

Managing *heart*

More than 5 million Americans are living with heart failure and 500,000 more are diagnosed each year, according to the American Heart Association. That's why it's important for you to understand the disease process and the available treatment options. We give you the lowdown so you can provide the best care possible for this growing patient population.

By Lacey Buckler, RN, ACNP-BC, MSN

Acute Care Nurse Practitioner • Inpatient Cardiology • Gill Heart Institute • University of Kentucky • Lexington, Ky.

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Heart failure is a major public health problem in the United States, and it continues to be the leading cause of hospitalization in people over age 65. Unfortunately, the prognosis for this condition isn't positive: 50% of patients with heart failure over a 4-year period will die of the disease. More than 287,000 people die yearly of heart failure, and 40% of patients admitted to the hospital with the condition die or are readmitted within 1 year. Not to mention that the estimated annual cost for the management of heart failure in 2006 was \$29.6 billion dollars.

In this article, I'll help you understand the pathophysiology, causes, and signs and symptoms of heart failure; important diagnostic tools and treatment options; and patient-teaching strategies to help your patient manage his condition.

Back to basics

The basic definition of heart failure, formerly known as congestive heart failure, is the heart's inability to pump enough blood to meet the body's oxygen and nutrient demands. Heart failure can be systolic or diastolic, left or right sided, and acute or chronic. As a nurse, you're likely to take

care of patients who are experiencing an acute exacerbation of heart failure in the hospital and those who are managing chronic heart failure in the outpatient setting.

Let's take a closer look at the categories of heart failure:

- systolic heart failure (pumping problem)—the inability of the heart to contract enough to provide blood flow forward
- diastolic heart failure (filling problem)—the inability of the left ventricle to relax normally, resulting in fluid backing up into the lungs
- left-sided heart failure—the inability of the left ventricle to pump enough blood, causing fluid to back up into the lungs
- right-sided heart failure—the inefficient pumping of the right side of the heart, causing congestion or fluid buildup in the abdomen, legs, and feet
- acute heart failure—an emergency situation in which a patient who was completely asymptomatic before the onset of heart failure decompensates when there's an acute injury to the heart, such as a myocardial infarction (MI), impairing its ability to function
- chronic heart failure—a long-term syn-

failure

drome in which the patient experiences persistent signs and symptoms over an extended period of time, likely as a result of a preexisting cardiac condition.

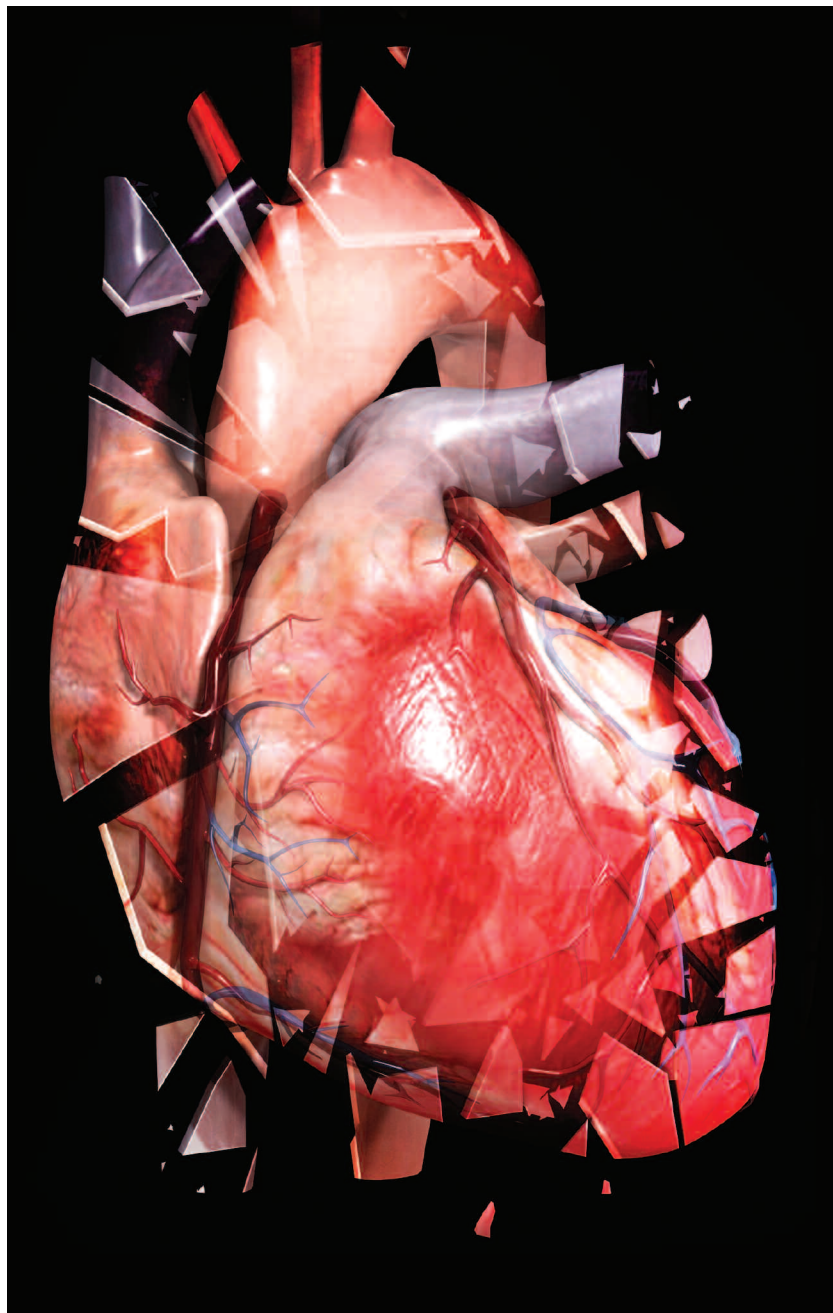
Cause and effect

There are a variety of conditions that can lead to the development of heart failure; however, the progressive process that occurs in response to one of these initiating events is similar. These conditions include:

- **coronary artery disease.** Atherosclerosis of the coronary arteries is the primary cause of heart failure; it's found in more than 60% of patients with the condition. Hypoxia and acidosis lead to ischemia, which causes an MI that leads to heart muscle necrosis, myocardial cell death, and loss of contractility. The extent of the MI correlates with the severity of the heart failure.

- **cardiomyopathy.** A disease of the myocardium, there are three types of cardiomyopathy: dilated, hypertrophic, and restrictive (see *Picturing dilated cardiomyopathy*). The most common type, dilated cardiomyopathy may result from an unknown cause (idiopathic), an inflammatory process such as myocarditis, or alcohol abuse; it causes diffuse cellular necrosis and fibrosis, leading to decreased contractility (systolic failure). Hypertrophic and restrictive cardiomyopathy lead to decreased distensibility and ventricular filling (diastolic failure). Heart failure due to cardiomyopathy usually becomes chronic and progressive; however, both may resolve if the cause, such as alcohol use, is removed.

- **hypertension.** Systemic or pulmonary hypertension increases the heart's workload, leading to hypertrophy of its muscle fibers.



This hypertrophy may impair the heart's ability to fill properly during diastole, and the hypertrophied ventricle may eventually fail (see *Picturing left ventricular hypertrophy*).

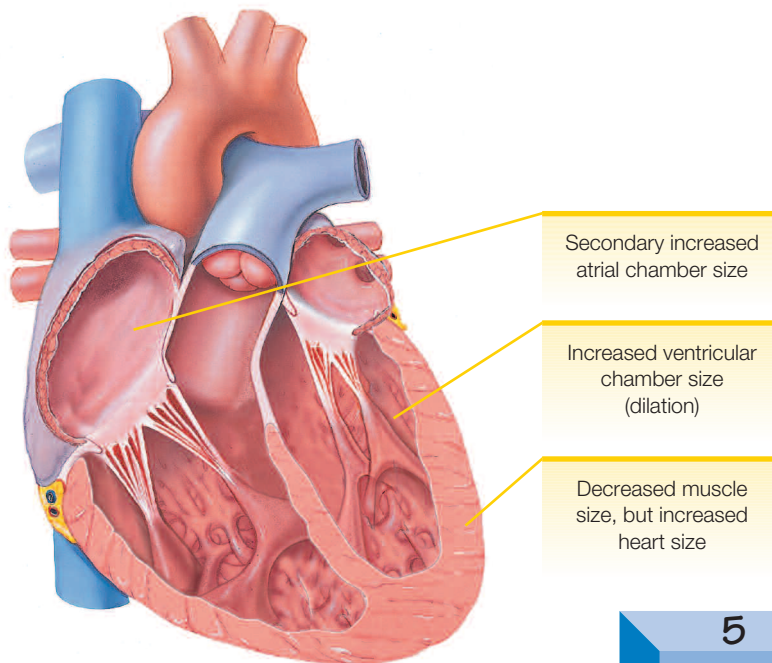
- **valvular heart disease.** The valves ensure that blood flows in one direction. In valvular disorders, blood has an increasing diffi-

culty moving forward, increasing pressure within the heart and cardiac workload and leading to heart failure. Degenerative aortic stenosis and chronic aortic and mitral regurgitation are often the culprits.

Other conditions that may contribute to the development and severity of heart failure include:

Picturing dilated cardiomyopathy

Dilated cardiomyopathy primarily affects systolic function. Here's what happens:



The pathophysiology steps

1
Cardiac muscle fibers are extensively damaged.

2
Contractility in the left ventricle decreases, lowering stroke volume.

3
Early changes of heart failure (increased heart rate and left ventricular hypertrophy) help the heart to compensate functionally.

4
The compensatory mechanisms eventually are unable to maintain adequate cardiac output.

5
Severe left ventricular dilation occurs as venous return and systemic vascular resistance increase.

6
Eventually, all chambers may dilate, causing generalized cardiomegaly with associated risk of arrhythmias and emboli.

- increased metabolic rate
- iron overload
- hypoxia
- severe anemia
- electrolyte abnormalities
- cardiac dysrhythmias
- diabetes.

Signs and symptoms afoot

Often, signs and symptoms of heart failure are the key to early detection because they lead a patient to seek medical attention.

Signs and symptoms of *left-sided heart failure* are related to pulmonary congestion and include:

- dyspnea
- unexplained cough
- pulmonary crackles
- low oxygen saturation levels
- third heart sound (S₃)
- reduced urine output
- altered digestion
- dizziness and light-headedness
- confusion
- restlessness and anxiety
- fatigue and weakness.

Signs and symptoms of *right-sided heart failure* include:

- lower extremity edema
- enlargement of the liver
- ascites (accumulation of fluid in the peritoneal cavity)
- anorexia
- abdominal pain
- nausea
- weight gain
- weakness.

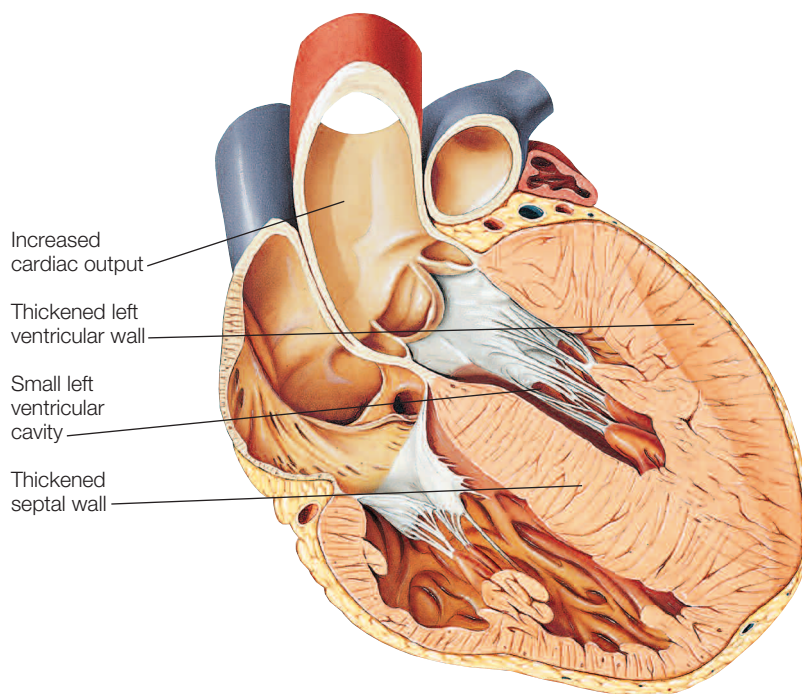
Diagnostically speaking

When a patient presents with symptoms of heart failure, there's an initial set of assessments, lab studies, and diagnostic tests that must be done in order to confirm the diagnosis.

The most important piece of the patient

Picturing left ventricular hypertrophy

Hypertrophy of the left ventricle is one of the heart's first steps to compensate for either increased pressures or increased blood volume.



assessment is the initial medical history and physical exam. The nurse is often the first person to obtain data from the patient about his history. It's important to gather information regarding the patient's risk profile, history of cardiac events, and response to previous therapies if this isn't a new diagnosis. There are also many questions you can ask to elicit important clinical data to help the healthcare provider determine the cause and severity of heart failure and the treatment plan for the patient. See *Assessment questions for heart failure* for a list of questions developed by the American Association of Heart Failure Nurses that can help you complete the initial assessment.

Specific blood tests will be ordered to help determine the patient's diagnosis. One of the most specific for heart failure is the measurement of brain natriuretic peptide (BNP), a hormone secreted by the heart at high levels

I failed?
I demand
a retest!



when it's injured or overworked. See "Deciphering BNP" in this issue for more information about BNP as a diagnostic tool. Lab tests include a complete blood cell count, complete metabolic panel (electrolytes, creatinine, glucose, and liver function studies), and urinalysis. Other lab tests that may be ordered to determine the cause of heart failure include

thyroid function tests, a fasting lipid profile, and testing for offending drug levels.

One of the most important diagnostic tools for heart failure is the echocardiogram, or echo. Not only is this an important assessment tool when the patient presents for the first time with heart failure, but it can also provide information periodically on the improvement of his heart's

Assessment questions for heart failure

Symptoms

- What symptoms prompted you to seek medical care? When did they begin?
- Did your symptoms begin suddenly or gradually worsen over time?
- What makes the symptoms better or worse?
- Do the symptoms occur continuously or only with certain activities?
- Do symptoms improve with rest?
- Do you have any pain now? Did you recently have pain? Rate it on a 0-to-10 scale.
- Has your heartbeat felt any different than usual, such as racing, fluttering, or skipping?

Breathing

- Have you felt short of breath? Do you wake up short of breath at night?
- Can you speak as much as you like before getting short of breath?
- What makes your breathing easier?
- Do you cough? Is it worse than usual?
- Do you cough throughout the day or mostly in the morning?
- Do you cough up any secretions?
- Do you use oxygen at home?

Sleep

- Have symptoms kept you from sleeping?
- Do you sleep in bed or in a chair?
- Are you able to lie flat in bed?
- How many pillows do you use to sleep? Is this more or less than usual?
- Have you recently slept more or less than usual? Do you feel rested?
- Does your spouse or significant other tell you that you snore or intermittently stop breathing during sleep?

Diet

- Have you recently eaten more salty foods or drank more water than usual?
- How often do you eat out?

- How often do you weigh yourself?
- Have you gained or lost weight recently?
- Have you experienced any swelling? Is swelling present all day or only evenings?
- Have you felt bloated or had edema?
- How far up your legs do you have edema?
- Are your clothes, belt, rings, and shoes tighter than 1 week or 1 month ago?
- Have you had nausea or abdominal pain?

Medications

- Have you taken all prescribed medications?
- Did you run out of any medications?
- Have you had diarrhea or vomiting that may have affected absorption of medications?
- Have you taken extra diuretic medications?
- Have you changed the dose of any medication?
- Did any physician or nurse practitioner recently prescribe different medications for you or change the dose of your medications?
- Do you take any over-the-counter medications or herbal supplements?

Activity

- How far can you walk?
- Can you dress, bathe, prepare food, and climb stairs without stopping to rest?
- What activities could you do recently but not now because of worsened symptoms?
- Have you decreased your activity level?

Other

- Do you have difficulty remembering information or do you have feelings of confusion?
- Have you had other health problems that may make your heart failure worse?

Source: American Association of Heart Failure Nurses. Comprehensive Assessment and Symptoms of Heart Failure—CASH. http://aahfn.org/assets/Comprehensive_Assessment_and_Symptoms_of_HF-CASH.pdf.

function. Echocardiography is a type of cardiac ultrasound that involves pulsed and continuous Doppler waves. An echo provides an accurate assessment of left ventricular function while also determining whether a patient has systolic or diastolic dysfunction. The number most frequently quoted from the echo is the ejection fraction (EF). EF is the measurement of how effectively the heart is pumping blood. A normal EF is greater than 55%. That means with every cardiac cycle more than 55% of the blood is being pumped out of the ventricle.

Anticipate an order for a chest X-ray to evaluate the size of the patient's heart and the basic heart structures and to determine the amount of fluid buildup in his lung fields. An ECG should also be ordered to examine the electrical activity of the heart. Other diagnostic modalities that may be ordered include a cardiac stress test, cardiac catheterization (angiogram), a cardiac computed tomography scan or magnetic resonance imaging, radionuclide ventriculography, ambulatory ECG monitoring (Holter monitor), pulmonary function tests, a heart biopsy, and exercise testing such as the 6-minute walk.

After all the data are obtained, the health-care provider can then determine the cause and classification of the patient's heart failure and the appropriate treatment plan. There are two well-accepted classification systems used to describe heart failure, focusing on either structural abnormalities or symptoms: the American College of Cardiology / American Heart Association stages of heart failure and the New York Heart Association (NYHA) functional classifications (see *Managing the stages of heart failure*).

Treatments 1, 2, 3

The Institute for Healthcare Improvement recommends the following bundle, or components of care, for all patients with heart failure unless contraindicated or the patient can't tolerate them:

Managing the stages of heart failure

The American College of Cardiology/American Heart Association 2005 guideline update classifies heart failure into four stages and makes specific recommendations for each.

Stage A identifies patients at high risk for heart failure because of conditions such as hypertension, diabetes, and obesity.

- Treat each comorbidity according to current evidence-based guidelines.

Stage B includes patients with structural heart disease, such as left ventricular remodeling, left ventricular hypertrophy, or previous MI, but no symptoms.

- Provide all appropriate therapies in Stage A.
- Focus on slowing the progression of ventricular remodeling and delaying the onset of heart failure symptoms.
- Strongly recommended in appropriate patients: Treat with ACE inhibitors or beta-blockers unless contraindicated; these drugs delay the onset of symptoms and decrease the risk of death and hospitalization.

Stage C includes patients with past or current heart failure symptoms associated with structural heart disease such as advanced ventricular remodeling.

- Use appropriate treatments for Stages A and B.
- Modify fluid and dietary intake.
- Use additional drug therapies, such as diuretics, aldosterone inhibitors, and ARBs in patients who can't tolerate ACE inhibitors, digoxin, and vasodilators.
- Treat with nonpharmacologic measures such as biventricular pacing, an ICD, and valve or revascularization surgery.
- Avoid drugs known to cause adverse reactions in symptomatic patients, including nonsteroidal anti-inflammatory drugs, most antiarrhythmics, and calcium channel blockers.
- Administer anticoagulation therapy to patients with a history of previous embolic event, paroxysmal or persistent atrial fibrillation, familial dilated cardiomyopathy, and underlying disorders that may increase the risk of thromboembolism.

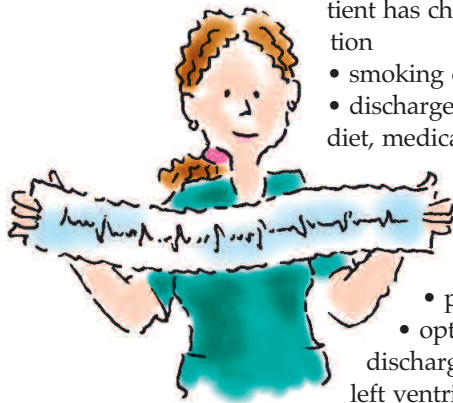
Stage D includes patients with refractory advanced heart failure having symptoms at rest or with minimal exertion and frequently requiring intervention in the acute setting because of clinical deterioration.

- Improve cardiac performance.
- Facilitate diuresis.
- Promote clinical stability.

Achieving these goals may require I.V. diuretics, inotropic support (milrinone, dobutamine, or dopamine), or vasodilators (nitroprusside, nitroglycerin, or nesiritide). As heart failure progresses, many patients can no longer tolerate ACE inhibitors and beta-blockers due to renal dysfunction and hypotension and may need supportive therapy to sustain life (a left ventricular assist device, continuous I.V. inotropic therapy, experimental surgery or drugs, or a heart transplant) or end-of-life or hospice care.

Source: Hunt SA, American College of Cardiology, American Heart Association Task Force on Practice Guidelines (Writing Committee to Update the 2001 Guidelines for the Evaluation and Management of Heart Failure). ACC/AHA 2005 guideline update for the diagnosis and management of chronic heart failure in the adult: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Update the 2001 Guidelines for the Evaluation and Management of Heart Failure). *J Am Coll Cardiol.* 2005;46(6):e1-e82.

Ejection fraction less than 40% = ACE inhibitor.



- assessment of left ventricular systolic function
- an angiotensin-converting enzyme (ACE) inhibitor or angiotensin receptor blocker (ARB) at discharge when left ventricular EF is less than 40%, indicating systolic dysfunction
- an anticoagulant at discharge if the patient has chronic or recurrent atrial fibrillation
- smoking cessation counseling
- discharge instructions addressing activity, diet, medications, follow-up appointments, weight monitoring, and what to do if symptoms worsen
- seasonal influenza immunization
- pneumococcal immunization
- optional beta-blocker therapy at discharge for stabilized patients with left ventricular systolic dysfunction without contraindications.

The treatment of heart failure can be further categorized into three basic strategies: pharmacologic management, devices and surgical management, and lifestyle management. All three are very important when combined and provide the best prognosis for the patient. Let's break it down.

Pharmacologic

Several drugs may be used for the medical management of heart failure, including ACE inhibitors, beta-blockers, and aldosterone antagonists.

The foundation of heart failure treatment is the ACE inhibitor. Unless it's contraindicated, every patient with an EF of less than 40% should receive an ACE inhibitor, which has been shown to improve ventricular function and patient well-being, reduce hospitalization, and increase survival. If the patient is intolerant to an ACE inhibitor, an ARB should be initiated.

Another class of drugs that's important for the patient with heart failure is beta-blockers. Unless contraindicated or not tolerated, a beta-blocker should be started for every heart failure patient with an EF of less than 40% due to the mortality benefit as shown in many randomized controlled trials.

An aldosterone antagonist may be added to the patient's pharmacologic therapy if his EF is less than 35% and he's on adequate ACE inhibitor therapy. Unlike the first two categories of drugs, aldosterone antagonists are approved for NYHA Classes III and IV and must be used cautiously, acknowledging renal function and potassium level. These drugs have been shown to decrease hospital admissions for heart failure and also increase survival when added to existing therapy.

Other drugs that may be used in heart failure management include hydralazine/isorbide, diuretics, and digoxin. Hydralazine/isorbide may be added as an alternative to an ACE inhibitor or ARB if the patient is intolerant to both drugs or it may be added to existing therapy if symptoms continue to progress. Diuretics are used as symptom relief agents and are recommended for patients who have clinical signs of congestion. Digoxin can be used in patients with heart failure and atrial fibrillation to slow conduction through the atrioventricular node, which increases left ventricular function and results in increased diuresis, and to increase the force of myocardial contraction. It may also be added to existing therapy for a patient with NYHA Class II, III, or IV heart failure and an EF of less than 40% who's receiving optimal doses of an ACE

Drugs commonly used to treat heart failure *cheat sheet*

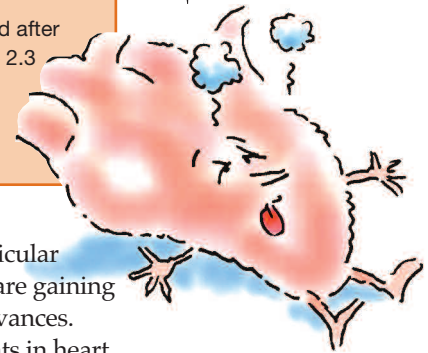
- **ACE inhibitors:** captopril, enalapril, lisinopril, ramipril, and trandolapril
- **ARBs:** candesartan and valsartan
- **Aldosterone antagonists:** eplerenone and spironolactone
- **Beta-blockers:** bisoprolol, carvedilol, metoprolol succinate, and nebivolol

Patient teaching for heart failure

When teaching a patient with heart failure, be sure to cover:

- the disorder, diagnosis, and treatment
- signs and symptoms of worsening heart failure
- when to notify the healthcare provider
- the importance of follow-up care
- the need to avoid high-sodium foods
- the need to avoid fatigue
- instructions about fluid restrictions
- the need for the patient to weigh himself every morning at the same time, before eating and after urinating, to keep a record of his weight, and to report a weight gain of 3 to 5 pounds (1.4 to 2.3 kg) in 1 week
- the importance of smoking cessation, if appropriate
- medication dosage, administration, adverse reactions, and monitoring.

Teaching your patient doesn't have to be exhausting.



inhibitor or ARB, beta-blocker, and aldosterone antagonist.

Devices and surgical management

There are several therapeutic options in addition to pharmacologic management for the treatment of heart failure, such as pacing; the use of an implantable cardioverter defibrillator (ICD), ventricular assist device, or artificial heart; and heart transplantation.

If the underlying cause of the heart failure is treatable with surgery, then surgical options should be the first explored. One of the most common surgical interventions is biventricular pacing, also known as cardiac resynchronization therapy. This is recommended for patients who are NYHA Class III or Class IV with a QRS prolongation of greater than 120 ms who continue to experience symptoms despite adequate pharmacologic therapy.

An ICD may be placed to prevent sudden cardiac death caused by symptomatic and asymptomatic arrhythmias, which are seen frequently in patients with heart failure. The ICD is a primary prevention to reduce mortality for patients with an EF of less than 35%; it's a secondary prevention for patients who've survived a ventricular tachycardic event.

Approved for both bridge-to-transplant

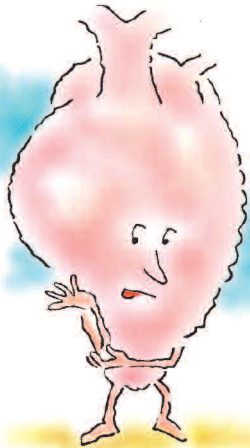
and destination therapy, left ventricular assist devices and artificial hearts are gaining more popularity as technology advances. And new technologic developments in heart failure devices continue to be made. Devices that are implanted under the skin have been developed that help monitor the patient's fluid status and then transmit the data back to the healthcare provider, which is helpful in monitoring patients remotely. These devices will hopefully prove to reduce hospitalizations for heart failure in the future.

Because the prognosis for patients with heart failure is so poor, the option of heart transplantation continues to be a viable choice. When a patient has reached the point of end-stage heart failure, transplantation is commonly addressed. There's a very detailed, complex process by which the patient qualifies for transplantation; therefore, it may not be an option for every patient. You can be influential in educating your patient with heart failure about the option of heart transplantation and the use of a ventricular assist device or artificial heart as a bridge to transplant, making sure he understands the magnitude of choosing one or both of these routes.

Lifestyle management

As a nurse, the most important piece of heart failure management is helping your

Following the treatment plan, a healthy diet, and not smoking—now that's a good start.



patients understand the lifestyle modifications that are necessary when living with this disease. Nurses must help patients learn how to change their lives to benefit their health. The first step is to stress the importance of adherence to the treatment regimen. In order to successfully treat heart failure, the patient must follow through with taking medications and coming to follow-up appointments. Data have shown that 20% to 60% of patients with heart failure don't adhere to their prescribed treatment plan. You play an important role in educating your patients on this topic.

You must also educate heart failure patients about symptom recognition, weight monitoring, diet and nutrition, and fluid intake. Intensive nursing-based education programs help patients understand these concepts and how they relate to treating their disease. For example, if the patient understands which symptoms can alert him

to an oncoming exacerbation, he'll know to call the healthcare provider. Other topics you should address include alcohol cessation, smoking cessation, weight loss, physical activity, sexual activity, and pregnancy. By empowering the patient to embrace self-management, you can make the difference in your patient's prognosis (see *Patient teaching for heart failure*).

Nursing interventions on parade

In both inpatient and outpatient settings, nursing interventions for the patient with heart failure include the following:

- administer medications and assess the patient's response to them
- assess fluid balance, including intake and output, with a goal of optimizing fluid volume
- weigh the patient daily at the same time on the same scale, usually in the morning after the patient urinates (a 2- to 3-pound [0.9- to 1.4-kg] gain in a day or a 5-pound [2.3 kg] gain in a week indicates trouble)
- auscultate lung sounds to detect an increase or decrease in pulmonary crackles
- determine the degree of jugular vein distension
- identify and evaluate the severity of edema (see *Assessing for pitting edema*)
- monitor the patient's pulse rate and BP and check for postural hypotension due to dehydration
- examine skin turgor and mucous membranes for signs of dehydration
- assess for symptoms of fluid overload.

Assessing for pitting edema



(A) Apply finger pressure to an area near the ankle.

(B) When the pressure is released, an indentation remains in the edematous tissue.

Evidence-based and on the ball

Heart failure is a complex disease process that affects millions of Americans. As a nurse, you play an integral role in both the management and treatment of this disease. Understanding the mechanisms of heart failure and the evidence-based therapies used to treat it continues to be a priority. ■

Learn more about it

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