol, atenolol, bisoprolol

- ↓ heart rate and contractility.
- Dahil mas mabagal at less forceful ang heartbeat, bumababa ang oxygen demand ng heart.

3. Calcium Channel Blockers

- amlodipine, nifedipine, diltiazem, verapamil
- Cause **coronary and peripheral vasodilation**.
- Helps **decrease afterload and can relieve coronary artery spasm**.
- Particularly useful when **vasospasm contributes to angina**.

4. Antiplatelets

- aspirin, clopidogrel
- Prevent platelet aggregation.
- Kapag may plaque rupture, maaaring mag-clump ang platelets at bumuo ng thrombus so they help reduce the risk of MI and cardiovascular death in appropriate CAD patients.

5. Anticoagulants

- heparin, enoxaparin
- prevent formation or extension of blood clots.
- Important in unstable angina/acute coronary syndrome.

6. Oxygen Administration

- Oxygen may be given **when indicated**, particularly if the patient is **hypoxemic** or has **low oxygen saturation**.
- Goal is to improve oxygen delivery to the myocardium and help relieve ischemic symptoms.

3. ACUTE CORONARY SYNDROME (ACS)

- Umbrella term para sa mga kondisyon kung saan may **biglaang pagbaba ng blood flow at oxygen supply sa heart muscle (myocardial ischemia)**, usually dahil sa ruptured atherosclerotic plaque + blood clot (thrombus).
- **Main types:**
 - **Unstable Angina** – may ischemia pero **walang permanent myocardial cell death/necrosis**; usually partial obstruction.
 - **NSTEMI** – may **myocardial infarction (cell death)** pero **walang persistent ST-segment elevation**; kadalasan partial obstruction.
 - **STEMI** – **complete or near-complete coronary artery occlusion** → severe ischemia and full-thickness myocardial infarction → ST-segment elevation.
- **Pathophysiology**
 - **Atherosclerotic plaque forms**
 - plaque becomes unstable and ruptures
 - exposed plaque/collagen attracts and activates platelets
 - platelet aggregation + coagulation
 - formation of a fibrin blood clot (thrombus)
 - coronary artery becomes partially or completely blocked
 - ↓ coronary blood flow and oxygen supply
 - myocardial ischemia
 - prolonged/severe ischemia causes myocardial injury and eventually infarction (cell death).
- **Diagnostic Tests**
 1. **Troponin T / Troponin I** – pinaka-importanteng **cardiac biomarkers for detecting myocardial injury**.
 2. **Electrocardiogram** – checks for ischemic changes and helps distinguish NSTEMI/unstable angina from STEMI.

3. **Creatine kinase-MB (CK-MB)** – cardiac enzyme that can increase with myocardial injury.
4. **Myoglobin** – rises early after muscle injury but is less specific for the heart.

- **Electrocardiogram Findings:**

- **Unstable Angina / NSTEMI**

- ST-segment depression
- T-wave inversion
- These indicate altered myocardial repolarization due to ischemia.

- **STEMI**

- ST-segment elevation
- T-wave inversion may occur.
- Abnormal Q waves may develop because necrotic myocardial tissue can no longer conduct electrical activity normally.
- Abnormal Q waves without current ST-segment or T-wave changes → maaaring indication ng previous/old myocardial infarction.

- **Management**

- **Main goals:** limit myocardial damage, preserve heart function, restore blood flow, and prevent complications.
- 1. **Aspirin** – prevents further platelet aggregation, helping stop the clot from getting larger.
- 2. **Supplemental oxygen** – given when the patient is hypoxemic/low oxygen saturation.
- 3. **Nitroglycerin** – causes vasodilation → improves coronary blood flow and decreases the heart's workload.
- 4. **Morphine** – may be used for severe persistent pain; also decreases anxiety and cardiac workload.
- 5. **Beta-blockers** – ↓ heart rate and contractility → ↓ myocardial oxygen demand.
- 6. **Angiotensin-converting enzyme inhibitors** – help reduce cardiac workload and limit adverse ventricular remodeling, particularly after myocardial infarction.
- 7. **Anticoagulants** – prevent further clot formation and extension.
- 8. **Statins** – ↓ low-density lipoprotein cholesterol and help stabilize atherosclerotic plaques.
- 9. **Percutaneous Coronary Intervention (PCI)** – angioplasty with stent to mechanically open the blocked coronary artery and restore blood flow.
- 10. **Cardiac rehabilitation** – **structured recovery program** involving exercise, lifestyle modification, education, and risk-factor control.

- **Nursing Interventions:**

1. Assess symptoms + reassess after management
2. Assess vital signs + monitor urine output
3. Obtain 12-lead ECG within 10 minutes
4. Administer oxygen if needed
5. Administer prescribed emergency medications
6. Maintain a patent IV line
7. Place patient in Semi-Fowler's position

CORONARY ARTERY BYPASS GRAFT (CABG)

- Surgical procedure kung saan **gumagamit ng healthy blood vessel mula sa ibang part ng katawan para gumawa ng bagong pathway ng blood flow papunta sa heart.**

- Ginagawa ito kapag may **severe coronary artery blockage** na hindi sapat ang medication o hindi magandang candidate/response sa PCI.
- **Note:** *May bara sa coronary artery → gagawan ng bagong daanan ang dugo.*
- **Indications:**
 - Angina na hindi makontrol kahit gumagamit na ng medications or PCI.
 - Left main coronary artery stenosis >50% → significant narrowing ng major coronary artery.
 - Multivessel coronary artery disease → maraming coronary arteries ang may significant blockage.
 - Para sa prevention/treatment ng complications gaya ng myocardial infarction, arrhythmias, at heart failure.
 - Kapag nagkaroon ng complications mula sa unsuccessful PCI
- **Graft Vessels Used**
 - **Left internal thoracic/internal mammary artery**
 - Preferred dahil **mas matagal itong nananatiling open/patent kumpara sa vein graft.**
 - **Great saphenous vein**
 - Kinukuha mula sa **leg** at ginagamit bilang bypass vessel.
- **Traditional CABG Procedure**
- 1. **Median sternotomy**
 - Binubuksan ang **sternum/breastbone** sa gitna para ma-access ng surgeon ang heart.
- 2. **Connect to cardiopulmonary bypass (CPB) machine**
 - Ang **heart-lung machine** muna ang tumutulong sa pag-pump ng blood at pag-oxygenate nito habang ginagawa ang surgery.
- 3. **Create the bypass**
 - Kinukuha ang **healthy blood vessel** mula sa ibang part ng katawan.
 - Ikakabit ito beyond/past the coronary artery blockage.
 - Result: may new route ang blood para makarating sa myocardium kahit may bara sa original artery.
- 4. **Discontinue CPB + close the incision**
 - Kapag tapos na ang bypass, unti-unting ibinabalik sa sariling heart function ang patient at tinatangal sa CPB.
 - Nilalagyan ng chest tubes para ma-drain ang blood/fluid.
 - Nilalagyan din ng epicardial pacing wires kung kailangan ng temporary pacing.
 - Pagkatapos, sinasara ang chest incision.

Nursing Interventions

1. PREOPERATIVE CARE

- Assessment
- Patient education
- Turuan din tungkol sa deep breathing, coughing, incentive spirometer, at postoperative activity.
- Monitor and manage potential complications

2. POSTOPERATIVE CARE

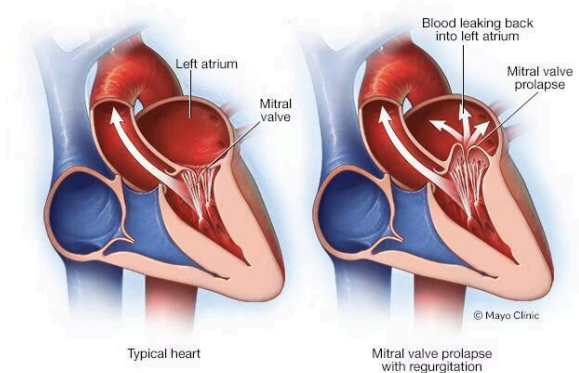
- Monitor cardiopulmonary status and oxygenation (ABGs, pulse ox, ECG, CVP, chest tube drainage, I&O, electrolytes)
- pain management
- wound care- aseptic technique (sternotomy site and donor site)
- After extubation, promote deep breathing, coughing, and turning.

- Encourage the use of the incentive spirometer
- Assess temperature every hour
- Assess peripheral vascular status
- Monitor for complications
 - a. decreased cardiac output
 - b. fluid volume and electrolyte imbalance
 - c. impaired gas exchange
 - d. impaired cerebral circulation
- Develop an education plan with the patient and family for

CARDIO PT. 2

VULVAR DISORDERS

a. Mitral Valve Prolapse (MVP)



- Condition kung saan ang one or both leaflets ng mitral valve ay nagbulge pabalik sa left atrium habang systole (nagcocontract ang ventricles). Dahil hindi sumasara nang maayos ang valve, bumabalik ang dugo sa left atrium (mitral regurgitation). Kadalasan, asymptomatic ang patient.
- **Pathophysiology:**
Abnormal mitral valve leaflets → bulge to left atrium during systole → incomplete valve closure → mitral regurgitation → possible left atrial enlargement & increased pulmonary pressure → heart failure in severe cases
 1. **Abnormal valve leaflets:** Nagiging floppy, stretched, o enlarged ang leaflets kaya hindi sila makasara nang maayos.
 2. **Mitral valve prolapse:** Kapag nag-contract ang ventricles, nagbubulge ang valve pabalik sa left atrium.
 3. **Mitral regurgitation:** May dugo na bumabalik sa left atrium imbes na lahat ay dumaloy papunta sa aorta.
 4. **Possible complications:** Kapag severe at matagal ang regurgitation, maaaring lumaki ang left atrium at tumaas ang pressure sa pulmonary circulation, na posibleng magdulot ng **dyspnea at heart failure**.
- **Assessment and Diagnostic Tests**
 - **Auscultation:** Maaaring marinig ang **mid-systolic click at heart murmur** dahil sa abnormal na paggalaw ng valve at pagtagas ng dugo.
 - **Echocardiography:** Gumagamit ng ultrasound para makita ang **prolapsing valve leaflets** at ma-assess kung may **mitral regurgitation**.

- **Medical Management**

1. **Kung may palpitations:**

- Iwasan ang caffeine at alcohol dahil maaari nilang palalain ang palpitations.
- Itigil ang smoking para mabawasan ang cardiovascular risks.
- **Beta-blockers** (metoprolol, propranolol) — nagpapabagal ng heart rate at nakakatulong mabawasan ang palpitations.

2. **Manage heart failure**

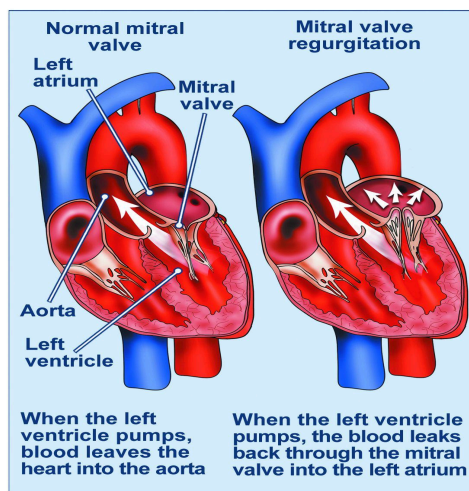
3. **Surgical repair or replacement:** Maaaring kailanganin kung severe ang mitral regurgitation at may indication para sa intervention.

- **Nursing Management**

- **Check product labels:** Iwasan ang energy drinks at products na may stimulants tulad ng caffeine, ephedrine, o epinephrine dahil maaaring mag-trigger ng palpitations o arrhythmias.
- **Encourage stress reduction:** Magpahinga at gumamit ng relaxation techniques dahil maaaring lumala ang palpitations kapag stressed.
- **Activity guidance:** Iwasan muna ang strenuous activity kung may symptoms, at sundin ang activity recommendations ng healthcare provider.
- **Teach warning signs:** Turuan ang patient na mag-report ng:
 1. **Palpitations**
 2. **Syncope**
 3. **Worsening dyspnea**

Note: Ang MVP ay kadalasang **benign at asymptomatic**. Pero kapag nagkaroon ng **significant mitral regurgitation**, maaaring humantong ito sa **left atrial enlargement, pulmonary hypertension, at heart failure**.

b. Mitral Regurgitation (MR)

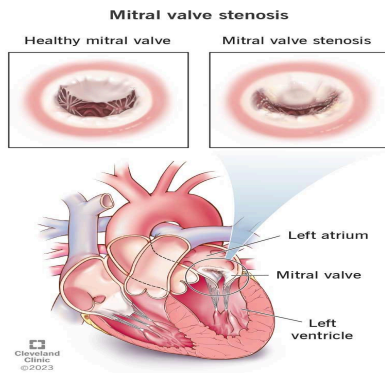


- Condition kung saan ang **blood ay bumabalik mula left ventricle papunta sa left atrium during systole** dahil **hindi sumasara nang maayos ang mitral valve**. Dahil dito, nababawasan ang blood na naipapasa sa aorta at maaaring **maipon ang dugo pabalik sa lungs**.
- **Etiology / Risk Factors**
 - **Chronic Mitral Valve Prolapse**
 - **Degenerative valve disease:** changes and weakness of valve structure dahil sa aging.

- **Ischemic heart disease:** kapag kulang sa oxygen, hindi gumagana nang maayos ang structures na tumutulong sa pagsara ng valve.
- **Congenital abnormalities:** abnormality of valve since birth
- **Infective endocarditis:** Infection sa inner lining ng heart na maaaring makasira sa valve.
- **Pathophysiology:**
Mitral valve fails to close properly → blood flows backward from left ventricle to left atrium during systole → left atrial enlargement and increased pressure → blood backs up into pulmonary circulation → pulmonary congestion → dyspnea and cough → increased workload on the heart → possible heart failure
 1. **Valve incompetence:** Hindi tuluyang sumasara ang mitral valve, may dugo na bumabalik sa left atrium tuwing nagko-contract ang left ventricle.
 2. **Left atrial enlargement:** Nadadagdagan ang volume ng dugo sa left atrium. Kapag matagal itong nangyari, maaaring lumaki ang atrium at tumaas ang pressure.
 3. **Pulmonary congestion:** Ang pressure ay naipapasa pabalik sa pulmonary veins, kaya naiipon ang fluid sa lungs. Ito ang dahilan ng dyspnea (hirap sa paghinga), orthopnea (hirap huminga kapag nakahiga), at cough.
 4. **Heart strain:** Kailangang magtrabaho nang mas mabigat ang left ventricle para maipasa ang sapat na dugo sa katawan. Kapag severe at matagal ang MR, maaaring magkaroon ng **ventricular enlargement at heart failure.**
- **Assessment and Diagnostic Tests**
 - **High-pitched systolic murmur:** Maririnig habang nagko-contract ang ventricles, dahil sa abnormal blood flow. Commonly, naririnig ito sa apex ng heart at maaaring kumalat papunta sa left axilla.
 - **Echocardiography:** Gumagamit ng ultrasound para makita kung **gaano kalala ang valve leakage at kung may enlargement o pagbabago sa function ng heart.**
- **Medical Management**
 - **Angiotensin-converting enzyme (ACE) inhibitors** (e.g., captopril) — lower the resistance of left ventricle to pump the blood (afterload).
 - **Beta-blockers** — control the heart rate, lalo na kung may atrial fibrillation (AFib), depende sa condition ng patient.
 - **Diuretics** (e.g., furosemide) — remove excess fluid on the body para mabawasan ang pulmonary congestion at hirap sa paghinga.
 - **Mitral valve repair or replacement** — maybe needed on severe MR to fix or change the valve and prevent additional heart damage.

Note: Sa mitral regurgitation, **backward ang flow ng dugo mula left ventricle papuntang left atrium during systole.** Kapag tumaas ang pressure pabalik sa lungs, maaaring magkaroon ng **pulmonary congestion at dyspnea.**

c. Mitral Stenosis (MS)



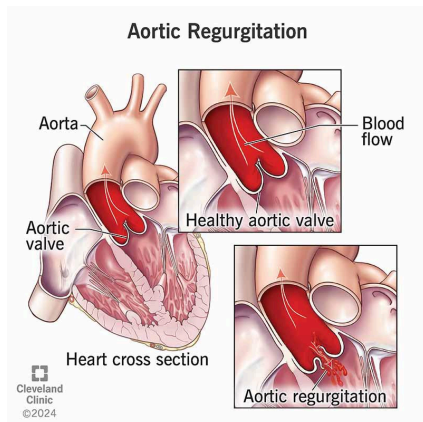
- **Narrowing of mitral valve, nahihirapan ang dugo na mag flow from left atrium (LA) papunta sa left ventricle (LV) during diastole** (relaxation phase ng ventricles). Dahil dito, **naipon ang dugo sa LA at maaaring bumalik ang pressure sa lungs.**
- **Common cause: Rheumatic heart disease** from rheumatic fever cause by **Group A Streptococcal infection**. Unti-unting kumakapal at nagdidikit ang valve leaflets, kaya nagnanarrow ang opening.
- **Pathophysiology:**
Mitral valve narrowing → obstructed blood flow from LA to LV → blood backs up in LA → increased pulmonary pressure → pulmonary congestion → pulmonary hypertension → right ventricular strain → possible right-sided heart failure
 1. **Narrowed mitral valve:** Nagnarrowed ang valve opening, kaya kaunting dugo lang ang nakakadaan mula LA papuntang LV.
 2. **Left atrial enlargement:** Naiipon ang dugo sa LA dahil nahihirapan itong magpasa ng dugo sa LV. Lumalaki ang LA at tumataas ang risk ng atrial fibrillation (AFib), na nagdudulot ng irregular heartbeat.
 3. **Decreased cardiac output:** Dahil kaunti ang dugong pumapasok sa LV, nababawasan ang dugong napo-pump papunta sa katawan. Puwedeng makaranas ang patient ng **fatigue, weakness, at activity intolerance.**
 4. **Pulmonary congestion:** Bumabalik ang **pressure sa pulmonary veins**, kaya naiipon ang fluid sa lungs. Causing **dyspnea (hirap sa paghinga), orthopnea (hirap huminga kapag nakahiga), cough, at hemoptysis (pag-ubo ng dugo).**
 5. **Pulmonary hypertension:** Kapag matagal ang mataas na pressure sa pulmonary circulation, **tumataas ang workload ng right ventricle.** Maaari itong lumaki at humina, na posibleng humantong sa **right-sided heart failure.**
- **Assessment and Diagnostic Tests:**
 - **Heart murmur:** Low-pitched diastolic murmur sa apex ng heart dahil sa pagdaan ng dugo sa narrowed valve.
 - **Echocardiography:** Examine the severity of valve narrowing at kung may enlargement ng LA.
 - **Electrocardiogram (ECG):** Maaaring makatulong makita ang **atrial fibrillation o ibang arrhythmias.**
- **Prevention**
 - **Treat Group A Streptococcal infection early:** Proper adherence to antibiotics to prevent rheumatic fever.
 - **Prevent recurrent rheumatic fever:** Sa mga patient na nagkaroon na nito, maaaring magreseta ng **long-term antibiotic prophylaxis** para maiwasan ang panibagong episodes at another valve damage.

- **Medical Management**

- **Anticoagulants:** lower risk of blood clots at stroke.
- **Cardioversion:** maibalik sa normal rhythm ang heart kung may atrial fibrillation
- **Beta-blockers, digoxin, o calcium channel blockers:** control heart rate, lalo na kung may atrial fibrillation, para mas magkaroon ng oras ang ventricles na mapuno ng dugo.
- **Avoid strenuous activities**
- **Percutaneous balloon valvotomy:** Gumagamit ng balloon catheter para idilate ang narrowed mitral valve, check if appropriate for valve anatomy at walang contraindications.
- **Commissurotomy:** Pinaghihiwalay ang magkakadikit na valve leaflets upang mapaluwang ang opening.
- **Valve replacement:** Pinapalitan ang damaged valve kapag severe ang stenosis or pag di effective ang ibang procedures.

Note : Sa mitral stenosis, **nahihirapan ang dugo na dumaloy from LA to LV during diastole.** Ang pangunahing problem ay **blood backup sa lungs, na maaaring magdulot ng pulmonary hypertension at right-sided heart failure.**

d. Aortic Regurgitation (AR)



- Condition kung saan **bumabalik ang dugo mula aorta papunta sa left ventricle (LV) during diastole** dahil **hindi nagc-close nang maayos ang aortic valve.** Dahil dito, mas **maraming dugo ang kailangang i-handle at i-pump ng LV.**
- **Etiology / Risk Factors**
 - **Rheumatic heart disease:** scarring at deformity ng aortic valve
 - **Syphilis:** in advanced case, nasisira ang aorta at maapektuhan ang aortic valve
 - **Aortic dissection:** napupunit ang inner layer ng aorta.
 - **Blunt chest trauma**
 - **Deterioration of a replaced valve:** nasira o hindi na gumana nang maayos ang artificial valve sa paglipas ng panahon.
- **Pathophysiology:**
Aortic valve fails to close → blood flows back into LV during diastole → increased LV blood volume → LV dilation and hypertrophy → increased workload → decreased LV function → possible left-sided heart failure
 1. **Backflow of blood:** Habang nagre-relax ang LV, bumabalik ang dugo mula aorta papunta sa LV dahil hindi sumasara nang maayos ang valve.

2. **Left ventricular dilation and hypertrophy:** Napupuno ng sobrang dugo ang LV, kaya lumalaki ang chamber at kumakapal ang heart muscle para kayanin ang dagdag na workload.
3. **Wide pulse pressure:** Maaaring tumaas ang systolic blood pressure dahil mas maraming dugo ang naitutulak palabas, habang bumababa ang diastolic blood pressure dahil bumabalik ang dugo sa LV.
4. **Corrigan's pulse (water-hammer pulse):** loud and rapid increase of pulse, tapos biglang humihina o bumabagsak.
5. **Left-sided heart failure:** Kapag hindi na nakayanan ng LV ang sobrang workload, humihina ang pumping function at maaaring **bumalik ang pressure sa lungs**.
6. **Possible symptoms:** Dyspnea, fatigue, orthopnea, at paroxysmal nocturnal dyspnea.

- **Assessment and Diagnostic Tests**

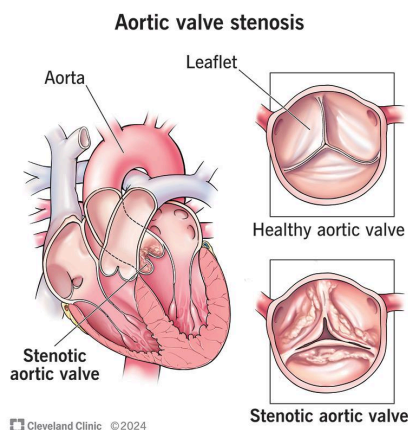
- **Echocardiography:** makita ang valve leakage, severity ng regurgitation, at function ng LV.
- **Cardiac magnetic resonance imaging (MRI):** detailed images para masukat ang blood backflow at ventricular size/function.
- **Cardiac catheterization:** measure the pressure of heart and blood vessels or examine the coronary arteries before surgery

- **Medical Management**

- **Control blood pressure:** Ang **angiotensin-converting enzyme (ACE) inhibitors** o **calcium channel blockers (CCBs)** ay maaaring gamitin sa piling patients para mabawasan ang resistance
- **Limit sodium intake:** Maiwasan ang sobrang fluid retention
- **Avoid smoking and strenuous exertion if symptomatic**
- **Aortic valve replacement or repair:**

Note: Sa aortic regurgitation, **bumabalik ang dugo mula aorta papunta sa LV during diastole**. Classic findings ang **wide pulse pressure at bounding pulse (Corrigan's pulse)**. Kapag lumala, maaaring humantong sa **left-sided heart failure**.

e. Aortic Stenosis



- **Narrowing of aortic valve** kaya nahihirapan ang blood na magflow mula sa left ventricle papunta sa aorta during systole.
- **Causes/Risk Factors:**
 - **Degenerative calcification** – calcium buildup na nagpapakapal at nagpapatigas sa valve.
 - **Rheumatic heart disease (RHD)** – damage mula sa rheumatic fever

- **Congenital leaflet malformations** – abnormal ang pagkakabuo ng valve mula birth.
- **Pathophysiology:**
Narrowed aortic valve → **obstructed blood flow palabas ng left ventricle** → **kailangang mag-contract nang mas malakas ang left ventricle para maitulak ang blood** → **left ventricular hypertrophy (pagkapal ng heart muscle)** → **bumababa ang ventricular compliance at cardiac output** → **blood backs up papunta sa lungs** → **pulmonary congestion at heart failure.**
- **Clinical Manifestations:**
 - **Dyspnea on exertion (DOE)** – hinihinalap kapag gumagalaw
 - **Angina pectoris** – chest pain
 - **Dizziness/Syncope** – pagkahilo o pagkahimatay
 - **Systolic murmur** – rough sound from turbulent blood flow on narrowed valve.
 - **Narrow pulse pressure** – maliit ang pagitan ng systolic at diastolic BP dahil nababawasan ang blood na nailalabas ng heart.
- **Diagnostic Tests:**
 - **Echocardiography**
 - **Cardiac MRI/CT scan**
 - **12-lead ECG**
 - **Cardiac catheterization**
- **Management:**
 - **Transcatheter Aortic Valve Replacement (TAVR)** – replacement ng valve gamit ang catheter, usually without open-heart surgery.
 - **Surgical Aortic Valve Replacement (SAVR)** – open surgery para palitan ang severely narrowed valve.
 - **Balloon valvuloplasty** – balloon catheter na ini-inflate para idilate ang narrowed valve; temporary ang benefit.

SURGICAL MANAGEMENT OF HEART VALVE DISORDERS

- a. **Valvuloplasty** – procedure para ayusin ang damaged valve habang pinapanatili ang sariling valve ng patient.
 - i. **Commissurotomy** – paghihiwalay ng valve leaflets na nagdikit o nag-fuse, commonly used sa mitral stenosis.
 - ii. **Balloon valvuloplasty** – ipinapasok ang balloon catheter at ini-inflate sa valve para paghiwalayin ang fused leaflets.
 - iii. **Open commissurotomy** – surgery kung saan direktang hinihiwalay ng surgeon ang fused leaflets.
 - iv. **Annuloplasty** – pag-aayos ng valve annulus, ang ring-like structure na sumusuporta sa valve, pwedeng maglagay ng annuloplasty ring o higpitan ang annulus gamit ang sutures para mas maayos ang pagsara ng valve. commonly used sa valvular regurgitation para mabawasan ang backflow ng blood.
- b. **Valve Replacement** — Tinatanggal ang severely damaged valve at pinapalitan ng mechanical valve o tissue valve kapag hindi na sapat ang repair.
 - i. **Mechanical valve** – matibay at mas tumatagal, pero usually nangangailangan ng lifelong anticoagulation gaya ng warfarin.

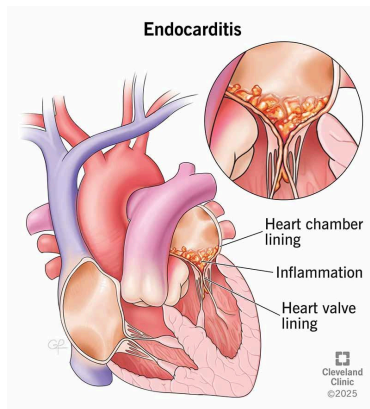
- ii. **Tissue valve** – gawa sa biological tissue; usually mas kaunti ang long-term anticoagulation requirements, pero maaaring mas maagang masira.

- **Nursing Management**

1. Frequent vital signs and cardiac monitoring
2. Monitor insertion or surgical site – kung may bleeding, swelling, redness, o signs of infection.
3. Assess for embolism – biglang panghihina, facial drooping, slurred speech, o pagbabago sa mental status dahil maaaring signs ng stroke.
4. Administer prescribed medications
5. Avoid strenuous activities
6. Anticoagulation therapy

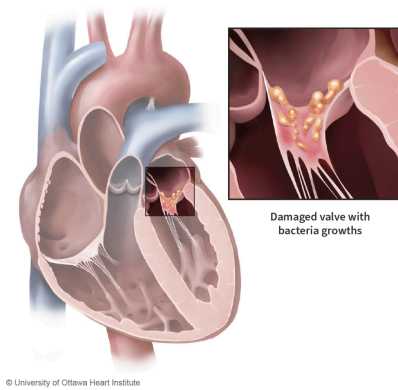
INFECTIOUS DISEASES OF THE HEART

a. Rheumatic Endocarditis



- Inflammatory reaction na nangyayari kapag **nagkamali ang immune system sa pag-atake sa sariling tissues ng katawan matapos ang untreated Group A beta-hemolytic streptococcal infection**, gaya ng strep throat. Maaari nitong **ma-damage ang heart valves at magdulot ng stenosis o regurgitation**.
- **Etiology / Risk Factors:**
 - **Untreated strep throat** – pangunahing trigger ng rheumatic fever dahil sa abnormal immune response laban sa Group A Streptococcus.
 - **Recurrent rheumatic fever** – paulit-ulit na inflammation na maaaring magpalala ng valve damage.
 - **Age 5–15 years** – mas common sa children at adolescents.
 - **Crowded living conditions and poverty** – mas mataas ang risk ng streptococcal infection at delayed treatment.
- **Clinical Manifestations:**
 - **Fever** – sign ng inflammation.
 - **Arthralgia** – pananakit ng joints.
 - **Polyarthrititis** – pamamaga at pananakit ng maraming joints, kadalasang palipat-lipat.
 - **New-onset murmur** – abnormal heart sound dahil sa valve damage.
 - **Tachycardia**
 - **Sydenham's chorea** – **hindi kontroladong paggalaw** dahil sa involvement ng nervous system.
 - **Fatigue**
 - **Dyspnea**

b. Infective Endocarditis



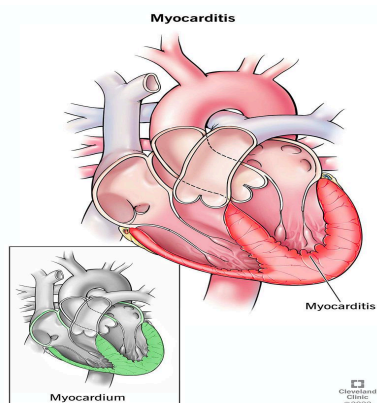
- **Infection ng inner lining ng heart (endocardium), lalo na sa heart valves, na maaaring magdulot ng valve damage, blood clots, at heart failure.**
- **Risk Factors**
 - **Prosthetic heart valves** – artificial valves na maaaring pamugaran ng microorganisms.
 - **Implanted cardiac devices**
 - **History of bacterial endocarditis** – mas mataas ang risk na maulit ang infection.
 - **Congenital heart disease**
 - **Dental caries or abscesses** – maaaring makapasok sa bloodstream.
 - **Hospital-acquired risks** – hemodialysis, long-term indwelling catheters, at prolonged IV access na maaaring maging entry point ng bacteria.
 - **Causative Organisms:** Staphylococci at Streptococci
- **Diagnostic Tests**
 - **Blood cultures**
 - **Echocardiogram** – vegetations of microorganisms, platelets, at fibrin sa valves.
 - **Complete blood count (CBC)** – increased white blood cells at anemia.
 - **Erythrocyte sedimentation rate (ESR) at C-reactive protein (CRP)** – tumataas dahil sa inflammation.
- **Pathophysiology:**

Pre-existing heart damage o abnormal valve → nasisira ang endocardium → nagkakaroon ng platelet at fibrin deposits → kumakapit ang bacteria sa deposits → dumadami ang microorganisms at nabubuo ang vegetations sa valve → nasisira ang valve at nagkakaroon ng regurgitation → maaaring humantong sa heart failure.

Kasabay nito: **Bacteria mula sa vegetations ay maaaring kumalat sa bloodstream → persistent fever at increased ESR/CRP → maaaring mabreak ang vegetations at magdulot ng emboli na bumabara sa blood vessels → posibleng organ damage, like stroke.**
- **Characteristic Manifestations**
 1. **Osler nodes** – masakit na nodules sa pads ng fingers at toes.
 2. **Janeway lesions** – painless, reddish o hemorrhagic spots sa palms at soles.
 3. **Roth spots** – retinal hemorrhages na may maputing center, na nakikita sa eye examination.
 4. **Petechiae** – maliliit na red o purple spots dahil sa pagdurugo sa ilalim ng balat o mucous membranes.
- **Prevention**

- **Antibiotic prophylaxis** – for selected high-risk patients bago ang ilang dental procedures, as provider's recommendation.
- **Good oral hygiene**
- **Report persistent fever** – tuloy-tuloy o hindi maipaliwanag na lagnat.
- **Aseptic technique** – panatiliing sterile ang IV insertion at catheter care upang maiwasan ang infection.
- **Medical Management**
 - **Goal:** Maalis ang infection, maiwasan ang valve damage, at makontrol ang complications.
 - **Intravenous antibiotics**
 - **Surgery**
 - **Treat complications**
- **Nursing Management**
 1. Monitor temperature and vital signs
 2. Administer prescribed medications
 3. Plan rest periods
 4. Maintain infection control
 5. Assess heart sounds
 6. Monitor for embolization and organ damage
 7. Assess PICC or IV sites
 8. Monitor IV antibiotic therapy
 9. Patient and family education

c. Myocarditis



- **Inflammation ng myocardium (heart muscle)** na puwedeng magpahina sa pumping ability ng heart at magdulot ng enlargement ng heart chambers.
- **Etiology:**
 - **Infectious:** viruses
 - **Immune-related:** ang immune system ay umaatake sa sariling tissues (rheumatic fever, systemic lupus erythematosus)
 - **Toxins and drugs:** puwedeng makasira sa myocardial cells.
- **Pathophysiology**
Causative agent, toxins, or autoimmune reaction → damage to myocardial cells → immune response and inflammation → destruction of heart muscle cells → decreased contractility and electrical instability → decreased stroke volume and cardiac output → possible heart failure and arrhythmias

1. **Myocardial cell damage:** Nasasira ang heart muscle cells dahil sa infection, toxins, o abnormal immune response.
2. **Inflammation:** Dumadami ang immune cells sa myocardium para labanan ang cause ng damage, pero puwede ring madagdagan ang tissue injury.
3. **Muscle destruction and scarring:** Kapag persistent ang inflammation, mas maraming heart muscle cells ang nasisira at maaaring mapalitan ng scar tissue.
4. **Decreased contractility:** Humihina ang pag-contract ng heart, kaya mas kaunting blood ang naipapump sa katawan.
5. **Complications:** Puwedeng magkaroon ng arrhythmias dahil naaapektuhan ang electrical activity ng heart, at heart failure dahil humihina ang pumping function.

- **Diagnostic Tests and Findings**

- **Endomyocardial biopsy:** maliit na sample ng heart muscle para makita ang inflammation; diagnostic gold standard sa selected cases.
- **Cardiac MRI:** myocardial inflammation, edema, at tissue damage.
- **Electrocardiogram:** abnormal ST-segment at T-wave changes dahil naaapektuhan ang electrical activity ng heart.
- **Echocardiogram:** heart size at pumping function;
- **Physical assessment:** muffled heart sounds o pericardial friction rub kung may kasamang pericardial inflammation.
- **Laboratory tests:** increase white blood cell count, erythrocyte sedimentation rate, C-reactive protein and troponin

- **Clinical Manifestations**

- **Flu-like symptoms:** Fever, muscle pain, at sore throat
- **Chest pain:** dahil sa inflammation ng heart muscle.
- **Palpitations:** mabilis, malakas, o irregular ang tibok ng heart
- **Dyspnea, orthopnea, at paroxysmal nocturnal dyspnea**
- **Syncope:** bumaba ang blood flow papunta sa brain.
- **Signs of heart failure:** Crackles sa lungs, peripheral edema, at jugular venous distention
- **Severe cases:** life-threatening arrhythmias o sudden cardiac death.

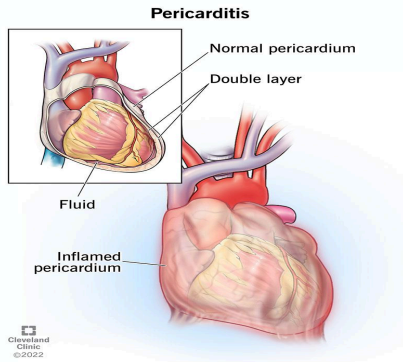
- **Medical Management**

1. **Treat the underlying cause:** Antibiotics for bacterial infection, selected antiviral/immune-directed treatment if indicated; not all myocarditis needs this
2. **Strict rest during the acute phase:** less than 3–6 months depende sa severity at medical clearance.
3. **Gradual return to activity:** kapag stable na ang heart function at cleared na ng healthcare provider.
4. **Antiarrhythmic medications:** Ibinibigay kung may clinically significant arrhythmias.
5. **Heart failure treatment**

- **Nursing Management**

1. Assess for heart failure and arrhythmias
2. Position in semi-Fowler's
3. Strict intake and output monitoring
4. Administer oxygen as indicated
5. Ensure adequate rest
6. Patient and family education

d. Pericarditis



- **Inflammation ng pericardium**, ang sac na nakapalibot at nagpoprotekta sa heart. Kapag namaga ito, nagkakaroon ng chest pain at maaaring **maipon ang fluid sa paligid ng heart**.
- **Risk Factors**
 - **Unknown etiology**
 - **Infection**: Viral o bacterial infection
 - **Post-cardiac surgery**: nairita o mamaga ang pericardium pagkatapos ng heart surgery.
 - **Post-MI (Dressler's syndrome)**: **Delayed inflammatory reaction** na maaaring mangyari pagkatapos ng myocardial infarction.
 - **Autoimmune conditions**
 - **Neoplastic disease or radiation therapy**: Cancer o radiation treatment
 - **Uremia**: Pag-ipon ng waste products sa dugo dahil sa severe kidney dysfunction na maaaring maging cause ng inflammation.
- **Pathophysiology**

Trigger → injury to the pericardium → inflammation → increased capillary permeability → fluid accumulation around the heart → possible restricted heart filling → decreased cardiac output

 1. **Pericardial injury**: May infection, autoimmune reaction, o ibang trigger na nagdudulot ng damage sa pericardium.
 2. **Inflammatory response**: Naglalabas ang katawan ng inflammatory chemicals na nagdudulot ng redness, swelling, at pagtaas ng capillary permeability.
 3. **Pericardial effusion**: Maaaring maipon ang fluid sa sac na nakapalibot sa heart. Kapag sobra o mabilis ang pag-ipon, naiipit ang heart at nahihirapan itong mapuno ng blood.
 4. **Chronic inflammation**: Kapag matagal ang inflammation, maaaring kumapal, tumigas, o magkaroon ng calcification ang pericardium, na naglilimita sa pag-expand ng heart.
 5. **Constrictive pericarditis**: Dahil matigas na ang pericardium, nahihirapan ang heart na mapuno ng blood during diastole, kaya bumababa ang cardiac output at maaaring magkaroon ng systemic venous congestion.
 6. **Cardiac tamponade**: Isang life-threatening complication kung saan naiipit ang heart dahil sa fluid buildup, kaya hindi sapat ang blood na napupump sa katawan.
 7. **Beck's triad**: Hypotension, muffled heart sounds, at jugular venous distention.
- **Diagnostic Tests**:
 - a. **Echocardiogram**: kung may fluid sa paligid ng heart at kung naapektuhan ang heart filling.
 - b. **Computed tomography scan or cardiac magnetic resonance imaging**: pericardial thickening, inflammation, at calcification.
 - c. **Twelve-lead electrocardiogram**

- d. **Pericardial fluid analysis:** fluid na kinuha sa paligid ng heart to know the cause of effusion or infection.

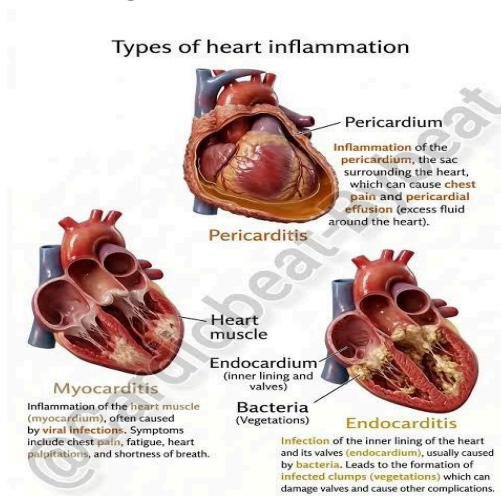
- **Medical Management**

- a. **Nonsteroidal anti-inflammatory drugs:** Ibuprofen o aspirin
- b. **Colchicine:** bawasan ang risk ng recurrent pericarditis.
- c. **Corticosteroids:** pag contraindicated o hindi effective ang ibang treatment, depende sa cause.
- d. **Pericardiocentesis:** pagtanggal ng sobrang fluid sa paligid ng heart gamit ang needle o catheter, lalo na kapag may cardiac tamponade.
- e. **Pericardiectomy:** surgical removal ng bahagi o karamihan ng pericardium kapag severe at persistent ang constrictive pericarditis.

- **Nursing Management**

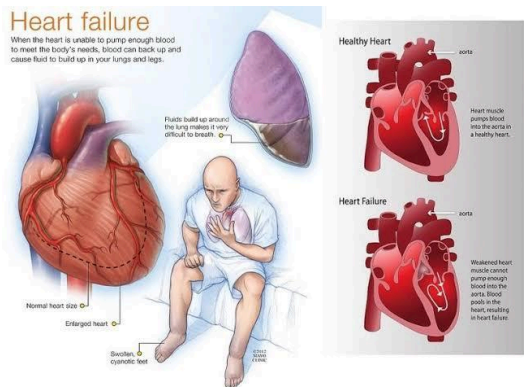
1. Monitor cardiovascular status
2. Watch for cardiac tamponade: hypotension, muffled heart sounds, jugular venous distention, and worsening dyspnea
3. Position appropriately: High-Fowler's
4. Administer oxygen as indicated
5. Encourage rest
6. Maintain strict aseptic technique
7. Patient education

Note: Ang **pericarditis** ay inflammation ng sac sa paligid ng heart, samantalang ang **myocarditis** ay inflammation mismo ng heart muscle.



COMPLICATIONS FROM HEART DISEASE

- a. **Heart Failure (HF)**



- **Hindi na kayang mag-pump ng heart ng sapat na blood para matugunan ang needs ng katawan, kaya bumababa ang oxygen supply at naiipon ang fluid sa lungs o ibang body tissues.**
- **Types of Heart Failure:**
 1. **Left-sided Heart Failure:** Mahina ang pumping ng left ventricle, kaya naiipon ang blood sa lungs at nagdudulot ng breathing problems.
 2. **Right-sided Heart Failure:** Mahina ang pumping ng right ventricle, kaya naiipon ang blood sa systemic veins at nagdudulot ng edema at abdominal congestion.

Note: *Left-Lung, Right-Rest of the body*

- **Pathophysiology:**
Heart damage → decreased pumping ability → decreased cardiac output → activation of compensatory mechanisms → fluid retention and vasoconstriction → increased workload of the heart → worsening heart failure
 1. **Decreased cardiac output:** Kapag mahina ang contraction o filling ng heart, mas kaunting blood ang nadadala sa katawan, kaya bumababa ang oxygen supply sa tissues.
 2. **Sympathetic nervous system activation:** Naglalabas ang katawan ng stress hormones na nagpapabilis ng heart rate at nagcoconstrict ng blood vessels para mapanatili ang blood pressure, pero nadadagdagan ang workload ng heart.
 3. **Renin-angiotensin-aldosterone system activation:** Kapag kulang ang blood flow sa kidneys, nagre-release ang kidneys ng renin, na humahantong sa production ng **angiotensin II at aldosterone**. Nagdudulot ito ng vasoconstriction at sodium at water retention.
 4. **Antidiuretic hormone release:** Mas maraming water ang nire-reabsorb ng kidneys, kaya tumataas ang blood volume.
 5. **Increased preload and congestion:** Mas maraming blood ang bumabalik sa heart. Dahil mahina ito, hindi nito kayang i-handle ang extra volume, kaya **naiipon ang fluid sa lungs o systemic tissues**.
 6. **Progressive heart failure:** Patuloy na tumataas ang workload ng heart, kaya lalong humihina ang pumping function at lumalala ang **fluid congestion**.
- **Clinical Manifestations**
 - **Left-sided Heart Failure**
 - Dyspnea
 - Orthopnea
 - Paroxysmal nocturnal dyspnea
 - Cough
 - Pulmonary crackles

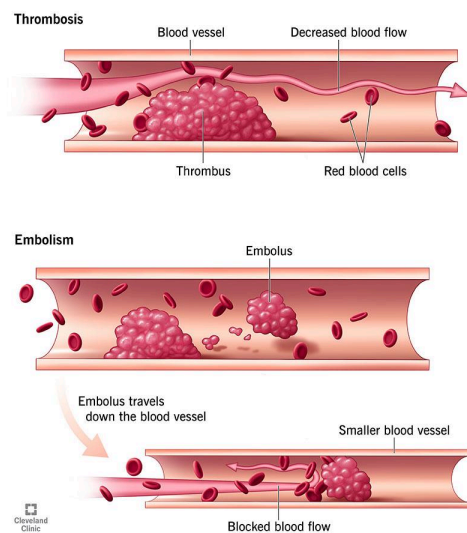
- Decreased oxygen saturation
 - Decreased urine output
 - Tachycardia and palpitations
 - Fatigue and weakness
- **Right-sided Heart Failure**
 - Jugular venous distention
 - Dependent pitting edema
 - Hepatomegaly
 - Ascites
 - Weight gain
 - Gastrointestinal distress:
 - Generalized weakness
- **Important Terms**
 - **Congestive Heart Failure:** Heart failure na may signs ng fluid congestion, gaya ng pulmonary crackles, edema, o fluid accumulation sa katawan.
 - **Pulmonary Edema:** Sobrang fluid accumulation sa lungs na maaaring magdulot ng severe dyspnea at hypoxemia; isa itong medical emergency kapag acute at severe.
- **Diagnostic Tests**
 - **Echocardiogram:** structure at pumping function ng heart, 40% ejection fraction or lower = reduced pumping function.
 - **Chest X-ray**
 - **12-lead electrocardiogram**
 - **Blood tests:** BNP or NT-proBNP for heart strain, creatinine and blood urea nitrogen for kidney function, electrolytes, liver function, and thyroid function.
- **Medical Management**

Goal: Mapabuti ang cardiac function, mabawasan ang fluid congestion, at mapabagal ang progression ng heart failure.

- **Pharmacologic Therapy**
 1. **Diuretics (furosemide, hydrochlorothiazide, metolazone, spironolactone):** remove excess fluid by increasing urine output.
 2. **Angiotensin system blockers:** Lower blood pressure and workload, reduce worsening heart failure.
 - a. **Angiotensin-converting enzyme inhibitors:** Enalapril, lisinopril, at captopril.
 - b. **Angiotensin receptor blockers:** Losartan, valsartan, at telmisartan.
 - c. **Angiotensin receptor-neprilysin inhibitor:** Sacubitril-valsartan, helps reducing strain in the heart.
- **Nursing consideration:** Check for hypotension, kidney function, at potassium level.
- 3. **Beta-blockers** (carvedilol, metoprolol succinate, bisoprolol)
- 4. **Ivabradine:** lower heart rate by targetting sinus node, for selected patients with persistent elevated heart rate.
- 5. **Hydralazine and isosorbide dinitrate:** isosorbide dinitrate dilate veins to lower the preload, hydralazine dilate arteries to reduce afterload.
- 6. **Digitalis (digoxin):** increase contraction of heart and reduce conduction on atrioventricular node. monitor heart rate and signs of toxicity (nausea, loss of appetite, confusion, visual disturbances, at arrhythmias), therapeutic range can be 0.5–0.9 nanograms per milliliter in heart failure
- 7. **Intravenous inotropes (dopamine, dobutamine, milrinone):** temporarily treats the cardiac output in selected patients with severe decompensated heart failure or cardiogenic shock. close monitoring for arrhythmias and changes in blood pressure.

8. **Vasodilators (nitroglycerin, sodium nitroprusside):** for selected cases of acute decompensated heart failure to reduce cardiac workload and congestion. monitor blood pressure and avoid if severely hypotensive.
- **Nutritional Therapy**
 - **Low-sodium diet:** less than 2 grams per day if prescribed, reduce fluid retention.
 - **Fluid restriction:** 1.5–2 liters per day in selected patients, depends on severity and medical advice.
 - **Lifestyle modifications:** avoid smoking at excessive alcohol intake, maintain appropriate weight, follow activity plan
- **Supplemental Oxygen:** Kapag may hypoxemia o mababang oxygen saturation, based on clinical assessment and prescribed oxygen target.
- **Management of Sleep Disorders:** can worsen heart failure symptoms and cardiovascular strain.
- **Procedural and Surgical Interventions**
 1. **Coronary artery revascularization:** percutaneous coronary intervention o coronary artery bypass grafting, if coronary artery disease ang contributing cause ng heart failure.
 2. **Implantable cardioverter-defibrillator:** electrical shock kapag may certain life-threatening ventricular arrhythmias to avoid sudden cardiac death.
 3. **Cardiac resynchronization therapy:** helps in synchronization of ventricles contraction in selected patients with electrical conduction delay.
 4. **Ultrafiltration:** remove excess fluid in patients with severe congestion na hindi sapat ang response sa diuretics.
 5. **Cardiac transplantation:** heart replacement for selected patients with advanced heart failure ba di makontrol ng ibang treatments.
- **Nursing Management**
 - Assessment
 - Optimize breathing: semi-Fowler's o High-Fowler's
 - Restrict fluids and sodium as ordered
 - Provide adequate rest: gradual activity kapag stable na ang patient.
 - Administer medications as prescribed

b. Thromboembolism

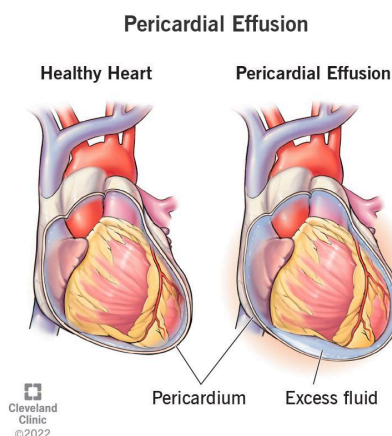


- **Blood clot (thrombus)** na maaaring mapunta sa ibang bahagi ng katawan (**embolus**) at **bumara sa blood vessel**, limiting blood flow.

- **Common causes/risk factors:** Heart failure, atrial fibrillation (AFib), prolonged immobility, at previous history of thrombosis.
- **Pathophysiology:**
Stasis of blood flow / abnormal blood flow → thrombus formation → clot breaks off → travels through circulation → blocks a blood vessel → decreased tissue perfusion → possible organ damage.
- **Clinical Manifestations:**
 - **DVT:** Unilateral leg swelling, pain, warmth, at redness.
 - **Pulmonary embolism (PE):** Sudden dyspnea, chest pain, tachycardia, at decreased O₂ saturation.
 - **Arterial embolism:** Sudden pain, pallor, coldness, at weak or absent pulse sa affected limb.
- **Diagnostic Tests:**
 - **D-dimer:** assess possible clot formation.
 - **Venous ultrasound:** detect DVT.
 - **CT pulmonary angiography (CTPA):** detect PE.
- **Medical Management:**
 - **Anticoagulants** (e.g., heparin, warfarin, DOACs) – prevent clot growth and new clot formation.
 - **Thrombolytics** – dissolve clots in selected severe cases.
 - **Thrombectomy** – physical removal of clot kapag indicated.
- **Nursing Management:**
 1. Assess for signs of DVT, PE, at impaired peripheral circulation.
 2. Monitor VS, O₂ saturation, at respiratory status.
 3. Administer prescribed anticoagulants; monitor for bleeding.
 4. Encourage early ambulation kapag appropriate; iwasan ang prolonged immobility.
 5. Monitor affected limb for swelling, pain, color, temperature, at pulses.
 6. Teach medication adherence at warning signs tulad ng sudden chest pain, dyspnea, or unexplained bleeding.

Note: Sudden dyspnea + chest pain in a patient at risk for thrombosis = suspect pulmonary embolism (PE); kailangan ng immediate assessment at urgent medical attention.

c. Pericardial Effusion



- **Accumulation of fluid sa pericardial sac na nagpapataas ng pressure at maaaring mag-compress sa heart,** na nagdudulot ng **low venous return at cardiac output (CO).**
- Commonly **walang noticeable symptoms hangga't hindi dumadami ang fluid.**

- **Effects of Pericardial Effusion & Cardiac Tamponade**

- ↑ Pressure sa cardiac chambers.
- ↓ Venous return dahil sa compression ng atria.

- **Hindi makapag-expand at makapag-fill nang maayos ang ventricles.**

- **Pathophysiology:**

Heart failure (HF) → ↑ systemic and pulmonary venous pressures → fluid accumulates in pericardial sac → ↑ intrapericardial pressure → RA and RV collapse → ↓ ventricular filling → ↓ stroke volume (SV) & cardiac output (CO).

1. Naiipon ang fluid sa pericardial sac kaya tumataas ang pressure sa paligid ng heart.
2. Naiipit ang RA at RV, kaya nahihirapan ang blood na pumasok sa heart.
3. Bumababa ang ventricular filling, SV, at CO.

- **Clinical Manifestations**

- Chest pain/pressure
- Tachypnea at dyspnea
- JVD
- Hypotension
- Distant heart sounds
- Tachycardia
- **Pulsus paradoxus** – exaggerated pagbaba ng systolic BP **greater than 10 mmHg during inspiration** dahil sa **decreased ventricular filling**.

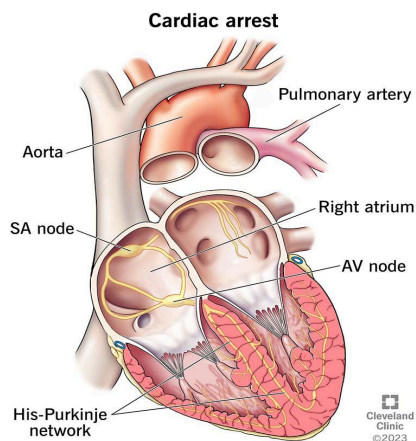
- **Diagnostic Tests**

- Echocardiogram
- Chest X-ray
- ECG

- **Medical Management**

- **Pericardiocentesis** – pag-drain ng pericardial fluid; monitor ECG at vital signs.
- **Pericardiotomy** – ginagawa kapag recurrent ang pericardial effusion.

d. Cardiac Arrest



- **Hindi na kayang mag-pump ng heart at mag-circulate ng blood sa buong katawan.**

- **Clinical Manifestations**

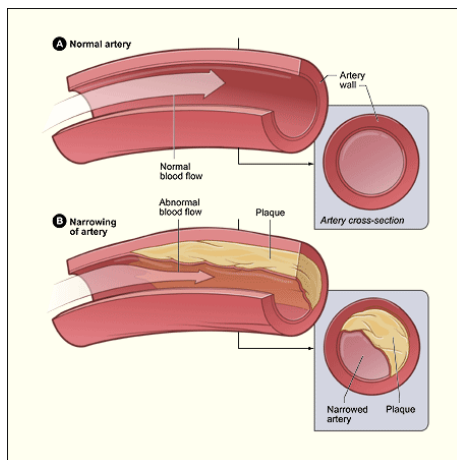
- **Loss of consciousness**
- **Pulselessness**

- Apnea
- Pupil dilation
- Seizure
- Pallor/Cyanosis
- **ECG rhythms:** VF, pulseless VT, asystole, o PEA.
- **Emergency Management**
 - **CPR (Cardiopulmonary Resuscitation)**
 - **Defibrillation:** VF at pulseless VT.
 - **Advanced Cardiovascular Life Support (ACLS)**
- **Medications used in CPR:**
 - **IV Epinephrine:** increase blood flow to the heart and brain during CPR.
 - **Dopamine infusion:** for hypotension and shock if indicated.
 - **Atropine:** increase SA node automaticity and AV conduction; not routine treatment for cardiac arrest.
 - **Amiodarone:** for VF o pulseless VT not responding to defibrillation.
 - **Sodium bicarbonate:** for selected cases of metabolic acidosis or specific indications.
 - **Magnesium sulfate:** selected arrhythmias, esp. **torsades de pointes**.

Note: Sa cardiac arrest, **simulan agad ang CPR at gumamit ng AED/defibrillator sa lalong madaling panahon**. Ang VF at pulseless VT ay **shockable**, habang ang **asystole at PEA ay non-shockable**.

VASCULAR AND PERIPHERAL CIRCULATION DISORDER

a. Arteriosclerosis and Atherosclerosis



1. **Arteriosclerosis:** kumakapal, naninigas, at nawawalan ng elasticity ang arterial walls.
 2. **Atherosclerosis:** type ng arteriosclerosis kung saan naiipon ang fats at cholesterol sa arterial walls, na bumubuo ng plaques at nagpapa narrow sa arteries.
- **Types of Atherosclerotic Lesions**
 - **Fatty streaks – Yellow, smooth deposits** na gawa sa lipids at smooth muscle cells; kadalasan walang symptoms.
 - **Fibrous plaques – Mas developed na plaques na binubuo ng smooth muscle cells, collagen fibers, plasma components, at lipids.**
 - **Risk Factors**
 1. **Modifiable (puwedeng baguhin):**

- Nicotine use
- Diabetes
- Hypertension
- Hyperlipidemia
- Stress
- Sedentary lifestyle
- Hyperhomocysteinemia

2. **Non-modifiable (hindi mababago):**

- Increasing age
- Familial predisposition/genetics

● **Clinical Manifestations**

- Depende sa artery na affected.
- **Coronary arteries** → Angina pectoris, myocardial infarction (MI).
- **Carotid/cerebral arteries** → **Transient ischemic attack (TIA), stroke.**
- **Peripheral arteries** → Intermittent claudication, gangrene.
- **Renal arteries** → Renovascular hypertension, renal failure.

● **Medical Management**

- **Statins (atorvastatin, simvastatin, rosuvastatin)** – lower cholesterol.
- **Antihypertensives (beta-blockers, ACE inhibitors)** – tumutulong mag-control ng BP.
- **Antiplatelets (aspirin, clopidogrel)** – tumutulong maiwasan ang platelet aggregation.
- **Antidiabetics** – para makontrol ang blood glucose.

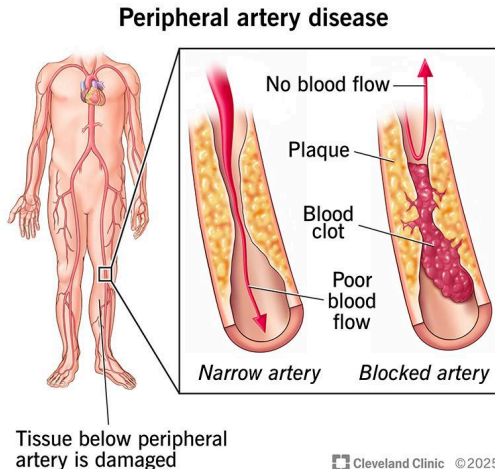
● **Surgical Management**

- **Inflow procedures** : fix the blood supply mula aorta papunta sa femoral artery.
- **Outflow procedures** : blood supply sa vessels na nasa ibaba ng femoral artery.
- **Endovascular Therapy**: paggamit ng catheter sa pamamagitan ng puncture o maliit na incision para ma-repair ang blood vessel.
- **Percutaneous Transluminal Angioplasty (PTA)**: balloon catheter ang ginagamit para palawakin ang narrowed artery.
- **Atherectomy**: gumagamit ng cutting device o laser para alisin ang plaque.

● **Nursing Management**

1. Encourage smoking cessation.
2. Promote low-fat, low-cholesterol, high-fiber diet.
3. Encourage weight management at stress reduction.
4. Improve peripheral arterial circulation:
5. I-position ang affected body part below heart level.
6. Assist sa walking o appropriate exercises.
7. Iwasan ang constrictive clothing at accessories.
8. Iwasan ang pag-cross ng legs.
9. Maintain warm temperature.
10. Administer prescribed pain medications para sa arterial insufficiency.
11. Maintain tissue integrity:
 - Magsuot ng sturdy, well-fitting shoes o slippers.
 - Gumamit ng mild soap at body lotion para maiwasan ang dry at cracked skin.
 - Maingat na mag-trim ng fingernails at toenails.
 - Iwasan ang scratching o vigorous rubbing
 - Encourage adequate nutrition, lalo na protein, vitamin C, at zinc, para sa tissue healing.

b. Peripheral Artery Disease



- **Narrowing o blockage ng peripheral arteries**, lalo na sa legs, na nagcacause ng decreased blood flow, ischemia, at possible gangrene.
- **Clinical Manifestations:**
 - **Intermittent claudication:** pananakit o cramping ng legs kapag naglalakad, nawawala kapag nagpapahinga.
 - **Rest pain:** matinding pain kahit nagpapahinga, lalo na sa gabi.
 - **Cool, pale extremities:** poor circulation.
 - **Unequal or absent pulses:** obstruction ng arteries.
 - **Arterial ulcers:** mahirap magheal dahil kulang ang blood supply.
 - **Shiny, dry skin with sparse hair:** poor tissue perfusion.
 - **Delayed capillary refill:** decreased circulation.

- **Pathophysiology**

Atherosclerotic plaque formation → narrowing of peripheral arteries → ↓ blood flow to the legs → tissue ischemia → intermittent claudication and cool, pale extremities → severe ischemia → rest pain, arterial ulcers, and possible gangrene.

- **Diagnostic Tests:**

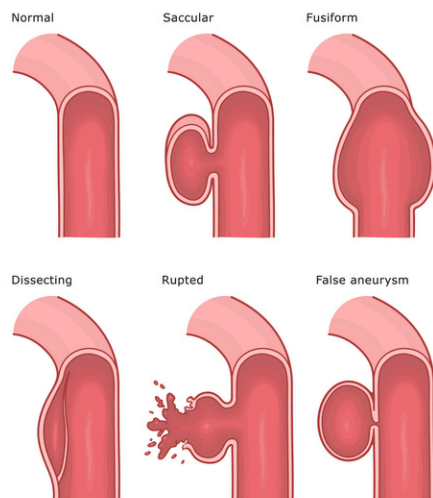
1. **Continuous-wave Doppler ultrasound** – examine peripheral pulses at blood flow.
2. **CT/MR angiography** – location at severity ng arterial narrowing.
3. **Ankle-Brachial Index (ABI)** – compare the systolic BP ng ankle at arm para malaman kung may PAD.
 - **1.00–1.40:** Normal
 - **0.91–0.99:** Borderline
 - **0.50–0.90:** PAD, usually associated with claudication
 - **≤0.40:** Severe ischemia
 - **>1.40:** Noncompressible arteries; kailangan ng additional assessment.
 - **ABI= Highest ankle systolic pressure (per leg) / Highest brachial systolic pressure**
4. **Duplex ultrasound** – pinagsasama ang structural imaging at Doppler blood-flow analysis para makita ang arterial obstruction.

- **Medical Management:**

- **Walking program** – improves circulation and walking tolerance.
- **Cilostazol** – nagpapabuti ng walking distance sa intermittent claudication; contraindicated sa heart failure.

- **Antiplatelets (aspirin, clopidogrel)** – reduce risk ng thrombotic events gaya ng MI at stroke.
- **Statins** – reduce cholesterol at cardiovascular risk.
- **Endovascular intervention** – balloon angioplasty, stent, o atherectomy para mapabuti ang blood flow.
- **Bypass surgery** – severe ang obstruction o hindi sapat ang ibang treatments.
- **Nursing Management:**
 1. Encourage smoking cessation at lifestyle modification.
 2. Promote walking exercises as tolerated.
 3. Position the affected legs below the level of the heart kapag kailangan para makatulong sa arterial blood flow.
 4. Iwasan ang crossing of legs, tight clothing, at constrictive accessories.
 5. Panatilihinang warm ang extremities; iwasan ang direct heat dahil sa risk ng burns.
 6. Assess peripheral pulses, skin color, temperature, capillary refill, at pain.
 7. Maintain skin integrity at turuan ang patient na magsuot ng well-fitting shoes at iwasan ang injury.
 8. Encourage adequate nutrition at proper foot care para maiwasan ang ulcers at infection.

c. Aneurysm

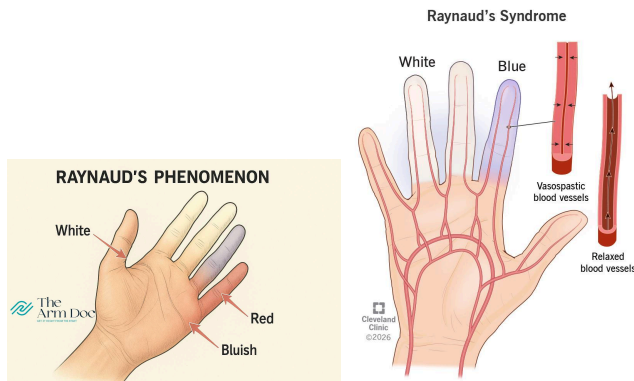


- **Localized abnormal dilation** ng artery dahil sa weakness ng vessel wall.
 1. **Saccular aneurysm** – parang pouch o sac na nakaumbok sa isang side ng artery.
 2. **Fusiform aneurysm** – buong circumference ng artery ang lumalaki o lumolobo.
 3. **Dissecting aneurysm** – pumapasok ang dugo sa tear ng vessel wall, naghihiwalay ang layers nito, at maaaring magdulot ng rupture.
 4. **Abdominal Aortic Aneurysm (AAA)**: Paglobo ng abdominal aorta, commonly associated with atherosclerosis at degeneration ng arterial wall.
- **Risk Factors:**
 - Genetic predisposition
 - Nicotine use / smoking
 - Hypertension
 - Atherosclerosis
- **Clinical Manifestations:**
 - **Asymptomatic** – walang obvious symptoms hanggang lumaki ang aneurysm.
 - **Tender, pulsating abdominal mass** – important clinical finding ng AAA.

- Abdominal, back, or flank pain – maaaring senyales ng expansion o pressure sa surrounding tissues.
- Bruit – abnormal vascular sound dahil sa turbulent blood flow.
- **Signs of Rupture (EMERGENCY):**
 - Sudden, severe, persistent back pain
 - Hypotension
 - Tachycardia
 - Pale, cool, clammy skin
- **Pathophysiology (AAA)**
Weakening of arterial wall → progressive dilation of the aorta → increased wall stress → aneurysm enlargement → possible rupture → massive internal bleeding → hypovolemic shock.
- **Diagnostic Tests:**
 - **Duplex ultrasound** – sinusukat ang size ng aneurysm at mino-monitor ang paglaki nito.
 - **CT angiography** – tinutukoy ang exact location, size, at extent ng aneurysm para sa treatment planning.
- **Medical Management:**
 - **Antihypertensive agents:** kinokontrol ang BP para mabawasan ang stress sa arterial wall.
 - **Endograft repair / stent graft (EVAR):** minimally invasive repair na naglalagay ng graft sa loob ng aorta; commonly considered kapag umabot sa 5.5 cm ang AAA sa eligible patients, depende sa symptoms, growth, at overall condition.
- **Nursing Management:**
 1. Monitor aneurysm size, symptoms, at vital signs.
 2. Instruct patient to avoid heavy lifting at activities na maaaring magpataas nang sobra sa BP.
 3. Post-operative care:
 - Maintain prescribed supine positioning pagkatapos ng femoral access; sundin ang protocol para sa duration.
 - Monitor VS at peripheral pulses using Doppler, initially every 15 minutes as ordered.
 - Assess femoral access site for bleeding or hematoma.
 - Monitor lower extremities, lumbar area, at buttocks for signs of embolization or decreased perfusion.
 - Continue prescribed IV infusion.
 - Monitor temperature, WBC, at platelets for possible post-implantation complications.
 - Report severe pain, hypotension, new pulse deficits, or signs of bleeding immediately.

Note: Ang ruptured AAA ay **life-threatening emergency** dahil maaaring magdulot ng **massive hemorrhage at shock**. **Sudden severe abdominal or back pain with hypotension requires immediate emergency evaluation.**

d. Raynaud's Disease/Phenomenon

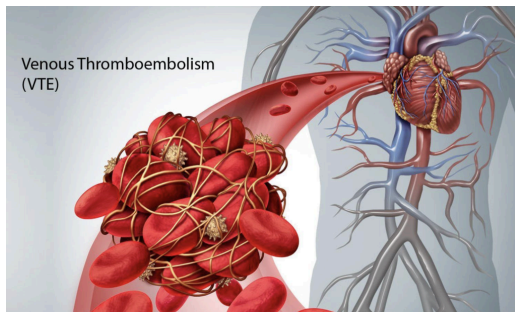


- **Intermittent vasospasm** ng digital arteries at arterioles na nagdudulot ng decreased blood circulation sa fingers at toes.
- **Types of Raynaud's:**
 1. **Primary Raynaud's (Raynaud's disease)** – walang identifiable underlying disease at usually less severe.
 2. **Secondary Raynaud's (Raynaud's phenomenon)** – associated sa underlying conditions tulad ng SLE, rheumatoid arthritis, scleroderma, trauma, o arterial obstruction; mas severe at may risk ng ischemia, ulceration, at gangrene.
- **Triggers:**
 1. Cold temperature
 2. Emotional stress
 3. Connective tissue disorders
 4. Obstructive vascular disease
 5. Injury sa hands or feet
 6. Certain medications (beta-blockers, migraine medications, chemotherapy drugs)
 7. Caffeine at nicotine
- **Clinical Manifestations:**
 - **White (pallor):** vasospasm causes decreased blood flow, resulting in ischemia.
 - **Blue (cyanosis):** prolonged vasospasm causes oxygen depletion sa tissues.
 - **Red (hyperemia)** – bumabalik ang blood flow pagkatapos mawala ang vasospasm.
 - **Numbness, tingling, at burning pain** – dahil sa reduced circulation, usually symmetric sa fingers o toes.
- **Pathophysiology**
Cold exposure or emotional stress → digital artery vasospasm → ↓ blood flow → white (pallor) → prolonged ischemia and oxygen depletion → blue (cyanosis) → vasospasm resolves → reperfusion → red (hyperemia) with possible tingling or pain.
- **Medical Management:**
 - **Avoid triggers:** iwasan ang cold exposure, stress, nicotine, at caffeine kung trigger.
 - **Avoid OTC decongestants and sympathomimetics:** worsen vasoconstriction.
 - **Calcium channel blockers (nifedipine, amlodipine):** relax blood vessels, fix circulation; monitor for hypotension.
 - **Sympathectomy** – rarely performed
- **Nursing Management:**
 1. Encourage stress-management techniques.
 2. Minimize cold exposure; panatiliing warm ang hands at feet.
 3. Recommend protective clothing, gloves, at warm socks.

4. Encourage complete nicotine avoidance.
5. Turuan ang patient na mag-ingat sa sharp objects at protektahan ang skin para maiwasan ang injury.
6. Monitor for skin breakdown, ulcers, at signs of ischemia.
7. Teach the patient to change positions slowly dahil maaaring magdulot ng orthostatic hypotension ang calcium channel blockers.

Note: White → Blue → Red = ischemia → deoxygenation → reperfusion. Secondary Raynaud's is more concerning dahil mas mataas ang risk ng tissue damage at gangrene.

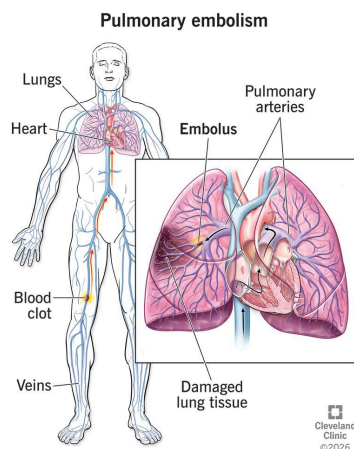
e. Venous Thromboembolism (VTE)



- Collective term para sa **Deep Vein Thrombosis (DVT)** at **Pulmonary Embolism (PE)**, kung saan nafoorm ang blood clot sa vein at maaaring mapunta sa pulmonary arteries.
- **Virchow's Triad** (3 causes of clot formation):
 1. **Venous stasis:** mabagal ang blood flow, kaya naiipon ang dugo sa veins.
 2. **Endothelial injury:** may damage sa inner lining ng blood vessel.
 3. **Hypercoagulability:** mas madaling mamuo ang dugo kaysa normal.
- **Deep Vein Thrombosis (DVT):** Pagbuo ng blood clot sa deep veins, usually sa thigh o calf, causing impaired venous circulation possible pulmonary embolism.
- **Pathophysiology (DVT)**
Venous stasis / endothelial injury / hypercoagulability → platelet activation and coagulation cascade → thrombin generation → fibrin mesh formation → RBCs and platelets trapped in fibrin → thrombus enlarges → partial or complete venous obstruction → ↑ venous pressure → edema, swelling, pain, warmth, and possible superficial vein dilation.
- **Clinical Manifestations:**
 - Unilateral leg swelling
 - Pain or tenderness
 - Warmth and redness
 - Dilated superficial veins
 - Asymptomatic
- **Diagnostic Tests:**
 - CBC
 - Coagulation studies
 - Duplex ultrasound
- **Medical Management (DVT):**
 - Anticoagulants (heparin, enoxaparin, warfarin)
 - Thrombolytics (alteplase)
 - Thrombectomy – physical removal ng clot
 - Ultrasound-assisted thrombolysis

- Bed rest initially
- Leg elevation
- Warm soaks
- Compression stockings
- **Nursing Management (DVT):**
 - Measure at i-monitor ang circumference ng affected limb.
 - Monitor laboratory results, kabilang ang CBC, platelet count, at relevant coagulation tests.
 - Observe for bleeding habang naka-anticoagulant therapy.
 - Elevate the affected leg kapag nagpapahinga.
 - Encourage ambulation kapag stable at cleared for activity.
 - Iwasan ang prolonged sitting; encourage regular movement.
 - Huwag i-massage ang affected leg dahil maaaring ma-disrupt ang clot.
 - Early ambulation – kapag stable at appropriately treated, nakakatulong maiwasan ang prolonged venous stasis.
 - Monitor for pulmonary embolism: sudden dyspnea, chest pain, tachycardia, hypoxemia, o hemoptysis — emergency signs ito.
 - Teach medication adherence at bleeding precautions.
- **Warfarin Patient Teaching:**
 - Inumin sa same time bawat araw.
 - Magpa-monitor ng PT/INR as prescribed.
 - Panatiliing consistent ang intake ng vitamin K-rich foods
 - Kumonsulta bago uminom ng bagong medication o supplement.
 - Iwasan ang activities na may mataas na risk ng injury at gumamit ng soft toothbrush at electric razor.
 - I-report agad ang unusual bleeding, blood sa urine, o black/tarry stools.

f. Pulmonary Embolism (PE)



- **Blockage sa pulmonary artery dahil sa embolus**, usually mula sa dislodged DVT sa legs, na nagreresulta sa decreased pulmonary blood flow at oxygenation.
- **Pathophysiology**

Thrombus formation (usually from DVT) → dislodgement → embolus travels through venous circulation → lodges in pulmonary artery → ↑ pulmonary vascular resistance → right ventricular strain → ↓ pulmonary perfusion → V/Q mismatch → hypoxemia

1. **Thrombus formation:** Nabubuo ang blood clot sa deep veins, usually sa legs, dahil sa venous stasis, endothelial injury, or hypercoagulability.
2. **Embolization:** Kapag natanggal ang clot, nagttravel ito through the venous circulation papunta sa lungs
3. **Pulmonary obstruction:** Naiipit ang clot sa pulmonary artery, kaya nababawasan ang blood flow papunta sa lungs.
4. **Right ventricular strain:** Tumataas ang resistance na kailangang labanan ng right ventricle, na maaaring humantong sa right-sided heart failure.
5. **V/Q mismatch:** Hindi sapat ang blood flow sa affected lung areas, kaya bumababa ang oxygen level sa dugo (hypoxemia).

- **Clinical Manifestations**

- Dyspnea/tachypnea
- Pleuritic chest pain — chest pain na lumalala kapag humihinga nang malalim
- Hemoptysis
- Tachycardia
- Hypotension/syncope
- Hypoxemia
- Signs of right heart strain

- **Diagnostic Tests**

- Chest X-ray
- ECG
- Pulse oximetry
- ABG analysis
- D-dimer
- CT pulmonary angiography
- V/Q scan

- **Medical Management**

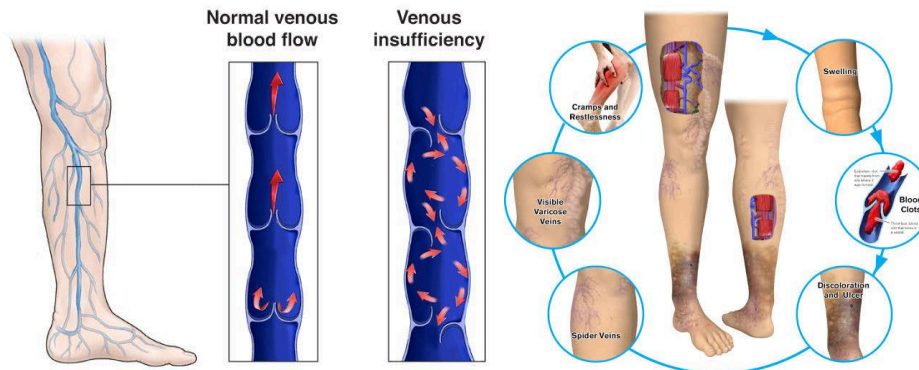
- **Goal:** Stabilize cardiopulmonary function, treat the existing clot, and prevent further clot formation.
- Thrombolytics: para mabilis na matunaw ang clot.
- Anticoagulants: maiwasan ang paglaki ng clot at formation ng bagong clots.
- Surgical embolectomy

- **Nursing Management**

1. Monitor SpO₂, cardiac rhythm, and vital signs.
2. Administer O₂ as ordered para ma-correct ang hypoxemia.
3. Maintain appropriate activity restriction during the unstable acute phase; encourage mobilization kapag stable at prescribed.
4. Monitor INR and aPTT as appropriate sa anticoagulant na ginagamit.
5. Apply pressure sa puncture sites at monitor for bleeding, lalo na pagkatapos ng thrombolytic therapy.
6. Immediately report signs of uncontrolled bleeding; urgent ang response kapag may active major bleeding.
7. Position in semi-Fowler's to promote easier breathing.
8. Encourage deep breathing and incentive spirometry as appropriate.
9. Monitor for signs of cardiogenic shock or right ventricular failure, gaya ng hypotension, worsening dyspnea, at altered LOC.

10. Provide post-procedure care and patient education tungkol sa medication adherence, bleeding precautions, at signs of recurrent DVT/PE.

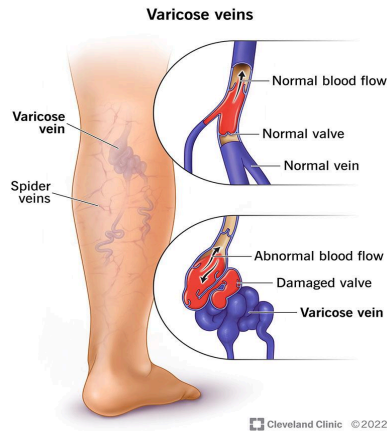
g. Chronic Venous Insufficiency (CVI)



- **Hindi nagfunction nang maayos ang venous valves sa legs** , kaya nagba-backflow ang blood at naiipon ito sa lower extremities, causing increased venous pressure.
 - **Post-thrombotic syndrome:** Isang type ng CVI na nangyayari after DVT dahil sa damage sa venous valves o persistent venous obstruction.
 - **Duplex ultrasound:** Ginagamit para makita ang venous obstruction at abnormal blood flow.
 - **Pathophysiology (CVI)**
Venous valve damage/obstruction → blood reflux → ↑ venous pressure → venous congestion and blood pooling → fluid leakage → edema + capillary damage → RBC breakdown → hemosiderin deposits → inflammation → stasis dermatitis → skin fibrosis → poor wound healing → venous ulcers
1. **Venous valve damage:** Hindi tuluyang nagsasara ang valves, kaya bumabalik ang blood at naiipon sa legs.
 2. **Venous hypertension:** Tumataas ang venous pressure dahil sa blood pooling, causing fluid leakage into surrounding tissues at edema.
 3. **Hemosiderin deposits:** Tumutulo ang RBCs mula sa damaged capillaries; kapag nasira ang RBCs, nagde-deposit ang **iron-containing hemosiderin**, causing brownish skin discoloration.
 4. **Stasis dermatitis:** Persistent congestion triggers inflammation, kaya nagiging itchy, dry, scaly, at irritated ang skin.
 5. **Skin fibrosis:** Nagiging thickened at hardened ang skin at surrounding tissues dahil sa chronic inflammation.
 6. **Venous ulcers:** Dahil sa poor tissue perfusion at impaired wound healing, nagkakaroon ng open wounds, usually sa medial malleolus (inner ankle).
- **Clinical Manifestations**
 - Edema
 - Altered pigmentation
 - Stasis dermatitis
 - Dilated superficial veins
 - Venous ulcers
 - **Management (CVI)**
 - **Goal:** Reduce venous stasis, improve venous return, and prevent skin breakdown and ulcers.
 - 1. Protect the extremities from trauma para maiwasan ang skin injury.

2. Keep the skin clean, dry, and moisturized para maiwasan ang cracking at irritation.
3. Elevate the legs above heart level for 15–20 minutes, four times daily, para makatulong mabawasan ang edema.
4. Use graduated compression stockings to improve venous return, provided adequate arterial circulation is confirmed.
5. Avoid prolonged sitting or standing para hindi lumala ang venous pooling.
6. Avoid pressure on the popliteal area (likod ng tuhod) para hindi ma-obstruct ang circulation.
7. Avoid constricting garments na maaaring makasagabal sa venous return.

h. Varicose Veins (Varicosities)



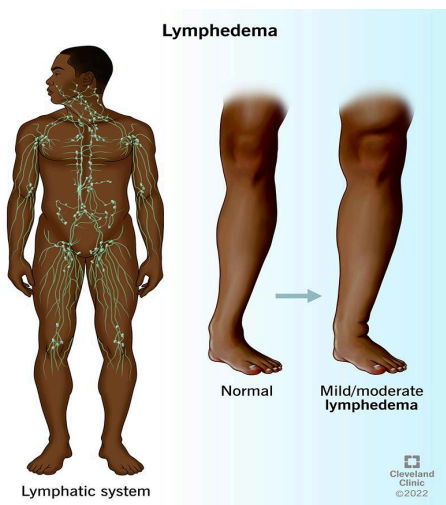
- **Abnormally dilated, twisted superficial veins dahil sa incompetent venous valves**, kaya nagba-backflow at naiipon ang blood sa legs.
- Common sa mga taong matagal nakatayo dahil tumataas ang **venous pressure sa lower extremities**.
 - **Primary**: walang involvement ng deep veins.
 - **Secondary**: resulta ng obstruction sa deep veins.
- **Clinical Manifestations**
 1. **Dull aches/heaviness**
 2. Muscle cramps/nocturnal cramps
 3. Increased leg muscle fatigue
 4. Ankle edema
 5. Signs of chronic venous insufficiency (CVI)
- **Diagnostic Tests**
 - **Duplex ultrasound** – tinutukoy ang location at severity ng venous valve reflux at blood flow.
 - **Venography** – gumagamit ng contrast dye at X-ray para makita ang veins; ginagamit lamang kapag indicated.
- **Prevention**
 - Avoid tight socks/clothing
 - Avoid crossing legs at the thighs
 - Avoid prolonged sitting or standing
 - Frequent position changes
 - Leg elevation
 - Walking every hour
 - Graduated compression stockings
 - Weight reduction
- **Medical Management**

- Thermal ablation
- Phlebectomy
- Sclerotherapy
- Ligation and stripping – itinatali at inaalis ang affected vein.
- NSAIDs – if indicated

- **Nursing Management**

1. Maintain compression
2. Avoid strenuous exercise temporarily
3. Explain expected symptoms – bruising, mild leg cramps, at temporary difficulty straightening the knee pagkatapos ng procedure.
4. Apply cool compress
5. Encourage early ambulation
6. Leg exercises
7. Elevate the foot of the bed
8. Avoid prolonged standing or sitting
9. Report unusual sensations
10. Post-procedure skin care – instructions sa showering; huwag kuskusin ang treatment site at iwasan muna ang lotion kung ipinagbabawal.
11. Sun protection – sunscreen o umiwas sa direct sun exposure para mabawasan ang hyperpigmentation at scarring.
12. After sclerotherapy – maaaring magkaroon ng burning sensation sa injected leg sa loob ng 1–2 days.
13. Long-term venous compression

i. Lymphedema



- **Inflammation of extremities dahil sa accumulation ng lymph fluid kapag may obstruction o damage sa lymphatic vessels, kaya hindi maayos ang fluid drainage.**
 - **Pathophysiology**
Lymphatic obstruction/damage → impaired lymph drainage → lymph fluid accumulates in tissues → increased tissue swelling → chronic inflammation and fibrosis → thickened, hardened skin
1. **Lymphatic obstruction:** May blockage o damage sa lymphatic vessels, kaya hindi maayos ang pag-drain ng lymph fluid.
 2. **Fluid accumulation:** Naiipon ang lymph sa tissues, causing persistent swelling sa affected extremity.

3. **Chronic inflammation:** Kapag matagal ang fluid accumulation, nagkakaroon ng inflammatory changes at tissue damage.
4. **Fibrosis:** Tumitigas at kumakapal ang tissues at skin dahil sa chronic changes.

- **Medical Management**

- **Goal:** Reduce swelling, improve lymph drainage, and prevent complications.
1. **Active and passive exercises** — for lymph flow.
 2. **External compression devices** — controlled pressure para maitulak ang lymph fluid palabas ng affected area.
 3. **Custom-fitted compression stockings or sleeves**
 4. Leg elevation
 5. Diuretics (furosemide) — hindi routinely recommended para sa uncomplicated lymphedema; ginagamit lamang kung may ibang indication, gaya ng coexisting fluid overload.
 6. Lymph node transfer

j. Cellulitis



- **Bacterial infection of skin and subcutaneous tissues** na kadalasang nagsisimula kapag nakakapasok ang bacteria, tulad ng **Streptococcus** o **Staphylococcus**, sa broken skin.
 - High risk sa may **chronic edema** o **lymphedema** dahil mas vulnerable ang skin sa infection.
 - **Pathophysiology**
Break in skin barrier → **bacteria enter subcutaneous tissues** → **bacterial growth and toxin release** → **inflammatory response** → **redness, warmth, pain, and swelling** → **possible systemic infection**
1. **Entry point:** Nakakapasok ang bacteria sa pamamagitan ng cuts, wounds, cracks, o insect bites.
 2. **Bacterial invasion:** Dumadami ang bacteria sa skin at subcutaneous tissues.
 3. **Inflammatory response:** Nagkakaroon ng redness, warmth, pain, at swelling sa affected area.
 4. **Systemic response:** Kapag lumala, maaaring magkaroon ng fever, chills, at spreading infection.
- **Clinical Manifestations**
 - Swelling
 - Redness
 - Warmth
 - Pain
 - **Orange-peel appearance**
 - Fever and chills
 - Sweating
 - Tender lymph nodes

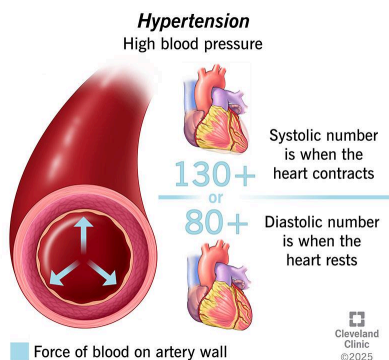
- **Medical Management**

- **Goal:** Treat the infection, control inflammation, and prevent complications.
- 1. **Antibiotics** — **oral** antibiotics for uncomplicated cases; **IV antibiotics** kapag severe o may systemic involvement.
- 2. **Identify the entry site** — wound, skin crack, other possible source ng infection.
- 3. **Compression therapy**
- 4. **Monitor for worsening infection**

- **Nursing Management**

1. Elevate the affected area.
2. Apply cool packs — iwasang direktang ilagay ang yelo sa skin.
3. Provide skin and foot care
4. Administer antibiotics as prescribed
5. Monitor temperature and skin changes
6. Educate the patient

k. Hypertension (HTN)



- **Blood pressure (BP)** – pressure na ine-exert ng circulating blood sa walls ng blood vessels, depende sa pumping action ng heart at volume ng blood.
- **Hypertension (HTN)** – persistently elevated BP; $\geq 140/90$ mmHg.
- **Risk Factors**
 - **Modifiable:** smoking, lack of exercise, obesity, stress, high-sodium/high-fat diet, alcohol intake, at oral contraceptives.
 - **Non-modifiable:** increasing age, male sex, postmenopausal status, at family history of HTN.
- **Classifications**
 - **Primary (essential) HTN:** walang identifiable underlying cause; usually related sa combination ng genetics, lifestyle, at vascular changes.
 - **Secondary HTN:** may identifiable cause, gaya ng kidney disorders o hormonal problems.
 - **Masked HTN:** normal ang BP sa clinic pero elevated sa home monitoring.
 - **White coat HTN:** elevated ang BP sa clinic dahil sa anxiety, pero normal sa home monitoring.
 - **Malignant HTN:** rapidly progressive, severe hypertension na maaaring makasira sa small blood vessels at major organs; **medical emergency** ito.
- **Assessment & Diagnostic Tests**
 - **Accurate BP measurement** – kumuha ng repeated readings gamit ang tamang cuff size at proper positioning para maiwasan ang inaccurate results.
 - **Health history** – alamin ang family history, lifestyle, medications, at existing conditions.
 - **Physical examination** – assess for signs ng cardiovascular at target-organ complications.

- **Laboratory tests** – evaluate kidney function, electrolytes, blood glucose, at lipid profile depende sa clinical indication.

- **Pathophysiology of Hypertension**

↑ **SNS activity** → ↑ **HR** + ↑ **cardiac contractility** + **vasoconstriction** → ↑ **Cardiac Output (CO)** + ↑ **Systemic Vascular Resistance (SVR)** → ↑ **BP**

RAAS activation → **Renin release** → **Angiotensin I** → **Angiotensin II** → **vasoconstriction** + **aldosterone/ADH release** → **Na⁺ and water retention** → ↑ **blood volume** → ↑ **BP**

Persistent ↑ BP → **damage to blood vessel walls** + **increased workload of the heart** → **target-organ damage**

1. **Sympathetic Nervous System (SNS) activation:** Ang SNS ang body's fight-or-flight system; kapag overactive ito, bumibilis ang heart rate at mas malakas ang contraction ng heart. Sumisikip ang arterioles (vasoconstriction), kaya mas mahirap dumaloy ang blood. Tumataas ang CO dahil mas maraming blood ang napo-pump, at tumataas ang SVR dahil mas makitid ang blood vessels → ↑ BP.
2. **Renin-Angiotensin-Aldosterone System (RAAS) activation:** Kapag naramdaman ng kidneys na mababa ang blood flow, naglalabas sila ng renin, na nagsisimula sa RAAS cascade. Nabubuo ang Angiotensin II, na nagpapasikip sa blood vessels (vasoconstriction) → tumataas ang SVR at BP. Pinapastimulate din nito ang release ng aldosterone mula sa adrenal cortex at ADH mula sa pituitary gland. Ang aldosterone at ADH ay tumutulong sa pagpapanatili ng sodium at water → ↑ blood volume → ↑ venous return → ↑ CO → ↑ BP.
3. **Persistent hypertension:** Kapag matagal na mataas ang BP, patuloy na nai-stress at nasisira ang blood vessel walls. Napipilitan ding magtrabaho nang mas mahirap ang heart para maitulak ang blood laban sa mataas na resistance. Over time, puwedeng magkaroon ng heart enlargement/failure, stroke, kidney damage, at retinal damage.

Note: Dalawang pangunahing dahilan ng pagtaas ng BP ang **increased CO (mas maraming blood na napo-pump)** at **increased SVR (mas mataas ang resistance sa blood vessels)**.

- **Medical Management**

1. **Lifestyle modifications**

- **DASH diet**
- **Regular exercise** –
- **Avoid smoking and excessive alcohol** – nicotine causes vasoconstriction dahil nasisira nito ang ciliary function, excessive alcohol intake increase BP.
- **Stress management** – reduce excessive SNS activation.

2. **Antihypertensive medications**

- **First-line antihypertensives**

- ACE inhibitors (Enalapril, Captopril, Lisinopril)
- Angiotensin receptor blockers (Losartan, Valsartan)
- Calcium channel blockers (Amlodipine, Nifedipine)
- Thiazide diuretics (Hydrochlorothiazide)

- **Second-line antihypertensives**

- Diuretics (Furosemide, Spironolactone)
- Beta-blockers (Metoprolol, Atenolol, Propranolol, Carvedilol)
- Alpha-1 blockers (Prazosin, Doxazosin)
- Direct vasodilators (Hydralazine, Minoxidil)
- Central-acting agents (Clonidine, Methyldopa)

- **Nursing Management**

1. **Monitor BP and HR regularly** – observe trends at response sa medications.
2. **Administer medications as prescribed** – bantayan ang adverse effects tulad ng dizziness, hypotension, o electrolyte changes, depende sa gamot.
3. **Encourage lifestyle modifications** – low-sodium diet, exercise, weight management, at smoking cessation.
4. **Teach home BP monitoring** – proper positioning, tamang cuff size, at pag-record ng readings.
5. **Promote medication adherence** – huwag basta mag-stop ng antihypertensives kahit normal na ang BP.
6. **Monitor for complications** – assess for chest pain, neurologic changes, shortness of breath, at changes sa urine output.

- **Hypertensive Crisis**

1. **Hypertensive emergency**

- Severe BP elevation, commonly around **≥180 systolic and/or ≥120 diastolic**, na may acute target-organ damage, gaya ng stroke, acute heart failure, o kidney injury.
- **Management (titrated drip)**
 - **Goal:** reduce the SBP by no more than 25% within the first hour of treatment, and then, if the patient is stable, to 160/100 mm Hg within the next 2 to 6 hours with an eventual goal of a normal, controlled blood pressure within 24 to 48 hours
 - **Labetalol IV – beta-blocker, often first-line**
 - 1. **Nicardipine IV** – calcium channel blocker
 - 2. **Sodium nitroprusside IV** – potent vasodilator (require monitoring because it can also reduce overall cerebral blood flow)

Note: Hindi dapat biglang ibaba ang BP nang sobra dahil maaari nitong **bawasan ang blood flow papunta sa brain, heart, at kidneys.**

2. **Hypertensive urgency / severe hypertension without acute organ damage:** Very high BP pero walang evidence ng acute target-organ damage.

- **Management:** restart antihypertensive medication therapy or increase dosage; hindi karaniwang kailangan ang rapid IV BP reduction.