Heart Failure Overview

*Scene 1: Normal Function of the Heart*

In the normal heart, deoxygenated blood flows from the body through the superior and inferior vena cavae into the right atrium.

The blood, a volume known as preload, then moves into the right ventricle, which contracts and sends blood out of the heart and into the lungs to remove carbon dioxide and collect oxygen.

Oxygenated blood moves from the lungs into the left atrium, then moves into the left ventricle, which contracts and propels oxygenated blood out of the heart and into the systemic circulation against resistance known as afterload.

*Scene 2: Function of the Heart in Congestive Heart Failure*

When the heart loses its ability to pump enough blood to meet its needs or those of the body, the diagnosis is heart failure.

In left-sided heart failure, the left ventricle does not pump an adequate volume of oxygenated blood into the systemic circulation. Left-sided heart failure causes pulmonary congestion, a buildup of blood and fluid in the lung tissues that interferes with respiration.

In response to the low levels of oxygen, the heart rate increases to compensate for the left ventricle’s weakened state and to meet the body’s oxygen demands, which in time, leads to thickening or hypertrophy, the myocardium as it labors to push blood out of the heart against the increasing pressure in the pulmonary vessels and fluid in the lungs, and continuing the cycle of cardiac muscle damage.

In right-sided heart failure, the right ventricle is unable to contract with enough force to drive enough blood through the pulmonary arteries to the lungs for oxygenation.

Right-sided heart failure results in a buildup of blood in the venous circulation, causing fluid retention, called edema, throughout the body.

Deprived of sufficient blood flow, the kidneys fail to filter excessive sodium and water from the blood, leading to a fluid imbalance and increased resistance against which the heart must pump. The result is perpetual damage to the heart’s overworked tissues.

*Scene 3: Common Treatment Options for Heart Failure*

Treatment for heart failure involves changes in lifestyle, such as diet and exercise, medication, surgery, or a combination of approaches.

Commonly, therapies for right-sided heart failure are geared toward improving left-sided cardiac function. In heart failure, an increase in fluid volume places added stress on the overloaded heart.
Diuretic medications reduce fluid volume and venous return by inhibiting sodium and water reabsorption along the kidney’s renal tubular system, increasing the amounts of sodium and water excreted in the urine and the volume of urine produced.

ACE inhibitors block hormones in the renin-angiotensin-aldosterone system, dilating vessels, lowering blood volume and venous return, decreasing the heart’s workload, and halting ventricular hypertrophy.

Digoxin is a medication that increases the force of myocardial contractility by raising intracellular sodium and calcium concentrations. To compensate for the decreased cardiac output in heart failure, the sympathetic nervous system initiates norepinephrine release, raising the overworked heart’s rate and force of contraction.

Beta-blockers are prescribed to compete with norepinephrine molecules for binding sites on cardiomyocytes, preventing norepinephrine’s effects, resulting in reduced speed and strength of the contractions, which can support more efficient circulation through the body.