

## Heart Failure

### ***What is heart failure?***

Despite its name, heart failure does not mean that the heart suddenly stops or fails to function. Heart failure is defined as a condition in which the heart cannot pump enough blood to meet the body's needs. Heart failure begins when the heart is weakened due to damage (e.g. heart attack or persistent high blood pressure) and then progressively worsens.

Over time, the heart no longer contracts as strongly or as coordinated as before. As a result, the heart gradually loses its ability to carry out its primary function, which is to pump enough blood to supply the body's need for oxygen.

When the heart muscle is weakened, the heart needs to work harder to keep blood circulating through the body. This stresses the heart, and to compensate for this additional strain the heart muscle becomes enlarged. The enlargement of the heart further weakens it and makes the problem worse. The left side of the heart, the right side, or both sides of the heart can be affected. The symptoms and effects on the body will depend on the side that is affected.

### ***What are the signs and symptoms of heart failure?***

The common signs and symptoms of heart failure are<sup>1</sup>:

- Extreme tiredness
- Sudden weight gain
- Swelling of the lower limbs (legs, ankles)
- Abdominal pain or swelling
- Problems with sleep (for example, due to shortness of breath)
- Frequent dry, hacking cough

### ***How does heart failure develop?***

Heart failure most commonly develops slowly, following damage to the heart that may be caused by a heart attack, coronary artery disease, chronic high blood pressure, diabetes or other disorders. As a consequence, the heart can no longer carry out its work, and heart failure develops.

A healthy heart has a number of compensatory mechanisms that allow it to temporarily increase its pumping function to meet increased metabolic need (e.g., during exercise). In patients with heart failure, these compensatory mechanisms are continuously being used. It is the continuous use of compensatory mechanisms that causes the death of individual heart muscle cells. When the compensatory mechanisms are continuously used, there is little reserve for activities, such as exercise.


Heart failure is often not recognised until a more advanced stage, commonly referred to as congestive heart failure, develops. In this stage, fluid may leak into the lungs (pulmonary oedema) and to other parts of the body – feet, legs (oedema) and, in some cases, the liver or abdominal cavity (ascites).

There are two types of heart failure:

- **Systolic heart failure:** decreased ability of the heart to contract and an inability of the heart to pump enough blood into circulation. This is the most common type of heart failure.
- **Diastolic heart failure:** decreased ability of the heart to relax. Blood has difficulty entering the heart's pumping chambers, and excess fluid builds up in different parts of the body.

### ***What is the impact of heart failure?***

Heart failure is a major cardiovascular problem affecting approximately 5.3 million Americans and 6.5 million Europeans.<sup>2,3</sup> This major cardiovascular disorder is increasing in both prevalence and incidence each year. This increase is due to a higher proportion of elderly



individuals in the population. Also, effective treatment of acute myocardial infarction and hypertension exposes more patients to the risk of developing heart failure than in the past. The incidence of heart failure is strongly correlated to age, with an almost exponential increase after age 65. However, heart failure affects approximately 1.4 million people under 60 years of age.<sup>4</sup>

Heart failure is one of the most commonly diagnosed medical conditions. Each year 550,000 new cases are diagnosed.<sup>4</sup> Heart failure is associated with frequent hospital admissions, placing a substantial burden on healthcare providers. The cost for heart failure treatment is enormous. Treatment of heart failure represents 1–2% of each country's total healthcare budget.<sup>5</sup> This translates to annual costs of £740 million in the UK and €1.4 billion in France. These costs were driven mainly by hospital admissions (67–75%) and are dependant on the severity of the disease.<sup>5</sup>

### ***What are the causes of heart failure?***

Although the cause of heart failure differs from patient to patient, the risk of developing heart failure increases with age and according to several other factors. Heart failure can strike at any age, but is most often seen in people over age 65. Risk factors for heart failure include:<sup>6</sup>

- Heart attack (myocardial infarction)
- High blood pressure (hypertension)
- Clogged arteries (atherosclerosis)
- Diabetes
- Chronic lung diseases, such as emphysema
- Heart rhythm or valve abnormalities
- Family history of heart disease or heart failure (for example, cardiomyopathy)
- Thyroid disorders
- Excess alcohol intake and smoking
- Obesity

### ***How is heart failure diagnosed?***

One of the most commonly used tools for diagnosis of heart failure is an echocardiogram (echo), which uses ultrasound waves to produce images of the heart. An echo is used to measure the size of the heart and the ejection fraction (EF). The EF refers to the volume of blood that is pumped out of the heart each time it beats, therefore measuring how well and how strongly the heart is pumping. According to the Heart Failure Society of America (HFSA), a healthy heart typically pumps out (ejects) 50–65% of the blood it contains. It is this figure that is known as the EF. People with heart failure have, among other symptoms, an EF of less than 40%.

Heart failure is classified according to the severity of patient symptoms and the New York Heart Association (NYHA) functional classification is the most commonly used:


- I. No symptoms and no limitation in ordinary physical activity.
- II. Mild symptoms and slight limitation during ordinary activity. Comfortable at rest.
- III. Marked limitation in activity due to symptoms, even during less-than-ordinary activity. Comfortable only at rest.
- IV. Severe limitations. Experiences symptoms even while at rest.

### ***What are the therapeutic options?***

Treatment for heart failure involves combination drug therapy and lifestyle modifications. Long-term treatment is usually required. In more severe cases of heart failure, surgery may be required.

#### ***Drug Treatments***

- **ACE inhibitors:** lower blood pressure and reduce the strain on the heart by inhibiting the production of a hormone (angiotensin II) that is responsible for the constriction of blood vessels, and the retention of water and salt. ACE inhibitors are first-choice treatments for heart failure.
- **Beta-blockers:** inhibit the action of adrenaline and noradrenaline, which helps to slow down the heart rate and lower blood pressure to reduce the workload of the heart. Beta blockers are often used in combination with other medicines such as ACE inhibitors.

- 
- **Digoxin:** increases the force of the heart's contractions and therefore increases the ejection fraction, improving exercise tolerance.
  - **Diuretics:** remove excess fluid in the body and reduce swelling in legs and ankles by helping the kidneys remove water from the blood. This helps to reduce the workload of the heart.

### ***Lifestyle Modifications***

All patients with heart failure are recommended to undergo lifestyle modifications such as dietary changes – including reduction of fat and sodium in the diet – and avoidance of alcohol. As some medicines deplete the amount of potassium in the body (which can cause arrhythmia), people with heart failure are advised to include foods rich in potassium in their diet. Mild heart failure sufferers are also encouraged to pursue a gradual course of gentle exercise under a doctor's supervision to help alleviate symptoms and build stamina.

### ***Surgical and Other Medical Procedures***

Some patients with heart failure may require surgery or other medical procedures. Although surgery is not often used, it is recommended when there is a correctable problem that is causing heart failure, such as a heart valve defect. Surgery may also be in order when the heart failure is so severe that it cannot be helped with medications or dietary and lifestyle changes. Surgical and other medical procedures include:

- **Valve replacement:** Valves regulate the flow of blood inside the heart. Because heart failure is sometimes the result of a defective or diseased valve, correcting the problem surgically can often improve or resolve the condition.
- **Defibrillator implantation:** Defibrillators deliver an electric shock to the heart when an abnormal rhythm is detected. These devices are surgically implanted under the skin near the shoulder through a small incision. Defibrillators effectively protect against sudden cardiac death but alone do not address other symptoms of heart failure.
- **Left Ventricular Assist Device (LVAD):** Implantation involves surgically embedding a mechanical pump that helps maintain the pumping ability of a heart that is unable to effectively function on its own.

- **Cardiac resynchronization therapy (CRT)** delivers tiny amounts of electrical energy to both ventricles of the heart, resulting in more synchronous and coordinated pumping. As a result of CRT, the heart's energy is used much more efficiently and circulation is improved.
- **Heart transplant** surgery may be the only effective option for those patients with severe, progressive heart failure who cannot be helped by medications and lifestyle changes. The number of patients who receive heart transplants is relatively low – about 2,000 each year.<sup>1</sup>

***What is the prognosis for patients with heart failure?***

The five-year survival rate for heart failure patients is approximately 50%.<sup>7</sup> This prognosis is worse than the five-year relative survival rate for all cancers combined.<sup>8</sup> The average survival is only 1.7 years in men and 3.2 years in women.<sup>9</sup>

Despite advances in the treatment of heart failure, prognosis remains poor, and the fate of the heart failure patient has not improved accordingly. Usually the disease continues to worsen; the power and coordination of the pumping function of the heart further declines, and life threatening heart rhythm disturbances develop. On average, about 50% of heart failure patients die of sudden cardiac death,<sup>10</sup> often the result of ventricular fibrillation or cardiac arrest that leads to a complete loss of the pumping function of the heart. Heart transplantation is a last resort for only a very limited number of heart failure patients, as donor organs are extremely scarce.

## References

1. American Heart Association. Heart Failure. Available at:  
<http://www.americanheart.org/presenter.jhtml?identifier=1614>.
2. American Heart Association. Heart and stroke statistics: 2008 update. Available at:  
[http://www.americanheart.org/downloadable/heart/1200082005246HS\\_Stats%202008.final.pdf](http://www.americanheart.org/downloadable/heart/1200082005246HS_Stats%202008.final.pdf)
3. Tendera M. Epidemiology, treatment, and guidelines for the treatment of heart failure in Europe. *Eur Heart J Suppl*. 2005;(Suppl J):J5-J9.
4. National Heart, Lung and Blood Institute. Congestive heart failure in the United States: a new epidemic. Data fact sheet. December 2007.
5. Malek M. Health economics of heart failure. *Heart*. 1999;82(supplement IV):IV11–IV13
6. Heart and stroke facts. American Heart Association. Available at:  
<http://www.americanheart.org/presenter.jhtml?identifier=3000333>
7. Schocken DD, Benjamin EJ, Fonarow GC, et al. Prevention of Heart Failure. A Scientific Statement From the American Heart Association Councils on Epidemiology and Prevention, Clinical Cardiology, Cardiovascular Nursing, and High Blood Pressure Research; Quality of Care and Outcomes Research Interdisciplinary Working Group; and Functional Genomics and Translational Biology Interdisciplinary Working Group. *Circulation*. 2008;117:2544-65.
8. National Cancer Institute. Cancer rates. Available at:  
[http://rex.nci.nih.gov/NCI\\_Pub\\_Interface/raterisk/rates28.html](http://rex.nci.nih.gov/NCI_Pub_Interface/raterisk/rates28.html).
9. Ho K, Anderson KM, Kannel WB et al. Survival after the onset of congestive heart failure in Framingham heart study subjects. *Circulation*. 1993;88:107-115.
10. Teresa E, Alzueta J, Jiménez-Navarro M. Profiling risk from arrhythmic or hemodynamic death. *Am J Cardiol*. 2000;86(suppl):126K-132K.