Exercise for Persons with Cardiovascular Disease

Cardiovascular disease is the leading cause of mortality in the U.S. It accounts for almost 50% of all deaths each year and affects nearly 14 million Americans. This number includes those with angina pectoris (chest pain) as well as persons with impairment of the heart's ability to pump effectively (congestive heart failure), resulting in inadequate blood flow to the tissues. Nearly 1.5 million Americans have heart attacks each year, and about a third of them die. What's more, heart attacks are equal opportunity killers: About half of the nearly 500,000 annual heart attack deaths are among women. And, every year more than 700,000 patients with heart disease undergo either bypass surgery or balloon angioplasty. Treatment for persons with heart disease is multifaceted and includes smoking cessation, cholesterol reduction, blood pressure control and exercise training.

Benefits and Limitations

The physical conditioning achieved by regular aerobic exercise decreases the heart rate and blood pressure at rest and at any given level of exercise. Consequently, the workload on the heart is reduced and anginal symptoms may be alleviated. Regular exercise also improves muscle function and increases the cardiac patient's ability to take in and use oxygen. This is commonly referred to as the maximal oxygen consumption or aerobic capacity. As the body's ability to transport and deliver oxygen improves, the patient has added energy and less fatigue. This benefit is important for patients with heart disease whose aerobic fitness is typically less than that of healthy adults of similar age. Moreover, the greatest improvements often occur among the most unfit.

How does an increase in aerobic capacity help the heart patient more easily perform occupational and leisure-time activities? Scientists have discovered that a given task requires a relatively constant supply of oxygen. Patients who are not aerobically fit may have to work at the high end of their aerobic capacity to accomplish moderate intensity leisure-time activities, e.g., gardening or walking the dog. On the other hand, aerobically fit patients may consume about the same amount of oxygen for these activities, but since they have a higher capacity, they will perform these tasks at a lower percentage of their maximum with less fatigue or symptoms.

Aerobic exercise training programs can result in modest decreases in body weight and fat stores, blood pressure (particularly in persons with elevated resting blood pressure), total blood cholesterol, serum triglycerides, and low-density lipoprotein cholesterol, and increases in the "protective" high density lipoprotein cholesterol subfraction. There is also evidence that exercise has favorable effects on insulin resistance (use of blood sugars) and blood clotting.

However, while high blood pressure, cholesterol, obesity and diabetes may be favorably affected by regular physical activity, exercise alone should not be expected to alter global risk status. The most effective regimens for coronary risk reduction also include nutritional education, counseling for smoking cessation, stress reduction and medication usage, if appropriate.

Cardiac patients who exercise often report increased self-confidence, especially in performing physical tasks; an improved sense of well-being; and, less depression, stress, anxiety and social isolation. Moreover, the combined results from randomized clinical trials indicate that exercise-based cardiac rehabilitation in patients who have had a heart attack results in a 20 to 25% lower death rate.

Although the many benefits of exercise are undeniable, there is no convincing evidence that exercise alone increases the diameter of the coronary arteries or the number of tiny interconnecting blood vessels (called collaterals) that feed the heart muscle. Moreover, conventional exercise training seems to have little or no effect on improving the pumping effectiveness or "ejection fraction" of a damaged heart or reducing heart rhythm irregularities.

How Much Exercise is Enough?
The most consistent benefits appear to occur when exercise training is performed at least three times a week for 12 or more week's duration. Exercising more frequently may elicit even greater improvements; however, if the program is discontinued, the benefits are lost within weeks. The duration of aerobic exercise training sessions should include a minimum of 30 continuous or accumulated minutes (e.g., three-10 minute exercise bouts) at an intensity approximating 70 to 85 percent of an individual's measured maximal heart rate. Nevertheless, the prescribed heart rate for exercise training should be 10 or more beats per minute below the intensity that evokes abnormal signs or symptoms. Your doctor should approve the level or intensity of exercise that is considered safe and appropriate for you.

Walking has several advantages over other forms of exercise during the initial phases of a cardiac exercise program. Brisk walk training programs can result in substantial improvements in the fitness and health factors listed above. Walking offers an easily tolerable exercise intensity and causes fewer orthopedic problems than jogging or running. It is also an activity that requires no special equipment other than a pair of well-fitted athletic shoes. Upper body aerobic exercise and resistance (weight) training can safely and effectively increase muscle strength and endurance in clinically stable coronary patients. These changes also result in improved cardiovascular function, reducing the heart rate and blood pressure responses to upper body work (e.g., lifting). Consequently, such training regimens can decrease the cardiac demands of occupational and leisure-time activities and provide greater diversity to the physical conditioning program, which may increase patient interest and adherence. Single set resistance training programs performed a minimum of two to three times per week are recommended over multi-set programs because they are highly effective and less time consuming. It is further recommended that these regimens include 8 to 10 different exercises that use the major muscle groups (arms, shoulders, chest, back, hips, and legs). A load that permits 10 to 15 repetitions to a moderate level of fatigue is recommended.

A recent American Heart Association consensus statement on preventing heart attack and death in patients with coronary disease suggested a minimum of 30 to 60 minutes of moderate-intensity activity 3 or 4 times weekly supplemented by an increase in daily lifestyle activities (e.g., walk breaks at work, using stairs, gardening, household activities); 5 to 6 hours a week was suggested for maximum benefits. Increasing physical activity in daily living can be helpful in this regard.

Risks of Exercise
The risk of cardiovascular complications appears to increase transiently during strenuous physical activity compared with the risk at other times. This seems particularly true among persons with heart disease who are habitually sedentary. Contemporary estimates of major cardiovascular complications in exercise-based cardiac rehabilitation programs range from 1/100,000 to 1/300,000 patient exercise hours. Thus, exercise rehabilitation has been shown to be safe with serious events being rare. Moreover, the overall risk of a cardiac event appears to be reduced in persons who are regular exercisers.

Regardless of the exercise format, cardiac patients should be aware of four warning signs or symptoms that may indicate a worsening or progression of their heart disease: new onset or recurring anginal pain (chest pain or pressure, an ache in the jaw or neck, discomfort down the left or right arms, pain across the shoulders and back); unaccustomed or unusual shortness of breath; dizziness or lightheadedness; and, heart rhythm abnormalities. In such instances, exercise should be discontinued and medical attention sought.

High-Risk Activities
Sudden stop-and-go or extremely strenuous activities may be beneficial, but are more likely to place undue stress on the heart, especially for those who are normally sedentary. For example, shoveling heavy, wet snow has been shown to elicit major increases in heart rate and blood pressure. Heart attacks are often reported after snow-related exertion in middle-aged and older persons clearing their driveways and walks during the cold winter months.

Compliance Issues
With such a convincing case for moderate exercise, it is unfortunate that more cardiac patients don't enjoy its benefits. A mere 11% to 20% of patients with heart disease participate in supervised rehabilitation programs, which suggests a vast underutilization, particularly among older adults, women, and minorities. Moreover, cardiac exercise programs have typically reported dropout rates of 50% after 3 to 6 months. Thus, it appears that exercise is not unlike other health-related behaviors in that typically half or less of those who initiate the behavior will continue. Common barriers to enrollment and participation include lack of physician referral, transportation problems, weather (hot or cold), other medical conditions (e.g., arthritis), lack of insurance reimbursement, and limited access.

Behavioral Strategies
Several practical recommendations are offered to maintain fitness motivation. These include:

- Learn about the "why's" and "how's" of exercise.
- Minimize the likelihood of injury with a sensible exercise program. Too often novice exercisers become discouraged due to muscular soreness from stepping up the pace too abruptly. Get qualified instruction.
- Exercise with others. The social reinforcement of others, either in a supervised setting or at home, may strengthen an exercise commitment.
- Do enjoyable activities. When exercise is fun or pleasurable, it helps to maintain motivation.
- Undergo fitness testing periodically to assess individual progress.
- Record exercise achievements on a progress chart.
- Establish an exercise schedule.
- Listen to music during exercise sessions.
- Incorporate more physical activity into your daily lifestyle.

Supervised Versus Home Programs
Although medically supervised group exercise programs are associated with increased cost and extended travel time, such programs are recommended for patients with major cardiac impairment or adverse signs or symptoms (i.e., those at increased risk for future cardiovascular events). Furthermore, supervised programs facilitate patient education in regard to lifestyle changes for coronary risk reduction, provide variety and recreational opportunities, and offer staff reassurance and the potential for enhanced adherence, safety, and surveillance. Medically-directed home exercise rehabilitation represents a viable alternative, however, because of its lesser cost, increased accessibility, convenience, and potential to promote risk factor modification, independence and self-responsibility. For stable coronary patients, home-based exercise rehabilitation and supervised group programs have shown comparable safety and efficacy.

Conclusions
Until the mid-1980s, cardiac rehabilitation programs largely focused on exercise training and a 'prudent' diet. Although these regimens resulted in improved aerobic fitness and modest decreases in mortality, the course of atherosclerotic heart disease remained largely unchanged. Contemporary studies now suggest that aggressive coronary risk factor modification, including diet, drugs, and exercise (especially in combination) may slow, halt and even reverse the progression of atherosclerotic coronary heart disease. Added benefits include a reduction in anginal symptoms, fewer recurrent cardiac events, and diminished need for balloon angioplasty and/or bypass surgery. Today, exercise remains an integral component of a comprehensive approach to treating heart disease — an approach that also includes psychosocial/vocational counseling, medical surveillance/ emergency support, and aggressive coronary risk factor modification.

Written for the American College of Sports Medicine by Barry A. Franklin, Ph.D., FACSM (chair); Gary J. Balady, M.D., FACC, Kathy Berra, M.S.N., ANP; Neil F. Gordon, M.D., FACSM, and Michael L. Pollock, Ph.D., FACSM