



## **Nursing management of patients with Cardiovascular disorders.**

**Prepared by :**

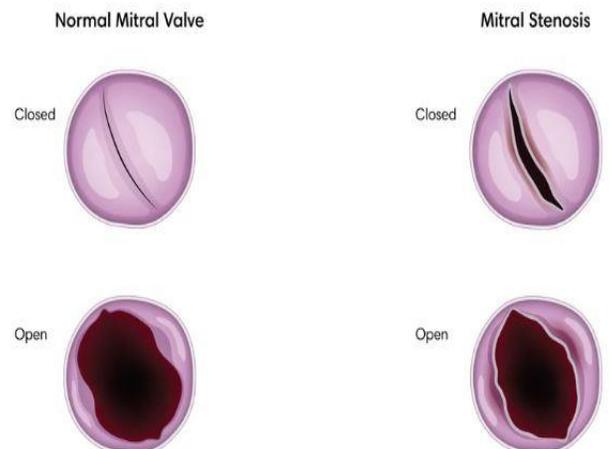
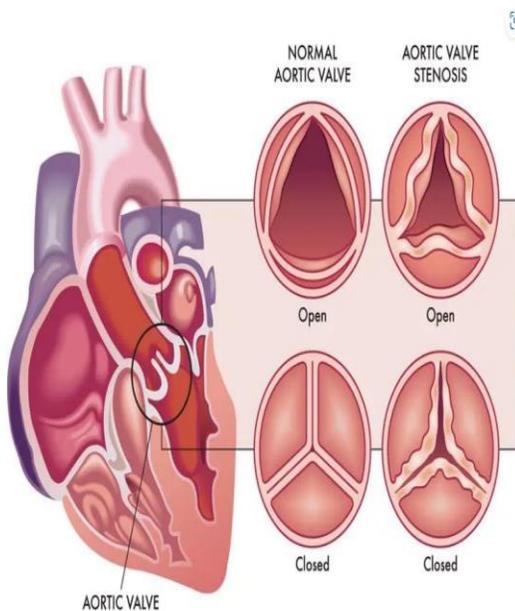
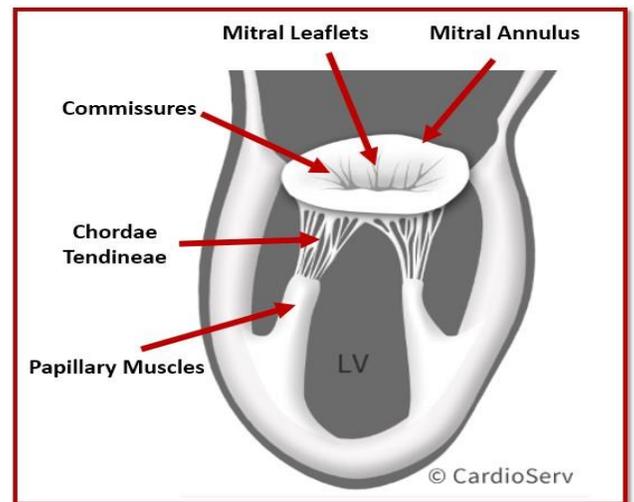
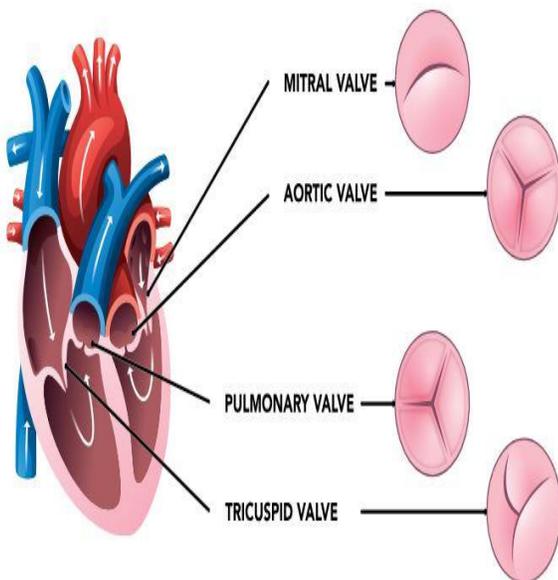
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## ❖ GLOSSARY

- ✓ **orthopnea:** shortness of breath when lying flat paroxysmal nocturnal dyspnea
- ✓ **(PND):** shortness of breath that occurs suddenly during sleep
- ✓ **Ejection fraction:** percentage of the end-diastolic blood volume ejected from the ventricle with each heartbeat.
- ✓ **Regurgitation:** a backward flow of blood through a heart valve (synonym: insufficiency)
- ✓ **Stenosis:** narrowing or obstruction of a cardiac valve's orifice
- ✓ **Chordae tendineae:** non-distensible fibrous strands connecting papillary muscles to atrioventricular (mitral, tricuspid) valve leaflets.



### ❖ Diagnostic Tests and Procedures

- **Electrocardiogram (ECG or EKG):** measures the electrical activity of the heart and helps diagnose abnormal heart rhythms or damage to the heart muscle.
- **Echocardiography:** This non-invasive test uses sound waves to create images of the heart and assess the structure, function, and blood flow.
- **Cardiac stress testing:** This test involves exercising on a treadmill or stationary bike while the heart is monitored to evaluate heart function during physical activity.
- **Cardiac catheterization:** This invasive test involves inserting a thin, flexible tube through a blood vessel in the groin or arm and guiding it to the heart to measure the pressure in the heart chambers and arteries, and to assess blood flow.
- **Coronary angiography:** This is a type of cardiac catheterization that involves injecting dye into the coronary arteries to assess for blockages or narrowing.
- **Holter monitor:** This is a portable device that records the heart's rhythm for hours, to detect abnormal heart rhythms.
- **Blood tests:** cholesterol levels, blood sugar levels, and kidney function, which are important factors in the development and management of cardiovascular disease.
- **Chest X-ray:** provides information about the size and shape of the heart, the presence of fluid in the lungs, or the presence of any other abnormality.
- **Transesophageal echocardiography (TEE):** This is a type of echocardiogram that involves inserting a small ultrasound probe into the esophagus to get a better view of the heart and its structures.

### ❖ Mitral stenosis

Results in reduced blood flow from the left atrium into the left ventricle.(in Diastole)

- It is most often caused by rheumatic endocarditis, which progressively thickens the mitral valve leaflets and chordae tendineae. The leaflets often fuse together. Eventually, the mitral valve orifice narrows and progressively obstructs blood flow into the ventricle.

- Rheumatic endocarditis occurs as a result of **rheumatic fever** and particularly affects the heart valves.

- **Pathophysiology**

Normally, the mitral valve opening is as wide as the diameter of three fingers.



In cases of marked stenosis, the opening narrows to the width of a pencil.



Difficulty moving blood from left atrium into the ventricle because of the increased resistance of the narrowed orifice.



Left atrium stretches and hypertrophies (thickens) because of the increased blood volume it holds.



Because there is no valve to protect pulmonary veins from backward flow of blood from the atrium, the pulmonary circulation becomes congested.



The right ventricle hypertrophies, eventually dilates, and fails

**Note:** Therefore, as the heart rate increases, cardiac output decreases and pulmonary pressures increase with Mitral stenosis.

- **Clinical Manifestations**

1. breathing difficulty (ie, dyspnea) on exertion as a result of pulmonary venous hypertension.
2. Dry cough or wheezing. Patients may expectorate blood (i.e., hemoptysis) or experience palpitations, orthopnea, paroxysmal nocturnal dyspnea (PND), and repeated respiratory infections.
3. the atrium dilates, hypertrophies, and becomes **electrically unstable (patients experience atrial dysrhythmias)**.

- **Assessment and Diagnostic Findings**

- The pulse is weak and irregular in the presence of **atrial fibrillation** (caused by strain on the atrium).

- A low-pitched, **rumbling diastolic murmur** is heard at the apex and the patient may have signs or symptoms of heart failure
  - **Echocardiography** is used to diagnose and quantify the severity of mitral stenosis.
  - Electrocardiography (ECG), exercise testing, and cardiac catheterization with angiography may be used to help determine the severity of mitral stenosis.
- **Medical Management**
    - Antibiotic prophylaxis therapy is instituted to prevent recurrence of infections.
    - anticoagulants to decrease the risk for developing atrial thrombus.
    - Surgical intervention consists of:
      - Valvuloplasty, usually a **commissurotomy** (i.e., splitting or separating leaflets) to open the fused commissure of the valve. **The commissure** is the site where valve leaflets meet.
      - Percutaneous transluminal valvuloplasty or valve replacement may be performed.

### ❖ Mitral Regurgitation

Mitral regurgitation is a condition in which blood flows from the left ventricle back into the left atrium during **systole**.

- The leaflets cannot close completely during systole because the leaflets and chordae tendineae have thickened and fibrosis, resulting in their contraction.
- Classification:
  1. Acute (less common): This type of regurgitation occurs suddenly .
  2. Chronic (common): This type of regurgitation develops gradually over time.

- **Causes**

1. Most common causes of mitral valve regurgitation in developed countries are degenerative changes of the mitral valve (including mitral valve prolapse) and ischemia of the left ventricle.
2. The most common cause in developing countries is rheumatic heart disease and its sequelae

3. Other conditions that lead to **chronic mitral regurgitation** include pathologic myxomatous changes, which enlarge and stretch the left atrium and ventricle, causing leaflets and chordae tendineae to stretch or rupture.
4. Infective endocarditis may cause **acute mitral regurgitation** through leaflet perforation, or scarring following an infection that may cause retraction of leaflets or chordae tendineae.
5. Conditions lead to functional, or secondary mitral regurgitation
  - a. Collagen vascular diseases (e.g., systemic lupus erythematosus)
  - b. Cardiomyopathy
  - c. ischemic heart disease

**NOTE:** may result in changes in the left ventricle, causing papillary muscles, chordae tendineae, or leaflets to stretch, shorten, or rupture.

- **Pathophysiology**

Each beat of the left ventricle pushes blood backward into the left atrium, adding to blood flowing in from the lungs.



This excess blood causes the left atrium to stretch and eventually thicken, or hypertrophy, then dilate.



Over time, blood coming in from the ventricle prevents blood flow from the lungs into the atrium. As a result, the lungs become congested.



During diastole, the increased blood volume from the atrium fills the ventricle and lead to hypertrophy and develops to systolic heart failure.

- **Clinical Manifestations**

- Chronic mitral regurgitation is often asymptomatic
- acute mitral regurgitation (e.g., resulting from a myocardial infarction) usually manifests as severe and sudden congestive heart failure.
- Dyspnea, fatigue, and weakness are the most common symptoms.
- Palpitations, shortness of breath on exertion, and cough from pulmonary congestion also occur.

- **Assessment and Diagnostic Findings**

- The systolic murmur of mitral regurgitation is a blowing sound best heard at the apex.
- The murmur may radiate to the left axilla.
- The pulse may be regular, or it may be irregular because of extra systolic beats or atrial fibrillation.
- Echocardiography is used to diagnose and monitor the progression of this disorder

- **Medical Management**

- Patients with mitral regurgitation who develop pulmonary congestion are managed with medications used for heart failure.
- treatment such as angiotensin-converting enzyme (ACE) inhibitors (e.g., captopril, lisinopril) and betablockers (e.g., carvedilol, metoprolol)...ect.
- mitral valvuloplasty (i.e., surgical repair of the valve) or valve replacement (replacement of the dysfunctional valve with either a mechanical valve or a type of tissue valve

### ❖ **Aortic Regurgitation**

Aortic regurgitation is backward flow of blood into the left ventricle from the aorta during diastole. Aortic regurgitation, also called **aortic insufficiency**

- **Cause**

- A congenital valve abnormality (e.g., a bicuspid aortic valve)
- Inflammatory lesions that deform aortic valve leaflets.
- Dilation of the aorta, preventing complete closure of the aortic valve.
- Chronic or acute aortic regurgitation may also be caused by infections such as rheumatic endocarditis or syphilis.
- A dissecting aortic aneurysm resulting in dilation or tearing of the ascending aorta.
- Blunt chest trauma.
- Deterioration of a surgically replaced aortic valve.

- **Pathophysiology**

Blood from the aorta returns to the left ventricle during diastole, in addition to blood normally delivered by the left atrium.



The left ventricle dilates in an attempt to accommodate the increased volume of blood.



The left ventricle hypertrophies to expel more blood with above-normal force, thus increasing systolic blood pressure.



Arteries attempt to compensate for higher pressures by reflex vasodilation.



Peripheral arterioles relax, reducing peripheral resistance and diastolic blood pressure.

- **Clinical Manifestations**

- Aortic insufficiency develops without symptoms in most patients.
- Some patients are aware of a pounding or forceful heartbeat, especially in the head or neck.
- Patients who develop left ventricular hypertrophy may have visible or palpable arterial pulsations at the carotid or temporal arteries due to increased force and blood volume.
- As aortic regurgitation worsens, DOE (Dyspnea On Exertion) and fatigue follow; there may eventually be signs and symptoms of progressive left ventricular failure including increased shortness of breath, orthopnea, or PND.

- **Assessment and Diagnostic Findings**

- A high-pitched, blowing diastolic murmur is heard at the third or fourth intercostal space at the left sternal border.
- The difference between systolic and diastolic pressures (the pulse pressure) may be widened in patients with aortic regurgitation.
- One characteristic sign is the water hammer (Corrigan's) pulse, in which the pulse strikes a palpating finger with a quick, sharp stroke and then collapses.
- echocardiography (preferably transesophageal), MRI and cardiac catheterization.

- Patients with symptoms usually have echocardiograms every 6 months, and those without symptoms have echocardiograms every 2 to 5 years.

- **Medical Management**

- A patient who is symptomatic or decrease in left ventricular function is advised to avoid physical exertion, competitive sports, and isometric exercise until the valve has been replaced.
- Patients who are symptomatic should be instructed to restrict sodium intake to prevent volume overload and will require valve replacement.
- The treatment of choice is aortic valve replacement or valvuloplasty (described later), preferably performed before left ventricular failure occurs.

- **Aortic Stenosis**

Aortic valve stenosis is narrowing of the orifice between the left ventricle and aorta.

- **Cause**

- In adults, stenosis is usually caused by degenerative calcification .Calcification may be caused by proliferative and inflammatory changes that occur in response to years of normal mechanical stress, similar to changes that occur in atherosclerotic cardiovascular disease.
- Congenital leaflet malformations or an abnormal number of leaflets (i.e., one or two rather than three) are less common causes.
- Rheumatic endocarditis may cause adhesions or fusion of the commissures and valve ring, stiffening of the cusps, and calcific nodules on the cusps.

- **Pathophysiology**

As the valve orifice narrows



the left ventricle overcomes obstruction by contracting more slowly and more forcibly.



Obstruction to left ventricular outflow increases pressure on the left ventricle, so the ventricular wall hypertrophies.



When these compensatory mechanisms are insufficient to allow for normal heart function, clinical signs and symptoms of heart failure will develop.

- **Clinical Manifestations**

- Many patients with aortic stenosis are asymptomatic.
- the first symptom to appear is **DOE**, caused by increased pulmonary venous pressure due to a dilating left ventricle.
- orthopnea, PND, and pulmonary edema
- Reduced blood flow to the brain may cause dizziness, and in more severe aortic stenosis, syncope.
- Angina pectoris.
- Blood pressure is usually normal but may be low. Pulse pressure may be low (30 mm Hg or less) because of diminished blood flow.

- **Assessment and Diagnostic Findings**

- On physical examination, a loud, **harsh systolic murmur** is heard over the aortic area (i.e., right second intercostal space) and may radiate to the carotid arteries and apex of the left ventricle. The murmur may be described as low pitched, crescendo–decrescendo, rough, rasping, and vibrating.
- Also be a palpable vibration extending from the base of the heart (second intercostal space next to the sternum and above the suprasternal notch) and up along the carotid arteries. The vibration is caused by turbulent blood flow across the narrowed valve orifice.
- Echocardiography, cardiac MRI, or computed tomography (CT) scanning.
- Patients with symptoms usually have echocardiograms every 6 to 12 months, and those without symptoms have echocardiograms every 2 to 5 years.
- **Stress tests** to assess exercise capacity are performed with **caution** for patients with severe aortic stenosis due to the high risk of inducing **ventricular tachycardia or fibrillation**, and should not be performed on symptomatic patients.

- **Medical Management**

- Definitive treatment for aortic stenosis is replacement of the aortic valve, which may be done surgically or nonsurgically.
- Nonsurgical valve replacement, known as transcatheter aortic valve replacement (TAVR).
- Patients who are symptomatic and are not candidates for valve replacement may benefit from one- or two balloon percutaneous valvuloplasty procedures, which can provide symptom relief.

- **Nursing Management: Valvular Heart Disorders**

- The patient is instructed to report new symptoms or changes in symptoms to the primary provider. The nurse also educates the patient that an infectious pathogen, usually a bacterium, can adhere to a diseased heart valve more readily than to a normal valve.
- The nurse measures the patient's heart rate, blood pressure, and respiratory rate, compares these results with previous data, and notes any changes.
- The nurse educates the patient about the importance of attempting to relieve the symptoms of angina with rest and relaxation before taking nitroglycerin and to anticipate potential adverse effects.
- For patients with heart failure, the nurse provides education on taking a daily weight and reporting sudden weight gain, as defined by the primary provider.
- Care of patients treated with valvuloplasty or surgical valve replacement.

- **Surgical Management: Valve Repair and Replacement Procedures**

1. Valvuloplasty: Repair of a cardiac valve, rather than replacement, The recommended procedure depends on the cause and type of valve dysfunction

- **Commissurotomy**

- Valve leaflets may adhere to one another and close the commissure (i.e., stenosis).
- **commissurotomy** is performed to separate the fused leaflets.

1. Closed Commissurotomy/Balloon Valvuloplasty

- Most often used for mitral and aortic valve stenosis.
- Balloon valvuloplasty is performed in a cardiac catheterization laboratory.

2. open commissurotomy

- less commonly used in recent decades.
- The patient is under general anesthesia, and a midsternal or left thoracic incision is made.

- **Annuloplasty** is a repair of the outer ring of the cardiac valve's annulus.

- **Leaflet Repair**

- Damage to cardiac valve leaflets may result from stretching, shortening, or tearing.

- Elongated tissue may be tucked and sutured, a technique called **plication**.
- A wedge of tissue may be cut from the
- middle of the leaflet and the gap sutured closed (i.e., **leaflet resection**)

## 2. Valve replacements:

- insertion of either a mechanical prosthetic valve or a bioprosthetic, homograft, or autograft tissue valve at the site of a malfunctioning heart valve to restore normal blood flow through the heart.
- **There are two types:**

1. **Mechanical valves** are made of durable materials (e.g., titanium, carbon, pyrolytic carbon) and are long-lasting, but require lifelong anticoagulation therapy to prevent blood clot formation.

## 2. Bioprosthetic valves

- Used for aortic, mitral, and tricuspid valve replacement
- They are not thrombogenic; therefore, patients do not need long-term anticoagulation therapy.
- Most bioprostheses are from pigs, but some are from cows or horses (equine).
- Viability is 7 to 15 years.

## 3. Homografts,

- also called allografts (i.e., human valves)
- obtained from cadaver tissue donations and are used for aortic and pulmonic valve replacement.
- They last for about 10 to 15 years.

## 4. Autografts

- Obtained by excising the patient's own pulmonic valve and a portion of the pulmonary artery for use as the aortic valve.
- Anticoagulation is unnecessary because the valve is the patient's own tissue and is not thrombogenic.
- If pulmonary vascular pressures are normal, some surgeons elect not to then replace the pulmonic valve. Patients can recover without a valve between the right ventricle and pulmonary artery.

## • Nurse Management

### 1. Assessment:

- Obtain a detailed medical history and perform a physical examination, including auscultation of the heart.
- Assess the patient's signs and symptoms, such as dyspnea, fatigue, chest pain, palpitations, cough, and edema.
- Assess the patient's medication regimen, including anticoagulants and diuretics.
- Assess the patient's activity level and functional capacity.
- Assess the patient's psychosocial and emotional status.

### 2. Nursing Diagnosis:

- Impaired Gas Exchange R/T decreased cardiac output and pulmonary congestion

#### Interventions:

- Monitor vital signs, oxygen saturation, and respiratory rate regularly
- Administer supplemental oxygen as ordered and monitor response
- Assist with positioning to promote optimal lung expansion
- Administer diuretics and other medications as ordered to reduce pulmonary congestion
- Encourage deep breathing and coughing exercises to help clear secretions
- Monitor for signs of respiratory distress and notify the physician as needed

- Activity Intolerance R/T decreased cardiac output and fatigue

#### Interventions:

- Assess the patient's level of activity tolerance and monitor for signs of fatigue
- Assist with activities of daily living as needed to conserve energy
- Implement a progressive activity plan to gradually increase endurance
- Monitor vital signs and symptoms during activity and adjust the plan as needed
- Encourage rest periods as needed throughout the day
- Administer medications as ordered to manage symptoms of fatigue

- Decreased cardiac output related to reduced stroke volume.

#### Interventions

- Monitor and record level of consciousness (LOC), heart rate and rhythm, oxygen saturation and blood pressure, to detect cerebral hypoxia possibly resulting from decreased cardiac output.
- Measure and record intake and output. Reduced urine output without reduced fluid intake may indicate reduced renal perfusion, possibly from decreased cardiac output.
- Weigh the patient daily before breakfast to detect fluid retention.
- Inspect for pedal or sacral edema to detect venous stasis and decreased cardiac output.