Heart Failure- Cardiovascular Nursing

Heart failure- general term used whenever the heart fails to work effectively as a **pump**. Heart failure can be **acute** or **chronic**.

Divided into left and right sided heart failure, as well as systolic or diastolic failure

Compensatory mechanisms:

Initially, the body will use compensatory mechanisms to **improve cardiac output**. These compensatory mechanisms are effective in increasing cardiac output but overtime they have a **damaging effect**. The compensatory mechanisms can be divided into the following:

- Sympathetic nervous system stimulation
- Renin-angiotensin system (RAS) activation
- Chemical responses
- Myocardial hypertrophy

Sympathetic nervous stimulation

To increase cardiac output, the adrenergic receptors are stimulated to increase heart rate and blood pressure

The benefit of this is limited because an increase in heart rate (especially if it is too rapid) can lead to a decrease in cardiac output

The increase in heart rate also causes an increase in myocardial oxygen demand. If that demand is not met, then heart failure may worsen

Stroke volume is also increased to increase cardiac output

However, after a certain point the force of contraction and cardiac output decrease

Arterial vasoconstriction helps to maintain blood pressure and improve tissue perfusion

However, afterload increases which can cause an increase in demand for myocardial oxygen. This could result in decrease stroke volume overtime

Renin-angiotensin system (RAS) activation

Decreased kidney perfusion can cause RAS activation

This leads to vasoconstriction and sodium and water retention

Preload and afterload increase

Chemical responses

Natriuretic peptides- these neurohormones promote vasodilation and diuresis

- B-type natriuretic peptide (BNP) is released by the ventricles when patient has fluid overload

Vasopressin (ADH) is secreted by the pituitary gland because of decreased cerebral perfusion. This leads to vasoconstriction and fluid retention which can result in worsening heart failure

Endothelin is secreted by endothelial cells when they are stretched. Endothelin causes vasoconstriction which can lead to worsening heart failure

Myocardial hypertrophy

The walls of the heart thicken causing more forceful contractions and increased cardiac output

However, it often results in decreased oxygen supply to the myocardium

As you can see, the compensatory mechanisms can be helpful in an acute situation, but lead to worsening of heart failure over time

Left Sided (Ventricular) Failure

Characterized by **decreased tissue perfusion** and **pulmonary congestion**

Systolic vs diastolic

Systolic

- Heart cannot contract forcefully enough during systole
- Decreased cardiac output
- Decreased ejection fraction (below 40%)

Diastolic

- Left ventricle does not relax adequately during diastole
- Causes decreased left ventricular filling=decreased cardiac output

Causes:

- Hypertension
- Coronary artery disease
- Valvular disease

Signs & Symptoms

Signs and symptoms can be divided into s/s caused by decreased output and s/s caused by pulmonary congestion

Decreased Cardiac Output	Pulmonary Congestion
Fatigue Weakness Oliguria Angina Confusion Dizziness Tachycardia Pallor Weak peripheral pulses Cool extremities	Hacking cough Dyspnea Crackles or wheezes Frothy, pink sputum Tachypnea

Right Sided Heart Failure

Right ventricle does not empty completely. Increased volume and increased pressure in the venous system results and peripheral edema follows

Causes:

- Left ventricular failure
- Right ventricular myocardial infraction (heart attack)
- Pulmonary hypertension
- COPD

Signs and symptoms:

- Lower leg edema; dependent edema
- Nausea and anorexia due to liver engorgement
- Diuresis at rest
- Distended neck veins
- Distended abdomen
- Weight gain

Labs & Diagnostics:

- **Increased BNP**: normal is 0-100- will signify fluid overload
- **Electrolyte imbalances** may vary
- Urinalysis- proteinuria, high specific gravity, microalbuminuria
- **Low hemoglobin and hematocrit** if the patient has fluid volume excess
- Chest x-ray will show **enlargement of the heart**
- Echocardiography is the best diagnostic tool in diagnosing heart failure

Medications:

Medication therapy is targeted to reduce preload, reduce afterload, or enhance contractility.

- **A**CE inhibitor/ARBs- suppress the RAS system; decrease fluid overload, decrease arterial resistance
- **B**eta blockers- decrease stimulation of the sympathetic nervous system
- **C**ardiac glycoside- digoxin is most common; increases the contractility of the heart
- **D**iuretics- furosemide, torsemide
- Morphine sulfate- most helpful for **acute** heart failure; reduces preload and afterload, vasodilates
- Human B-Type Natriuretic Peptides- synthetic BNP (nesiritide)

Nursing Interventions for Heart Failure:

- Elevate the HOB to decrease incidence of dyspnea; legs should be in a dependent position to decrease the preload
- Oxygen therapy if needed
- Record intake and output
- Daily weights- weigh patient at the same time every day with lightweight clothing. If patient is bedbound and the bed scale must be used, be sure to remove extra linen, pillows, and items from the bed before weighing the patient.
- Nutrition- aim to decrease sodium and water retention. Sodium restriction of 3g of sodium per day. Fluid restriction may be needed in severe cases
- Teaching
    - **M**edications- teach patients which medications they will be taking and any side effects to report. Teach patients to avoid NSAIDs as they can cause sodium and fluid retention
    - **A**ctivity- teach the patient they may have activity restrictions due to fatigue, weakness, and dyspnea. Teach patient to conserve their energy and rest when needed
    - **W**eigh daily- report to physician a weight gain of more than 2-3 pounds in one week
    - **D**iet- do not consume more than 3g of sodium per day, do not consume excess fluids
    - **S**ymptoms- call doctor if there is a decrease in exercise tolerance that lasts for 2-3 days, excessive awakening at night, dyspnea at rest, increase swelling in hands, feet, and ankles, a 2-3 pound weight gain in one week