

CARDIAC FAILURE

Introduction

The burden of cardiovascular disease (CVD) in the world is enormous and growing, and the majority of those affected are in developing countries. In most African countries CVD is now the second most common cause of death after infectious disease and a major cause of chronic illness and disability (World Bank, 2006).

The incidence of Heart failure is growing as the older adult population and patient survival rates increase. According to the American Heart Association, 5 million people have HF with over 550,000 new cases each year. Heart failure is the most common reason for hospital admission in the older adult in some developed world. The patient may experience many functional limitations and symptoms, and there is a high mortality rate. Quality of life is often impaired. Readmission rates to hospitals soon after discharge for heart failure treatment are high and pose a challenge for health-care providers.

Objective

At the end of this presentation, participants will be able to:

1. Demonstrate adequate knowledge of the concept, causes, pathophysiology and management of cardiac failure.
2. Utilize the Nursing Process approach in rendering care to the patients with cardiac failure and the family.

Anatomy and Physiology of the cardiovascular system

Review the Anatomy and Physiology of the cardiovascular system using appropriate diagrams of the interior of the heart, blood vessels etc.

Definition of cardiac failure

Cardiac failure is a clinical syndrome that results from the progressive process of remodeling, in which mechanical and biochemical forces alter the size, shape and function of the ventricles ability to fill and pump enough oxygenated blood to meet the metabolic demands of the body. The underlying mechanism of cardiac failure involves impairment of the contractile properties of the heart which leads to the clinical syndrome associated with a failing heart (elevated ventricular/a trial pressures, sodium and water retention, decrease CO, circulatory and pulmonary congestion).

Causes

- Caused by disorders of heart much resulting in decreased contractile properties of the heart; coronary heart disease (CHD) leading to myocardium infarction (MI); hypertension; uvular heart disease; congested heart disease; cardiomyopathies.
- **Other causes includes:** pulmonary embolism, chronic lung disease; haemorrhage and anaemia, transfusion or infusions, increase body demands (fever, infection, pregnancy), drug ó induced, physical and emotional stress, excessive sodium intake.
- **Risk factors includes:** Diabetes, hyperlipidemia, CAD, family history, smoking, alcohol consumption, use of cardiotoxic drugs etc.

Pathophysiology

Cardiac failure commonly occurs when there is a disorder of cardiac muscles that results in decrease contractile properties of the heart common underlying conditions that lead to myocardial dysfunction, include hypertension, severe anaemia, inflammatory or degeneration disease, valvular diseases, myocardial infarction and any other condition affecting blood flow to the myocardium or that places strain and stress on the myocardium.

The initial reaction is a cardiac compensatory mechanism (increases in heart rate, vaso constriction, heart enlargement) that occurs to assist the struggling heart. These mechanisms are able to compensate for the heart's ability to pump effectively and maintain sufficient blood flow to organs and tissue at rest.

Physiologic stressors such as exercise, infection may increase the work load of the heart and can be the compensatory mechanism to fail and precipitate the various clinical syndrome associated with failing heart e.g elevated ventricular/atrial pressure, Na and H₂O retention, decreased CO, circulatory and pulmonary congestion.

Types /Classification

The following types of cardiac failure have been documented:

- Systolic versus diastolic failure
- Acute versus chronic heart failure
- Left-sided versus right sided heart failure.

Systolic versus Diastolic failure

There are two types of dysfunction that may exist with heart failure.

1. **Systolic failure** ó poor contractibility of the myocardium resulting in decreased Co and a resultant increase in the SVR (this bring about increase in the after load ó i.e force the left ventricle must overcome to eject the volume of blood).
2. **Diastolic failure** - stiff myocardium which impairs the ability of the left atrium and pulmonary vasculature, causing the pulmonary signs of heart failure.

Acute versus Chronic Heart failure

1. **Acute failure:** sudden onset of symptoms such as acute pulmonary odema and decrease Co . It requires intervention and medical attention.
2. **Chronic failure:** long-term process with associated compensatory mechanism.
This can progress to acute phase in the presence of sudden illness.

Note: Heart failure may also be classified according to physical activity. or symptomatology (ACC /AHA Guideline 2003).

Clinical Manifestation

Initially, there may be isolated left-sided heart failure, but eventually the right ventricle fails as a result of additional work load. Combined left-sided and right-sided heart failure is also common.

Left-sided heart failure (forward failure)

This alters the filling and pumping of left ventricle ó congestion occurs mainly in the lungs from blood backing up into pulmonary reins and capillaries.

- Shortness of breath, dyspnea on exertion, tachypnea, paroxysma nocturnal dyspnea, cyanosis, pulmonary oedema and haemoptysis.
- Cough may be dry, unproductive and usually occurs at night
- Fatigability: form low Co, nocturnal, insomnia, dyspnea, catabolic.

Effect of chronic failure

- Insomnia, restlessness
- Tachycardia ó ventricular gallop (S₃ and S₄)

Right – sided heart failure (Backward failure)

Alterations in the pumping function of right ventricle. Accompanied by signs and symptoms of elevated pressures and congestion in systemic veins and capillaries:

- Oedema of the ankles, unexplained weight gain.
- Liver congestion: may produce upper abdominal pain
- Distended jugular veins, increased CvP, pulmonary hypertension
- Abdominal fluid in body cavities, splenomegaly
- Anorexia and nausea; from hepatic and visceral engorgement
- Nocturia: diuresis occurs at night with supine position and improves Co.
- Weakness.

Complications

- Intractable heart failure i.e. does not yield to treatment
- Cardiac arrhythmias
- Myocardial failure and cardiac arrest

- Digoxin toxicity is from decreased renal function and potassium depletion.
- Pulmonary infarction, pneumonia and emboli

Diagnostic Evaluation

- **Nursing History:** This should include history of present illness, past medical history, medication history (use of prescription drugs, OTC and herbal preparations/alternation therapies), and family history, personal and social history.
- **Physical examination**
This should include assessment of the patient's general appearance, vital signs, examination of the head, neck, skin, chest and the extremities.
- **Chest x-ray:** may show cardiomegaly, pleural effusion and vascular congestion.
- **Echocardiography:** may show ventricular hypertrophy, dilation of chambers and abnormal wall motion makes definite diagnosis of type of heart failure (systolic or diastolic)
- **Electrocardiography (ECG)** (resting and exercise): may show ventricular hypertrophy and ischemia.
- **Cardiac catheterization:** can be done to rule out CAD. Right sided heart catheterization can be done to measure pulmonary pressure and left ventricular function.
- **Human B – type natriuretic peptide (BNP):** estimation aids in the diagnosis of heart failure. A level of BNP greater than 100/ml is diagnostic for heart failure. This test is often used in the emergency departments to quickly diagnosis cardiac failure.

Management

Aim of management

1. To promote rest
2. To reduce workload on the heart
3. To increase the force and efficiency of myocardial contraction
4. To eliminate excessive accumulation of body fluid.

Medical Management

❖ **Drug therapy:**

- (i) **Diuretics:** Eliminate excess body water and decrease ventricular pressures. This may be complemented with a low sodium diet and fluid restriction. Example: Frusemide, spironolactone etc.
- (ii) **Positive Inotropic Agents:** This can increase the heart's ability to pump more effectively by improving the contractile force of the muscle. Examples: Digoxin, Dopamine
- (iii) **Vasodilators:** Decreases the workload of the heart by dilating peripheral vessels. Examples of vasodilators used in CHF are Hydralazine (Apresoline), prazosin (Minipress) etc.
- (iv) **ACE inhibitors** e.g captopril, enalapril

- ### ❖ **Low-Sodium Diet and Weight Control:** Dietary therapy can complement drug treatment. A diet assessment should include patient's food likes and dislikes, cultural influences, economic status, and food preparation resources. For overweight patients, weight reduction may help eliminate the underlying cause of

heart failure. Diet counseling and support with emphasis on restriction of sodium and fluids should be given to the obese patient to encourage weight loss.

- ❖ **Heart Transplantation:** This may be required in advanced heart failure.

Nursing Management Using Nursing Process Approach

Assessment:

- Obtain history of symptoms, limits of activity.
- Assess peripheral arterial pulses, assess heart and blood pressure rhythm and rate.
- Identify sleeping pattern and need for rest

Nursing Diagnoses:

- Decreased cardiac output related to weakness of the cardiac muscle
- Ineffective breathing pattern related to pulmonary congestion
- Fluid volume excess related to sodium and water retention
- Activity intolerance related to oxygen supply and demand imbalance
- Anxiety related to outcome of illness
- Knowledge deficit related to disease process and treatment regimen.

Planning:

A Nursing care plan should be developed at this level using the identified Nursing diagnoses.

Note: Guide the participants to develop a Nursing Care Plan for a Patient with Chronic Heart Failure. Use the identified nursing diagnoses with focus on improving oxygenation and decreasing the body's need for oxygen through rest, positioning, medications, fluid balance, and oxygen consumption control.

Implementation

- Implement patient care based on priority needs/problems as follows:

Maintaining adequate cardiac output

- Place patient at physical and emotional rest to reduce work of heart e.g. place in semi recumbent position, provide bed pan/urinals at bedside
- Take frequent Bp readings to monitor progression of heart failure.
- Assess for reduced peripheral tissue perfusion
- Administer drug as directed

Improving oxygenation

- Raise head of bed 20-50cm to reduce venous return to heart and lungs and reduces pulmonary congestion.
- Observe for increased rate of respirations.
- Encourage patient to change position every 2 hours to prevent pneumonia and atelectasis
- Encourage deep breathing exercise 1-2hrs

- Administer O₂ as prescribed.

Restoring Fluid Balance

- Administer prescribed diuretic (Note: give diuretic early in the morning to prevent sleep disturbance)
- Monitor intake and output
- Weigh the patient daily to monitor oedema control and weight loss
- Watch for side effect of diuretic therapy. e.g DM, electrolyte imbalance etc
- Monitor patient diet for sodium intake.

Patient education

- Explain the disease process to the patient
- Teach the signs and symptoms of recurrence e.g. weight gain (> 1.4kg in few days), swelling of ankles, persistent cough, tiredness etc
- Review activity programme

Evaluation:

Expected patient's outcome may include:

- Patient BP and heart rate return to normal
- Respiratory pattern return to normal, R. rate 16-20, no signs of dyspnoea, ankles in the lungs.
- Weight decrease by 1kg daily, no pitting oedema of lower extremities and sacral area.



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Conclusion

When cardiac output fails, the sympathetic nervous system accelerates the heart rate to maintain adequate output when this compensatory mechanism fails to maintain adequate tissue perfusion, the properties of stroke volume must adjust to maintain cardiac output.

Clients with cardiovascular dysfunction show widely variable rates of progress. For this reason specific goals for these clients must be individualized. Together the nurse and client can establish realistic goals for measuring goal attainment.

The patient should be assisted to understand that cardiac failure can be controlled. Careful follow-up, maintenance of correct weight, sodium restriction, and prevention of noxious agents such as coffee and tobacco and avoidance of unregulated, excessive exercise are critical in care of the patient and management after discharge.



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Multiple Choice Questions on Cardiac Failure

Read the clinical background information given below and circle the correct answer for the questions presented.

Mr. Dauda is to be discharged from the hospital to home. He is 79 years old, lives with his wife, and has just recovered from mild pulmonary oedema secondary to congestive heart failure.

- (1) The nurse advised Mr. Dauda to rest frequently at home. Her advice was based on the knowledge that rest
 - (a) decreases blood pressure
 - (b) increases the heart reserve
 - (c) reduces the work of the heart
 - (d) does all of the above
- (2) Mr. Dauda takes 0.5mg of Digoxin once per day. The nurse would tell him about signs of digitalis toxicity, which would include
 - (a) anorexia
 - (b) bradycardia and tachycardia
 - (c) nausea and vomiting
 - (d) all of the above.
- (3) Mr. Dauda also takes Lasix, 40mg twice each day. He is aware of signs related to hypokalemia and takes a potassium supplement, which might include
 - (a) bananas
 - (b) raisins
 - (c) orange juice
 - (d) all of the above
- (4) An example of a potassium-sparing diuretic that might be prescribed for a person with congestive heart failure would be
 - (a) Aldactone
 - (b) Diuril
 - (c) Esidrix
 - (d) Lasix

- (5) A recommended position for a patient in acute pulmonary oedema would be (a) prone to encourage maximum rest, thus decreasing respiratory and cardiac rates (b) semi-fowler's to facilitate breathing and promote pooling of blood in the sacral area (c) Trendelenburg to drain the upper airways of congestion (d) Upright with the legs down to decrease venous return.
- (6) Incomplete closure of the tricuspid valve results in a backward flow of blood from the (a) aorta to the left ventricle (b) left atrium to the left ventricle (c) right atrium to the right ventricle (d) right ventricle to the right atrium
- (7) The treatment of congestion heart failure is directed at (a) Decreasing the oxygen needs of the heart (b) Increasing the cardiac output or decreasing peripheral resistance (c) Reducing the amount of circulating blood volume (d) All of the above
- (8) The first heart sound is generated by the (a) Closure of the aortic valve (b) Closure of the atrioventricular valves (c) opening of the atrioventricular valves (d) opening of the pulmonic valve
- (9) Heart rate is stimulated by all of the following EXCEPT (a) Excess thyroid hormone (b) increased levels of circulating catecholamines (c) the sympathetic nervous system (d) the vagus nerve.
- (10) The pacemaker for the entire myocardium is the (a) atrioventricular junction (b) bundle of His (c) Purkinje fibers (d) Sinoatrial node

Note: Answers to the multiple choice questions are as follows:



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