Keeping heart failure patients on the

MICHAEL TRINSEY

Five million Americans already have heart failure, and more than 500,000 are newly diagnosed each year. With your help, patients with heart failure can lessen their symptoms, prevent further damage, and improve their quality of life.

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IN THE UNITED STATES, heart failure is considered a national public health priority. The country's aging population, the increased prevalence of high blood pressure in older Americans, and improved survival rates following heart attack in middle-aged individuals have made heart failure a common health problem. Although heart failure is often manageable, the risk of sudden cardiac death for those who have it or who have survived a heart attack is six to nine times greater than that of the general U.S. population.

For these reasons, you need to be up-to-date on the therapies that can improve the quality of life for your heart failure patients. In this article, we'll review the pathophysiology and clinical consequences of heart failure. We'll also examine the treatment options currently available to heart failure patients, as well as a few that are in the pipeline. Finally, we'll explore ways in which you can help your patients improve their chances for a healthy and comfortable life.

Age matters

The American Heart Association estimates that 5 million people in the United States have heart failure, with 550,000 new cases diagnosed every year. The overall prevalence of heart failure in the United States is 2.2%, but that rate varies considerably by age: less than 1% of those younger than 45 years have heart failure, but roughly 10% of those older than 75 years develop it.

Heart failure is costly, too: In 1999, Medicare paid an average of $5,456 per heart failure discharge ($3.6 billion total), making it the most expensive of all diagnoses covered by the government health care plan. Direct and indirect hospital costs for heart failure were approximately $14.7 billion in 2005, with an

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estimated total cost of $27.9 billion.

Now that you understand the scope of the problem, let's delve into its clinical features.

The heart in decline

Heart failure is a complex clinical syndrome that begins with a decrease in ventricular function. The most common causes are coronary artery disease, high blood pressure, cardiomyopathy, and valve disease. Patients at higher risk include those who are obese, those with diabetes or hyperlipidemia, and those who smoke or abuse alcohol.

The left or right side of the heart can be affected. *Left-sided heart failure* occurs when the left ventricle can no longer pump effectively. Blood backs up into the left atrium and into the blood vessels of the lungs. The patient develops shortness of breath on exertion and at rest. You'll hear "crackles" when you auscultate your patient's lungs. The most common causes of left-sided heart failure are high blood pressure; obstructed blood flow; or narrowed, obstructed, or incompetent left-sided heart valves.

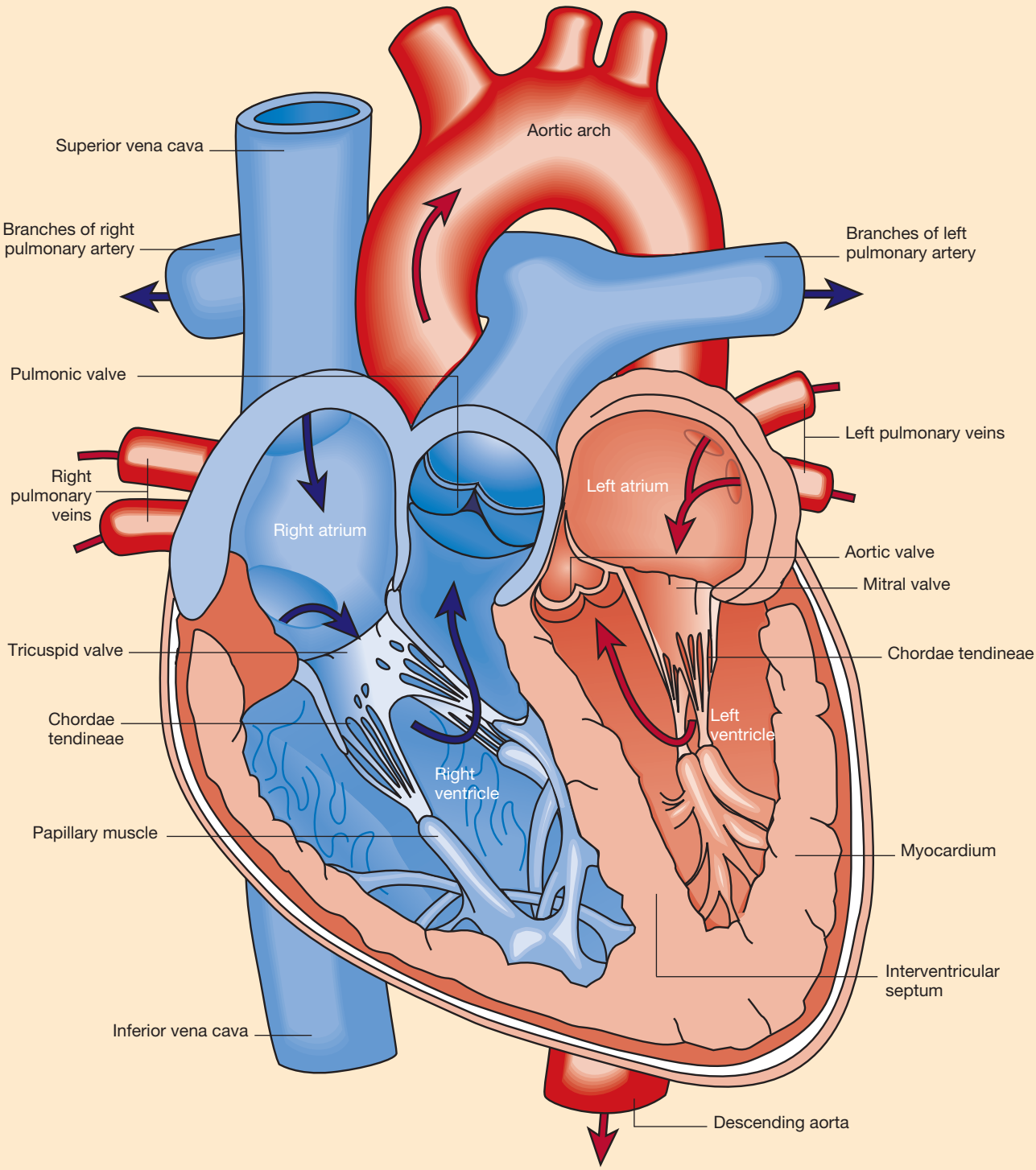
Right-sided heart failure occurs when the right ventricle can no longer pump effectively. Blood backs up into the right atrium and then into peripheral blood vessels. A patient with right-sided heart failure will have peripheral edema and an enlarged liver, and his neck veins will be distended. The most common causes of right-sided heart failure are chronic obstructive pulmonary disease (COPD) and left-sided heart failure.

The cardiac cycle gives us another way to differentiate heart failure. In *systolic heart failure*, the ventricles don't effectively eject their contents, so blood backs up. If the left side of the heart is affected, blood backs up into the vasculature of the lungs; if the right side is affected, blood backs

A review of chronic heart failure drugs

Drug Type	Examples	What It Does	What to Look For
Aldosterone antagonist	Eplerenone (Inspra), spironolactone (Aldactone)	Helps kidneys rid the body of excess fluid	Eplerenone interacts with many drugs, including nonsteroidal anti-inflammatory drugs (NSAIDs) and herbs such as St. John's wort. Advise your patient to alert his health care provider about other drugs or supplements he's taking. The patient may require blood tests for potassium levels and kidney function.
Angiotensin-converting enzyme inhibitor	Captopril (Capoten), enalapril (Vasotec), lisinopril (Prinivil, Zestril), quinapril (Accupril)	Dilates blood vessels, helps kidneys work more effectively, blocks a chemical that harms the heart, helps lower blood pressure	The patient may require blood tests to check his potassium level and kidney function. If he develops a dry cough, his health care provider may change the drug he's taking. The patient should immediately discontinue and contact his health care provider at signs of an allergic reaction (itchy eyes, swelling of the face, lips, or tongue). Advise him to call 9-1-1 immediately if he has trouble breathing.
Angiotensin receptor blocker	Losartan (Cozaar), valsartan (Diovan), candesartan cilexetil (Atacand)	Dilates blood vessels, helps kidneys work more effectively, blocks a chemical that harms the heart, helps lower blood pressure	The patient may require blood tests to check his potassium level and kidney function. He should immediately discontinue and contact his health care provider at signs of an allergic reaction (itchy eyes, swelling of the face, lips, or tongue). Advise him to call 9-1-1 immediately if he has trouble breathing.
Beta-blocker	Metoprolol succinate (Toprol), metoprolol, tartrate (Lopressor), carvedilol (Coreg)	Prevents the heart from working too hard, helps control heart failure symptoms	Beta-blockers may make the patient feel tired and may raise his cholesterol level. Male patients may have erectile difficulties. Advise your patient to call his health care provider if he experiences lightheadedness or dizziness.
Digitalis glycoside	Digoxin (Lanoxin)	Helps the heart pump more effectively	Tell your patient to contact his health care provider if he experiences abnormal heart rhythms, nausea, or vomiting, or if he sees yellow halos around objects. The health care provider may lower the patient's dose.
Diuretic	Chlorothiazide (Diuril), furosemide (Lasix), bumetanide (Bumex)	Helps rid the body of excess water	The patient may need to take potassium pills in addition to a diuretic.

The inner workings of the heart



up into the peripheral circulation. The most common causes of systolic heart failure include idiopathic dilated cardiomyopathy or coronary ischemia.

In *diastolic heart failure*, the ventricles can't relax, so they don't fill completely. Diastolic heart failure usually results from high blood pressure, enlarged muscles in the left ventricle (hypertrophic cardiomyopathy), or impaired filling ability (restrictive cardiomyopathy). Systolic heart failure is more common: 60% of heart failure patients develop it. The other 40% develop diastolic dysfunction.

Here's one more way to categorize types of heart failure: by the timing of their development. *Acute heart failure* occurs rapidly, so the body doesn't have time to activate compensatory mechanisms to improve cardiac performance (such as with heart attacks). *Chronic heart failure* develops more slowly.

How the heart fails

Why do the ventricles fail in heart failure? The culprit is endothelial dysfunction, which leads to ventricular remodeling. The endothelium is the layer of thin, flat cells that lines the interior surface of blood vessels and internal body cavities, including the entire circulatory system, from the heart to the smallest capillary.

Normally, blood pressure is regulated through the autonomic nervous

Classifying heart failure signs and symptoms

The New York Heart Association classifies heart failure by the severity of a patient's symptoms and physical limitations; the American College of Cardiology/American Heart Association categorizes heart failure stages by risk factors and treatments. Here's what you need to know.

New York Heart Association Classification	American College of Cardiology/ AmericanHeart Association (ACC/AHA)	Guideline Recommendations
	Stage A. Patient at high risk for developing heart failure but without structural heart disease or signs and symptoms of heart failure	• Treat high blood pressure, lipid disorders, and diabetes • Encourage patient to stop smoking and to exercise regularly • Discourage use of alcohol and illicit drugs • Patient may be required to take an ACE-inhibitor
Class I. Ordinary physical activity doesn't cause undue fatigue, palpitations, shortness of breath, or angina.	*Stage B*. Structural heart disease, but without signs or symptoms of heart failure	• Follow all Stage A therapies • Patient may be required to take an ACE-inhibitor unless contraindicated • Patient may be required to take a beta-blocker unless contraindicated
Class II. Slight limitation of physical activity, but asymptomatic at rest. Ordinary physical activity causes fatigue, palpitations, shortness of breath, or angina.	*Stage C.* Structural heart disease with prior or current signs and symptoms of heart failure	• Follow all Stage A and B therapies • Patient should be placed on sodium-restricted diet • Patient may be prescribed a diuretic and digoxin • Patient should be advised to avoid, or should be taken off of, antiarrhythmic agents, most calcium channel blockers, and NSAIDs • Health care provider may consider aldosterone antagonists, angiotensin receptor blockers, hydralazine, and nitrates
Class IV. Unable to perform any physical activity without discomfort; symptoms may be present at rest. Discomfort increases with physical activity.	*Stage D*. End-stage disease requiring specialized treatment strategies, such as mechanical circulatory support, continuous inotropic infusion, or heart transplant	• Follow all therapies for Stages A, B, and C • Patient may receive a mechanical assist device, such as a biventricular pacemaker or left ventricular assist device • Patient may receive continuous inotropic therapy • Patient may do best under hospice care

system and the renin-angiotensin-aldosterone system. When blood pressure and fluid volume drop, the sensory centers in the aortic and carotid arches that respond to changes in blood pressure (baroreceptors) signal the brain. The brain in turn signals the adrenal glands to produce more norepinephrine and epinephrine. Norepinephrine and epinephrine cause blood vessels to constrict and the heart rate to increase.

At the same time, the kidneys, which aren't getting as much blood volume as before, begin producing renin. Renin is converted to angiotensin I and then to angiotensin II in the presence of angiotensin-converting enzyme (ACE). Angiotensin II is the most powerful vasoconstrictor in the body. It activates angiotensin receptors on the endothelial cells, causing the blood vessels to constrict.

The adrenal glands also produce aldosterone in the presence of elevated angiotensin II and norepinephrine levels. Aldosterone signals the kidneys to filter out less sodium and water, thus increasing fluid volume in the blood vessels.

All of these compensatory mechanisms combine to help the body maintain cardiac function. In the short term, they're beneficial, and they "turn off" when the extra volume and pressure are no longer needed. In certain people, however, they don't turn off, and as their effects continue over time, the blood vessels stiffen and become less able to dilate. This leads to high blood pressure.

Because the heart is also lined with endothelial cells, the process taking place inside the blood vessels is also occurring inside the heart. With time, the heart becomes less elastic, and it stiffens and changes shape. The ventricles are then unable to pump blood as effectively as they once did, and the patient develops heart failure.

The heart of the matter

When assessing a patient with suspected heart failure, obtain a complete medical history to determine whether he has associated diseases, including a personal or family history of coronary artery disease, cardiomyopathy, high blood pressure (the number one cause of heart failure), rheumatic fever, peripheral vascular disease, hypothyroidism or hyperthyroidism, or valve disorders.

Also assess the patient for symptoms of heart failure. Most of these patients seek medical attention when their symptoms (such as fatigue or breathing problems) worsen or when they can no longer tolerate regular exercise. Others will report having few or no symptoms, but this may be the result of their having become less active to avoid experiencing discomfort.

The severity of symptoms generally indicates whether the patient has acute or chronic heart failure and whether he can compensate for decreased cardiac output.

Let's take a closer look at what your assessment may uncover.

- ***General appearance.*** The patient may feel generally weak or fatigued and may have peripheral edema. His skin may appear pale or bluish and his hands and feet may be cool to the touch. He may have abdominal swelling, and he might complain of decreased urinary output and feeling confused or sleepy at times. He may have recently begun gaining weight.
- ***Heart rate and blood pressure.*** The patient may tell you that he feels palpitations or a "fast" heart beat. Experiencing tachycardia is not uncommon; it could be the body's attempt to compensate for reduced cardiac output or pump failure. When you auscultate the heart, you may hear a third heart sound or a murmur. The patient may also have low blood pressure with dizziness and fatigue.
- ***Venous system.*** Neck vein distention is a clinical indicator of whether the patient is volume overloaded. If he is experiencing right-sided heart failure, a hepatojugular reflux test, performed by exerting a firm constant pressure over the upper right quadrant of the abdomen, will displace blood from the liver into the jugular veins, causing the veins to become distended. If the patient has peripheral edema, attempt to distinguish it from generalized obesity by noting whether it has a "pitted" appearance.
- ***Lung function.*** As we mentioned earlier, the patient may be short of breath or unable to breathe deeply or comfortably on exertion. He may also complain of a persistent cough. Congestion of the pulmonary vasculature is responsible for the patient breathing rapidly, wheezing, or feeling breathless when at rest. You will hear crackles when listening to the lungs.

See *Diagnostic tests* for information on the tests the patient's health care provider may order.

Life-saving lifestyle changes

Once your patient's been diagnosed with heart failure, he's going to need a lot of education and advice on how to stay as healthy as possible and how to keep his heart failure in check. (see *Patient education: Heart failure*) He should follow a low-fat, low-cholesterol diet that limits his total fat intake to 25% to 35% of total calories, saturated fat to less than 7% of total calories, carbohydrates to 50% to 60% of total calories, and proteins to approximately 15% of total calories. Suggest that he avoid fats, such as shortening, butter, and margarine, and steer

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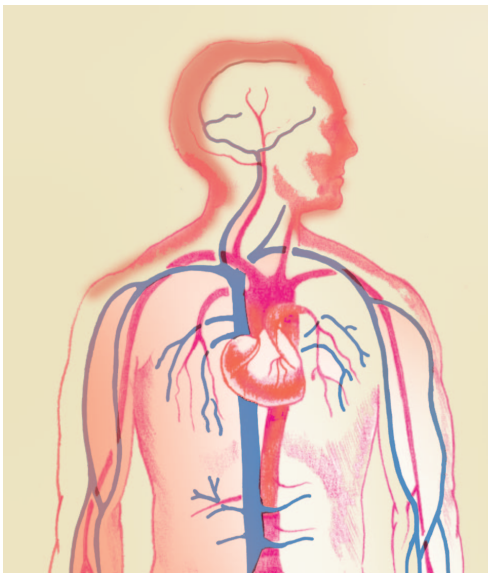
Heart failure



What is heart failure?

Heart failure means that your heart can't fill with blood or pump blood to the rest of your body as well as it should. The heart muscles have to work harder to do their job.

When your heart can't pump as it should, blood and fluids back up in your body, which may cause swelling in your belly, legs, hands, and feet and make you gain weight. You may feel tired, dizzy, or short of breath, especially at night or when you lie down. Too much fluid in your lungs may make you cough.

Heart failure can be caused by a narrowing of arteries that carry blood to the heart, high blood pressure, or damage to the heart muscle from a heart attack. Diseases of the heart muscle or heart valves can also cause heart failure. Chronic lung disease and pregnancy may play a part too.

How will my health care provider know I have heart failure?

Your health care provider will take your medical history, perform a physical exam, and order tests to see how well your heart works. These tests usually include blood tests and a painless echocardiogram to look at the heart's valves and pumping chambers. A stress test can help him determine what's causing your heart failure. You don't need to be hospitalized for these tests.

Your health care provider may order cardiac catheterization to look at the blood flow and pressures in your heart and to take a closer look at the valves and pumping action of your heart. Performed in the hospital, this test involves putting dye in your blood and taking X-ray pictures of your heart as the dye circulates in the heart.

How will my health care provider treat my heart failure?

Your health care provider will advise you to make lifestyle changes, such as getting more exercise and changing your eating habits. You may also need to take medicine. (See *How does this medicine help me?*)

Your health care provider may recommend a daily exercise plan that won't make you too tired or strain your heart. Even getting a little exercise will help you feel better.

Follow the diet your health care provider recommends. Avoid fats such as shortening, butter, and margarine. Olive and vegetable oils are okay in small amounts. Also avoid fried foods—eat baked or broiled foods instead. Stay away from foods with more than 400 milligrams of salt (sodium) per serving. Read labels so you don't eat more than 2 grams (less than a teaspoon) of salt per day.

Don't drink more than two alcoholic drinks a day if you're a man, or more than one if you're a woman.

If you have high blood pressure or diabetes, follow your health care provider's plan to keep your blood pressure and blood sugar under control.

How does this medicine help me?

Here are the most common medicines people take for heart failure. If you don't see your medicine on this chart, ask your health care provider for more information.

Drug type	Examples	What it does	Things you should look out for
Aldosterone antagonist	• Eplerenone (Inspra) • Spironolactone (Aldactone)	Helps the kidneys get rid of excess fluid in your body	Eplerenone interacts with many drugs, including nonsteroidal anti-inflammatory drugs and herbs such as St. John's wort. Tell your health care provider about any other drugs or supplements you're taking. Your health care provider may order blood tests to check potassium levels and kidney function.
Angiotensin-converting enzyme (ACE) inhibitor	• Captopril (Capoten) • Enalapril (Vasotec) • Lisinopril (Prinivil, Zestril) • Quinapril (Accupril)	Opens up your blood vessels; helps your kidneys work better; blocks a chemical that harms the heart; helps lower your blood pressure	Your health care provider may order blood tests to check potassium levels and kidney function. If you get a dry cough while taking your medicine, your health care provider may change the medicine. If you have signs of an allergic reaction (itchy eyes, swelling of the face, lips, or tongue), stop taking the medicine and call your health care provider. If you have trouble breathing, call 9-1-1.
Angiotensin receptor blocker	• Losartan (Cozaar) • Valsartan (Diovan)	Opens up your blood vessels; helps your kidneys work better; blocks a chemical that harms the heart; helps lower your blood pressure	Your health care provider may order blood tests to check potassium levels and kidney function. If you have signs of an allergic reaction (itchy eyes, swelling of the face, lips, or tongue), stop taking the medicine and call your health care provider. If you have trouble breathing, call 9-1-1.
Beta-blocker	• Atenolol (Tenormin) • Carvedilol (Coreg) • Metoprolol tartrate (Lopressor)	Keeps your heart from working so hard; helps control your heart failure symptoms	These medicines may make you tired and make your cholesterol level go up. If you're a man, you may have problems having or keeping an erection. If you feel dizzy or light-headed, call your health care provider.
Digitalis glycoside	• Digoxin (Lanoxin)	Helps your heart pump better	If you have heart rhythms that aren't normal, feel nauseated or vomit, or see yellow halos around objects, tell your health care provider. He may lower the dose.
Diuretic	• Bumetanide (Bumex) • Furosemide (Lasix)	Gets rid of extra water in your body	You may need to take potassium pills.

If you're overweight, lose weight. Being too heavy causes high blood pressure and makes your heart work harder. If you smoke, ask your health care provider about ways to help you quit.

Join a heart failure support group. Other people with heart failure can help you deal with these lifestyle changes. Make sure your family members or your caregiver reads this guide. Ask them to support you during treatment.

When should I call my health care provider?

Notify your health care provider immediately if:

- you feel more tired or short of breath than usual
- you feel bloated or dizzy
- your heart beats faster than normal or you have chest pain
- you gain 2 or more pounds (1 kg) within a day, which may indicate a fluid buildup. Weigh yourself each day at the same time and record the results.

This patient-education guide has been adapted for the 5th-grade level using the Flesch-Kincaid and SMOG formulas. It may be photocopied for clinical use or adapted to meet your facility's requirements. Selected references are available upon request.

clear of fried foods. Baked or broiled dishes are a better choice for him.

He should also avoid high-sodium foods and limit his sodium intake to less than 2,000 mg per day. He needs to read food labels, stay away from processed meats, and avoid condensed soup. He must learn to cook without using salt and to avoid using the salt shaker at the table. Salt substitutes can be a useful alternative for heart failure patients.

If your patient is overweight, encourage him to lose weight by limiting his caloric intake. He should aim for a body mass index (BMI) between 18.9 and 24.9.

Show your patient how to monitor and track his weight. Advise him to weigh himself every day at the same time—each morning after he voids and before he eats is best. A 2-pound gain in 1 day or a 5-pound gain in 1 week is a strong indicator that he's retaining fluid, often from excessive sodium intake. If this happens, he should contact his health care provider.

Stress the importance of regular exercise; even a little exercise will help him feel better. Get him involved in a cardiac rehabilitation program. The goal of a good exercise program for a heart failure patient is to complete 20 to 30 minutes of low-intensity exercise on most days of the week.

If your patient smokes, advise him to stop, and recommend a smoking cessation program. Heart failure patients should limit alcohol consumption as well.

If your patient has diabetes or high blood pressure, remind him of the importance of following his health care provider's guidelines to keep his blood glucose or blood pressure level under control. Blood pressure should be no higher than 140/90; patients with diabetes should have a blood pressure level less than 130/80. A normal fasting glucose level is between 70 mg/dl and 100 mg/dl; for a patient with diabetes, a fasting glucose level less than 110 mg/dl is acceptable.

Don't forget about the emotional and psychological impacts of heart failure. Tell your patient about support groups that can provide additional information and help him deal with lifestyle changes. Family members or caregivers may want to get involved as well.

Drug therapy

Help your patient understand the routine medications he'll be taking. They include diuretics, digoxin, ACE-inhibitors, angiotensin receptor blockers, beta-blockers, and spironolactone. See *A review of chronic heart failure drugs* for more information.

Patients with acute heart failure may require other medications as well, such as nesiritide (Natrecor) or another type of vasodilator (such as nitroglycerin). Nesiritide is synthetic brain natriuretic peptide, which vasodilates blood vessels; the result is decreasing venous return to the heart. If your patient has acute heart failure, he may also receive intravenous morphine, which will dilate blood vessels in the pulmonary circulation.

Surgical options

Patients with heart failure are at greater risk for sudden death than those with healthy hearts. Biventricular pacemakers and implantable cardioverter defibrillators have been shown to help reduce this risk. If your patient has one, be sure to educate him about the device.

If your patient is a candidate for heart transplant, he may receive mechanical assist therapy while waiting for a donor heart. The left ventricular assist device provides cardiac support and improves blood flow to other organs for patients with severe heart failure. Expanded indications for receiving a mechanical assist device now include its use as an alternative to transplant.

A heart transplant is the only treatment that offers a potential cure for end-stage heart failure patients who do not respond to aggressive medical therapy. The option for a transplant, however, is limited by the availability of donor hearts. Additionally, heart failure patients who are older than 65 years or those with severe pulmonary hypertension; irreversible kidney or liver dysfunction; severe chronic lung disease; symptomatic peripheral, kidney, or cerebrovascular disease; active systemic infection; diabetes requiring insulin therapy with evidence of other organ damage; cancer within the past 5 years; or a history of transient ischemic attacks or stroke can fail to meet standard eligibility criteria for a heart transplant.

Boosting the success rate

New treatment and management options for heart failure patients are on the horizon. Here are a few of the most promising:

• ***Cellular transplant.*** Myoblast transplant therapy may one day provide end-stage heart failure patients with a new alternative to current treatments. The procedure consists of an intramyocardial injection of autologous bone marrow. The aim is to augment and regenerate the myocardium by repopulating it with donor heart muscle cells (cardiomyocytes) that will promote neovascularization in the injured area.

In a trial of this treatment, investigators isolated myoblasts from a skeletal muscle biopsy and transplanted them back into the hearts of

patients who had postinfarction heart failure using transendocardial injection. The procedure appears feasible and safe, although much larger trials are needed to verify the results.

• ***Better patient education.*** Encouraging adherence to therapy and guiding patients to care for themselves is a vital part of keeping them healthy. Yet lack of adherence is often the reason heart failure treatments are unsuccessful. Outpatient clinics specifically geared to treating heart failure patients are currently being established. Their goal is to improve clinical outcomes and lower hospital readmissions by educating patients on how to help prevent heart failure and how it's treated when it's diagnosed. The more a patient knows about his condition, the more likely he is to adhere to his treatment regimen and help improve his functional status and quality of life.

• ***Better means of prevention.*** One of the best heart failure treatment options for the future may be to work harder at *preventing* heart failure in the first place. Developing consistent evidence-based guidelines may be the most promising way to increase heart failure patient survival and lower mortality rates.

For example, the American College of Cardiology/American Heart Association (ACC/AHA) has established a staging system for heart failure that complements the New York Heart Association's classification for treating heart failure (see *Classifying heart failure signs and symptoms*). The ACC/AHA system focuses on the reality that heart failure carries risk factors and has symptomatic and asymptomatic phases, and emphasizes that disease progression can be slowed at every stage by medical intervention.

Also, a new nationwide hospital-

Diagnostic tests

You can expect your patient's health care provider to order the following diagnostic tests to help determine whether the patient has heart failure; later, he will also order them to aid in monitoring a diagnosed patient.

• ***Blood urea nitrogen (BUN) and creatinine.*** Abnormal levels of BUN and creatinine may signal kidney disease. These values can also be used to determine a patient's blood volume status.

• ***Electrolytes***. Electrolyte values must be monitored for imbalances, especially if the patient is taking a diuretic, an angiotensin-converting enzyme inhibitor, or an aldosterone antagonist. A potassium imbalance can cause heart rhythm problems as well.

• ***Complete blood cell count (CBC).*** The CBC monitors for anemia, which can lead to increasing shortness of breath.

• ***Thyroid function tests.*** A heart failure patient's thyroid stimulating hormone (TSH) level should be monitored. If the level is high, he has hypothyroidism; if it's low, he has hyperthyroidism. Both of these thyroid conditions can exacerbate heart failure.

• ***Cardiac enzymes***. Elevated troponin, myoglobin, and creatine kinase–MB levels may indicate active ischemic injury to the heart.

• ***Liver function tests***. If fluid overflow impairs hepatic function, the results of liver function tests may be elevated. Liver damage can decrease the albumin level and increase prothrombin time. A lower albumin level causes a fluid shift out of the blood vessels and cells into the interstitial spaces, causing increased edema.

• ***NT-proBNP and B-type natriuretic peptide (BNP) assays***. ProBNP is a compensatory peptide secreted from the heart's ventricles in response to changes in pressure that come with heart failure. As proBNP is secreted into the bloodstream, another type of peptide, BNP, breaks off. One of the substances released during this split is NT-proBNP.

An assay of a patient's NT-proBNP or BNP level can signal whether he's in heart failure. NT-proBNP and BNP levels increase when the ventricles are stressed. The blood vessels dilate and venous return to the heart decreases.

If your patient has high NT-proBNP or BNP values, you know his heart is in trouble and you're alerted to intervene promptly. These values are also useful in monitoring a patient with chronic heart failure because they'll tell you whether his condition is worsening.

• ***Electrocardiogram.*** The presence of ST, T, and Q wave changes indicates potential or actual changes to the myocardium. An abnormal heart rhythm, a conduction disturbance, and left ventricular hypertrophy are common in heart failure patients.

• ***Chest X-ray.*** A chest X-ray will readily identify heart size and pulmonary congestion, which aids in determining the severity of heart failure.

• ***Echocardiography.*** Probably the single most effective tool in diagnosing and managing heart failure, an echocardiogram provides information on the heart's structure and function; differentiates systolic and diastolic dysfunction; and estimates heart pressures, chamber sizes, wall motion abnormalities, and the presence of valve problems.

• ***Stress test.*** A stress test may help determine whether coronary artery disease is present.

• ***Heart catheterization.*** A patient with acute angina, with or without a history of heart disease, may undergo heart catheterization to evaluate the patency of his heart's arterial vessels. Catheterization also provides information about the heart's ability to pump blood.

based quality-of-care improvement program and registry called OPTIMIZE-HF (**O**rganized **P**rogram **T**o **I**nitiate life-saving treat**M**ent **I**n hospitali**ZE**d patients with **H**eart **F**ailure) is available online. The program places the latest practice guidelines at health care providers' fingertips. They can apply these guidelines in their practices to improve heart failure patient outcomes.

Brighter days

At one time, heart failure was considered a grave diagnosis. Patients could expect to be substantially disabled, and it was understandably viewed as an early death sentence.

Thankfully, this is no longer the case. Advances in therapy have made heart failure a manageable syndrome for many patients. New and successful treatments have reduced mortality rates, improved quality of life, increased patient adherence to therapy, and reduced hospitalization rates.

Best of all, today's heart failure patient can generally look forward to a longer life. And that's the greatest success of all. **LPN**

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On the Web

Alliance for Aging Research: **http://www.agingresearch.org**
American Heart Association: **http://www.americanheart.org**
Heart Failure Society of America: **http://www.hfsa.org**
National Heart, Lung and Blood Institute: **http://www.nhlbi.nih.gov**

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INSTRUCTIONS

Keeping heart failure patients on the right path

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- On the print form, record your answers in the test answer section of the CE enrollment form on page 29. Each question has only one correct answer. You may make copies of these forms.
- Complete the registration information and course evaluation. Mail the completed form and registration fee of $19.95 to: **Lippincott Williams & Wilkins, CE Group**, 2710 Yorktowne Blvd., Brick, NJ 08723. We will mail your certificate in 4 to 6 weeks. For faster service, include a fax number and we will fax your certificate within 2 business days of receiving your enrollment form.
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CE 3.0 CONTACT HOURS

Keeping heart failure patients on the right path

GENERAL PURPOSE: To provide the nurse with an overview of heart failure and its diagnostic tests and treatments.
LEARNING OBJECTIVES: After reading the preceding article and taking the following test, you should be able to: 1. Identify the pathophysiology and presentation of heart failure. 2. Describe diagnostic tests and classification systems for heart disease. 3. List lifestyle changes and treatment methods for heart failure patients.

1. Risk factors for heart failure include all of the following except
a. gallbladder disease.
b. diabetes.
c. alcohol abuse.
d. hyperlipidemia.

2. Which type of heart failure occurs when the left ventricle doesn't pump effectively and blood backs up into the lungs over time?
a. diastolic.
b. left-sided.
c. right-sided.
d. acute decompensated.

3. A common cause of right-sided heart failure is
a. acute pneumonia.
b. chronic obstructive pulmonary disease.
c. high blood pressure.
d. irregular heart rhythm.

4. The most powerful vasoconstrictor in the body is
a. aldosterone.
b. angiotensin I.
c. angiotensin II.
d. renin.

5. A patient with right-sided heart failure will exhibit
a. increased urinary output.
b. peripheral edema.
c. warm hands and feet.
d. weight loss.

6. A patient with heart failure should limit
a. total fat to 25% to 35% of total calories.
b. sodium to 3,000 mg/day.
c. saturated fats to 20% of total calories.
d. carbohydrates to 20% of the total diet.

7. A patient should call his health care provider if his weight
a. increases by 1 pound in 1 day.
b. drops 3 pounds in 1 day.
c. drops 5 pounds in 1 week.
d. increases 2 pounds in 1 day.

8. A patient has developed a dry cough. Which drug is associated with this?
a. aldosterone antagonist
b. angiotensin-converting enzyme (ACE) inhibitor
c. beta-blocker
d. digitalis glycoside

9. The only treatment that offers a potential cure for end-stage heart failure patients who don't respond to aggressive medical therapy is
a. a biventricular pacemaker.
b. a heart transplant.
c. an implantable cardioverter defibrillator.
d. a left ventricular assist device.

10. Which statement about cellular transplant is true?
a. It's an accepted treatment presently being used for patients with end-stage heart failure.
b. It's a method that limits revascularization in injured heart muscle.
c. It consists of injecting subcutaneous fat tissue into the heart muscle.
d. It's a way to augment and regenerate the myocardium by repopulating it with donor heart muscle cells.

11. A patient with heart failure classified as Stage B under the American College of Cardiology guidelines would receive which of the following recommendations?
a. a beta-blocker and an ACE-inhibitor
b. a mechanical device such as a biventricular pacemaker
c. continuous inotropic therapy
d. a nonsteroidal anti-inflammatory drug and a calcium channel blocker

12. Mrs. C has slight shortness of breath with ordinary activity but no symptoms at rest. What is her New York Heart Association classification?
a. Stage A
b. Class I, Stage B
c. Class II
d. Stage C

13. OPTIMIZE-HF is
a. an individualized, step-by-step, goal-oriented program for heart failure patients.
b. a national registry of the National Institutes of Health for all heart failure patients.
c. a program that's available online for health care providers to receive practice guidelines.
d. a resource for patients and family to access information and listings of emotional support groups.

14. Which test looks at blood volume status?
a. blood urea nitrogen and creatinine
b. cardiac enzymes
c. complete blood cell count
d. electrolytes

15. Which test estimates heart size and identifies pulmonary congestion?
a. chest X-ray
b. electrocardiogram
c. cardiac catheterization
d. stress test

16. Which noninvasive test estimates heart function?
a. chest X-ray
b. echocardiogram
c. electrocardiogram
d. cardiac catheterization

ENROLLMENT FORM ***LPN2005,*** **September/October,** **Keeping heart failure patients on the right path**

A. Registration Information:

Last name _____ First name _____ MI ___

Address _____

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Registration Deadline: October 31, 2007
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❑ LPN ❑ RN ❑ CNS ❑ NP ❑ CRNA ❑ CNM ❑ other _____

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	a	b	c	d
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2.	❍	❍	❍	❍
3.	❍	❍	❍	❍
4.	❍	❍	❍	❍
5.	❍	❍	❍	❍
6.	❍	❍	❍	❍
7.	❍	❍	❍	❍
8.	❍	❍	❍	❍
9.	❍	❍	❍	❍
10.	❍	❍	❍	❍
11.	❍	❍	❍	❍
12.	❍	❍	❍	❍
13.	❍	❍	❍	❍
14.	❍	❍	❍	❍
14.	❍	❍	❍	❍
16.	❍	❍	❍	❍

C. Course Evaluation*
1. Did this CE activity's learning objectives relate to its general purpose? ❑ Yes ❑ No
2. Was the journal home study format an effective way to present the material? ❑ Yes ❑ No
3. Was the content relevant to your nursing practice? ❑ Yes ❑ No
4. How long did it take you to complete this CE activity?___ hours___minutes
5. Suggestion for future topics _____

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