

# Prescription of Home Exercise Therapy for Cardiovascular Fitness

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The importance of regular exercise activity in health maintenance has been continually emphasized. Family physicians, as the primary health care providers to many individuals, need a protocol for exercise prescription that is both practical for the physician to administer and reasonable for the patient to understand and follow. A practical protocol applicable to individuals of varying cardiac states is presented.

Prescription of exercise therapy may be indicated in a variety of clinical situations, including (1) improvement of cardiac status in sedentary individuals who otherwise have no manifestations of cardiac problems, (2) clinical improvement in patients with ischemic heart disease, (3) rehabilitation of patients following myocardial infarction, and (4) rehabilitation of patients who have undergone coronary bypass surgery. The family physician is frequently presented with all of these situations, yet most medical school and residency curricula poorly prepare the physician in the development of exercise rehabilitation programs. This paper, therefore, will outline a practical approach to exercise therapy, including guidelines for writing exercise prescriptions.

## Asymptomatic Patients

This is the category comprising most of the patients requesting or needing an exercise program. Included are people needing to lose weight, middle-aged individuals seeking to recapture lost youth, and motivated young adults looking toward a physically fit future.

The first step toward establishing any exercise regimen is to obtain a complete history and physical examination. This is essential both to rule out

conditions that would contraindicate the patient's entrance into an exercise program and to establish the limits of endurance at which he or she should begin to exercise. Those who would be excluded from a vigorous exercise regimen are as follows:

1. Patients with acute or chronic systemic illnesses, including uncontrolled diabetes, active central nervous system or neuromusculoskeletal disease, thrombophlebitis, liver or kidney disease, anemia, uncontrolled hypertension, or marked obesity.

2. Patients with cardiac abnormalities such as myocarditis, significant congenital or rheumatic heart disease, aortic or ventricular aneurysm, certain arrhythmias at rest (multifocal premature ventricular contractions or second or third degree heart block), cardiomegaly, patients with fixed-rate pacemakers, and recent myocardial infarction or severe myocardial insufficiency.

3. Patients with psychiatric problems, such as highly apprehensive or negative individuals.<sup>1,2</sup>

In addition to the obvious areas of attention during history taking and physical examination, significant family historical data (ie, hypertension, myocardial infarction, heart disease, hyperlipidemia, and diabetes) should be sought out. Evidence of risk factors for the development of coronary artery disease must also be obtained. These include hyperlipidemia, hypertension, cigarette smoking, diabetes, psychologic and emotional factors (tension, frustration or anger, type A personality), obesity, and hormonal alterations (oral contracep-

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tives).<sup>3</sup> Laboratory examinations should include a complete blood count, urinalysis, and blood urea nitrogen, plasma glucose, cholesterol, and triglyceride levels. Chest x-ray examination, electrocardiogram, and cardiac stress testing should also be obtained. While these guidelines generally apply to sedentary individuals over the age of 35 years who are entering an exercise protocol for the first time, the presence of risk factors or other suspicious findings on history, physical examination, or laboratory studies should dictate flexibility in application of guidelines to individual patients of any age.

Once the patient has been properly evaluated and his level of endurance determined, an individualized exercise program can then be developed according to each patient's particular tastes, preferences, environment, and lifestyle. Selection of a mode of exercise that the patient will enjoy and follow compliantly is of prime importance. A daily log of exercise activity may provide an added stimulus for compliance.

The level of activity at which the patient should enter an exercise program is determined from the exercise stress test, whereby the maximum attainable heart rate and metabolic equivalents (METS, multiple of the resting hemostatic oxygen requirement) are directly measured. If a stress test is not obtained, the maximum heart rate is determined according to age. This is readily available from published tables or a simple formula ( $220 - \text{age in years} = \text{maximum heart rate for age}$ ) can be used.<sup>1</sup> The sedentary individual should begin his exercising at 70 percent of his maximum heart rate, increasing this to 85 percent of maximum heart rate over a period of three months.<sup>3,4</sup> It is expected that the amount of a particular exercise activity required to achieve and maintain the 85 percent goal will increase as the patient progresses through his program.

The type of exercise performed must be of an aerobic, isotonic nature. Aerobic exercise is that which stimulates heart and lung activity sufficiently to increase oxygen uptake and delivery. Isotonic exercise develops endurance by changing muscle length while maintaining muscle tension constant. Isometric exercise, on the other hand, is characterized by a constant muscle length with increasing muscle tension and serves to increase the size and strength of muscle; isometric activity also has the effect of markedly increasing both systolic and

diastolic blood pressure while decreasing cardiac output, a situation which could have a deleterious effect on a compromised cardiovascular system. Isotonic activity only moderately increases systolic pressure while maintaining or slightly decreasing diastolic pressure and increasing cardiac output.<sup>3,5</sup>

Types of aerobic exercise currently popular include walking, jogging, cross-country skiing, cycling, swimming, and racquet sports. All are relatively constant activities making use of several muscle groups. Other examples of aerobic exercise include shuffleboard, golf, skating, dancing, rowing, and skipping rope, representing a wide variety of energy requirements. Patients may also use a treadmill, a stationary bicycle, or run in place. By knowing the metabolic equivalents achieved during stress testing, a patient can be prescribed an appropriate activity level at which to start his exercising. Whatever the exercise prescribed, it is important that the patient be taught to take his pulse and that he adjust his activity to maintain 70 to 85 percent of his maximum heart rate throughout his exercise sessions.

The duration and frequency of exercise are as important as the intensity and type of activity. Initially, exercise should occupy 20 to 30 minutes of continuous activity at the prescribed heart rate at least three times per week, increasing this gradually to 40 to 60 minutes per session.

Patients should precede each exercise session with a 5- to 10-minute warm-up consisting of stretching exercises and calisthenics. These help to guard against cramps, sprains, strains, and heart irregularity. A 5-minute cool-down session is also important and helps to avoid nausea, cramps, and peripheral pooling of blood. The cool-down session can consist simply of tapering off of the exercise activity, such as walking the last quarter mile after jogging, pedaling slowly the last mile of cycling, or walking around the court following tennis or racquetball. Patients should be advised to avoid hot showers or baths and saunas immediately following their exercise sessions.<sup>5,6</sup>

### Patients with Angina

The evaluative workup of patients experiencing anginal attacks is similar to that described for

asymptomatic patients, with some notable modifications. Exercise stress testing is mandatory for these patients. A continuous multistage tolerance test following the Bruce protocol is effective for this purpose.<sup>7</sup> Patients experiencing a positive stress test should undergo further diagnostic evaluation to assess any perfusion abnormalities present. While coronary angiography has been the mainstay procedure for this purpose in the past, radioactive thallium scanning is rapidly emerging as a significant noninvasive technique for identifying perfusion defects.<sup>8,9</sup> In addition, multiple gated pool studies have proven to be a valuable corollary in providing data on left ventricular function.<sup>3,9,10</sup>

After the evaluation is completed, the patient with angina can then be prescribed an appropriate exercise regimen much in the same manner as for the asymptomatic patient, using the same types of aerobic exercises. Those with negative stress tests (that is, failing to demonstrate symptomatic, physiologic, or electrocardiographic evidence of ischemic heart disease) should begin exercising at 70 percent of the maximum heart rate for age. The target heart rate selected for symptomatic patients should be below that rate which produced symptoms during the stress test. Walking will be the initial exercise necessary for most symptomatic patients with positive stress tests. They should exercise with the benefit of nitroglycerine, taken either prophylactically prior to an exercise period or during the session.<sup>2,11</sup> Patients should also be maintained on proper vasodilator and/or beta blocker therapies as indicated. Hospital or YMCA cardiac rehabilitation programs may be of benefit in easing the symptomatic patient into an exercising regimen, although lack of availability in many communities should encourage physicians to develop home exercise programs as outlined for their patients.

### Postmyocardial Infarction Patients

Rehabilitation of patients following myocardial infarction involves a multidisciplinary approach requiring the physician to direct the involvement of nursing staff, physiotherapists, and occupational therapists. Nursing personnel assist the patient in reestablishing independence in self-care activities. Occupational therapy helps the patient develop confidence in the ability to engage in useful daily

activities with the goal of returning to work or full activity. The physiotherapists provide guidance in the initial exercise activity of the patient during hospitalization (usually 10 to 14 days).

Physical rehabilitation during the hospitalization period will include calisthenic-type exercises such as leg and shoulder abduction, straight arm raising, knees to chest, toe touches (while sitting), side trunk bends, slight knee bends, and trunk circles. Exercises should begin when the patient is free from pain and arrhythmias and has a resting pulse less than 100 beats per minute. Activities should be curtailed if angina or dyspnea occur, if electrocardiographic abnormalities develop (arrhythmias, block, ischemia), or if a decline (or disproportionate increase) in heart rate or blood pressure appears with increasing activity.

Prior to discharge from the hospital, the patient should obtain a limited activity stress test (also referred to as the mini stress test). The prognostic value of exercise testing soon after myocardial infarction in terms of future morbidity and mortality has been established.<sup>12,13</sup> Not only do the test results have important implications toward medical management of the patient, but they also provide a guideline for the level of activity at which he may begin the next phase of exercise rehabilitation. In addition, early exercise stress testing has been shown to be superior to psychological stress testing for evaluating the cardiovascular response to most commonly encountered psychological stressors.<sup>14</sup>

Phase 2 of postinfarction rehabilitation lasts from hospital discharge until the patient is returned to work or full activity, generally about 12 weeks after the infarction. Activities consist primarily of increasing the energy expenditure for self-care and brief walks twice daily. Activities should not exceed five metabolic equivalents. Exercise should begin no sooner than 60 minutes after a meal. Maximum pulse rates to be attained are 120 beats per minute for patients less than 50 years old and 110 beats per minute for patients older than 50 years, unless the mini stress test results dictate a lower rate.<sup>3</sup>

A submaximal stress test should be performed at four to six weeks into phase 2, to evaluate the patient's progress and to formulate a basis for an exercise prescription. He may then begin to train at a pulse rate of 70 percent of the maximum heart rate achieved during the stress test. This training should be done at least five times per week, with

the benefit of a hospital oriented cardiac rehabilitation program. Close supervision and monitoring of the patient is essential at this point. The patient should assume a gradual pace in easing himself back into his working situation or full activity and may expect to begin this transition at about 8 to 12 weeks after the infarction.

During phase 3, the patient's exercise status should be periodically reevaluated and adjustments made in the exercise prescription. Other types of aerobic activities may be added at the proper energy level, the patient being careful to avoid excessive fatigue and angina. Intermittent high-energy expenditure should be avoided for at least six months.<sup>3</sup>

It is important that psychological support and family education be provided throughout the rehabilitation process. The patient must understand the necessity of identifying and dealing with the risk factors and psychologic stressors that might have an adverse effect on his recovery. His family must also recognize the importance of exercise rehabilitation and support and encourage him in this endeavor.

### Postbypass Surgery Patients

An exercise protocol is indicated for patients following coronary bypass surgery. Postoperative exercise training should address three primary objectives: early convalescence (1 to 8 weeks postoperatively), intermediate convalescence (8 to 12 weeks postoperatively), and long-term convalescence (greater than 12 weeks postoperatively).<sup>15</sup> The initial program should be designed to assist with postoperative recuperation and allow the patient to develop a routine for conditioning muscles. Exercises would include walking and low-level calisthenics, the workload not to exceed two to four metabolic equivalents. In the intermediate convalescent period, a greater emphasis is placed on exercises designed to improve endurance. A careful evaluation and subsequent prescription of appropriate aerobic exercise activities should be carried out in a manner similar to that described for patients with angina. Exercise programs for long-term convalescence should be developed on the basis of each individual patient's symptomatology and cardiac status. They are therefore treated as the asymptomatic and symptomatic patients already discussed, with continued reevalua-

tion and modification of the exercise program essential in each case.<sup>15,16</sup>

### Conclusion

Exercise is but one factor over which the patient has control in determining his well-being, be it preventive or rehabilitative. Proper dietary control, elimination of potentially harmful habits (eg, smoking, excessive alcohol), and removal of psychological stressors are also likely to result in a healthier, happier existence. It is one of the prime responsibilities of the family physician to encourage, prescribe, and counsel patients with these objectives in mind.

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