vessels (decreased peripheral vascular resistance). Diuretics are also used in the treatment of heart failure. The three major classifications of diuretics are thiazides, potassium-sparing diuretics, and loop diuretics. They are classified based on their site of action in the kidney.

- Thiazide diuretics such as hydrochlorothiazide (HydroDIURIL, Aquazide H, Esidrix, Microzide) and chlorothiazide (Diuril, Diuril Sodium) are the most common classification of diuretic prescribed. Thiazide diuretics work by diminishing the amounts of sodium and chloride reabsorbed by the distal tubule of the kidneys. This effect increases fluid loss and thus decreases blood volume.
- Potassium-sparing diuretics such as amiloride (Midamor), spironolactone (Aldactone), and triamterene (Dyrenium) produce diuresis by interrupting the sodium-potassium exchange in the distal tubule as do the thiazide diuretics, but they spare potassium from being lost, as occurs with thiazide medications.
- Loop diuretics are the most potent of the three classifications. These medications act on the loop of Henle to inhibit the reabsorption of sodium and chloride. This effect, in turn, causes less water to be reabsorbed into the blood and is thus excreted into the urine, to reduce blood volume. Examples of loop diuretics include bumetanide (Bumex), ethacrynic acid (Edecrin, Sodium Edecrin), furosemide (Lasix), and torsemide (Demadex).

When thiazide and loop diuretics work effectively, the patient may lose valuable potassium, so potassium is usually prescribed as a supplement to prevent imbalances that could lead to severe arrhythmias, seizures, and death. Although diuretics relieve heart failure symptoms and decrease blood pressure, they can also significantly disrupt the lives of patients by necessitating frequent trips to the bathroom. A patient may need assistance in planning activities around dosing.

Calcium channel blockers block calcium from passing into the heart muscle and the blood vessel walls. Calcium allows muscles and blood vessels to contract and narrow, thus increasing blood pressure. These medications decrease the level of contraction in the muscles in the arteries and trigger a series of responses: dilation of the arteries, decreased peripheral vascular resistance, reduced workload for the heart, and, ultimately, reduced blood pressure. Calcium channel blockers are used to treat angina and certain tachyarrhythmias, as well as hypertension. Drugs in this class that are indicated for the treatment of hypertension include amlodipine (Norvasc), diltiazem (Cardizem, Dilacor, Tiazac, Diltia XL), nifedipine (Procardia XL, Adalat), and verapamil hydrochloride (Isoptin, Calan, Verelan, Covera-HS). Additional calcium channel blocker medications are included in the Master the Essentials table.

Methods to decrease or regulate blood pressure without medications include losing weight, ceasing tobacco use, decreasing salt (sodium) intake, limiting alcohol, reducing stress, and exercising.

CRITICAL THINKING

What do you think is the role of stress in hypertension?

Medications for Heart Failure

Chronic high blood pressure can place great stress on the heart muscle. The muscle can weaken and fail to push a normal amount of blood around the body, thus leading to a condition called **congestive heart failure (CHF).** When this happens, the kidneys do not receive enough blood, and fluid that would normally be flushed out of the body builds back up in the blood. This additional fluid puts even greater strain on the heart and leads to worsening heart failure.

Although CHF has no cure, some drugs can decrease the symptoms caused by the weakened heart muscle. Drugs used to treat heart failure include vasodilators, which decrease the amount of pressure the heart has to exert to pump blood through the vascular system, and cardiac glycosides, which help the heart to beat more strongly and more efficiently. ACE inhibitors, angiotensin receptor blockers, beta blockers, and diuretics, discussed earlier in the chapter, are also used for the treatment of CHF. They work to slow the heart rate, relax the blood vessels, and decrease the amount of blood that the heart has to push through the vascular system.

Signs and symptoms of CHF are anxiety, restlessness, cyanotic and clammy skin, tachycardia, lower leg edema, tachypnea, persistent cough, and a forward-leaning posture.