Regular exercise provides a myriad of health benefits in older adults, including improvements in blood pressure, diabetes, lipid profile, osteoarthritis, osteoporosis, and neurocognitive function. Regular physical activity is also associated with decreased mortality and age-related morbidity in older adults. Despite this, up to 75 percent of older Americans are insufficiently active to achieve these health benefits. Few contraindications to exercise exist, and almost all older persons can benefit from additional physical activity. The exercise prescription consists of three components: aerobic exercise, strength training, and balance and flexibility. Physicians play a key role in motivating older patients and advising them regarding their physical limitations and/or comorbidities. Motivating patients to begin exercise is best achieved by focusing on individual patient goals, concerns, and barriers to exercise. Strategies include the “stages of change” model, individualized behavioral therapy, and an active lifestyle. To increase long-term compliance, the exercise prescription should be straightforward, fun, and geared toward a patient’s individual health needs, beliefs, and goals. (Am Fam Physician 2002;65:419-26,427-8. Copyright© 2002 American Academy of Family Physicians.)

Benefits of Exercise

As is the case in younger adults, regular exercise has been shown to decrease mortality and age-related morbidity in older adults.1-3 Despite this, up to three fourths of the older adult population do not currently exercise at recommended levels. The relative risk (RR) for cardiovascular disease caused by sedentary living has been estimated to be 1.9, compared with other modifiable risk factors such as hypertension (RR = 2.1) and cigarette smoking (RR = 2.5), but it occurs at a much higher prevalence.4 Fewer than 10 percent of women over age 75 smoke cigarettes while greater than 70 percent are insufficiently active.5

By the year 2030, 22 percent of the U.S. population will be older than 65 years, a total of 70 million people.6 The fastest growing segment of the elderly population is the group older than 85 years, classified as “old old.” Because activity levels generally decline with advancing age, the absolute number of inactive older Americans will most likely increase dramatically.

As the population of older adults increases, it will become vitally important for family physicians to counsel sedentary patients to become physically active.
The health benefits of exercise follow a hyperbolic dose-response curve. Those patients who go from none to some exercise receive the greatest health benefits, while further increases in activity levels bring progressively smaller improvements.12 Physicians can have the greatest overall impact by helping their sedentary patients to become active.

Illustrative Cases

CASE 1

A 71-year-old man who has moderately well-controlled hypertension, and osteoarthritis of the knees bilaterally and right hip. He is active in two bowling leagues and enjoys walking; however, both activities are becoming limited by pain in his knees.

He will benefit from increasing the level of activity and incorporating resistance training into his exercise routine. The patient began cross training with non–weight-bearing activities of swimming and biking three times per week. He was encouraged to wear good athletic shoes and may benefit from bracing, orthotics, nonsteroidal anti-inflammatory medication, or viscosupplementation. A twice-weekly, resistance training program was initiated focusing initially on lower extremity strength using light weights on a multipurpose machine.

CASE 2

An 85-year-old woman who lives alone has a previous history of a minor stroke and has hypertension controlled with a beta blocker. She does not have known osteoporosis or a history of fracture and is currently sedentary.

On examination, this patient had some difficulty with eyes-closed balance and was unable to stand from a chair without using both armrests, indicating fairly significant leg weakness. She began her exercise program by focusing on balance and strength with a simple home routine based on chair exercises, 12 oz soup cans, and balancing on one leg while holding the kitchen counter. Because she is asymptomatic for coronary artery disease, she can begin a low-intensity aerobic program without further testing. Because of the cold weather, the patient chose to begin walking the ground floor of her large apartment building, adding time and distance as she gains endurance.
**Strength Training**

Although the positive benefits of aerobic exercise are widely accepted, the importance of resistance training in the older population has also become increasingly apparent. Muscle strength declines by 15 percent per decade after age 50 and 30 percent per decade after age 70.1 This is principally the result of sarcopenia (loss of muscle mass) and occurs to a greater degree in older women than men. Results from the Framingham disability study13 demonstrate that 45 percent of women older than 65 years and 65 percent older than 75 years cannot lift 10 lb. Resistance training can result in 25 to 100 percent, or more, strength gains in older adults through muscle hypertrophy and, presumably, increased motor unit recruitment.1,14

Strength is intrinsic to daily function, especially in the very elderly. Most of the variance in walking speed in the elderly is related to leg strength, and increased strength has been shown to improve walking endurance and stair-climbing power. Strength training also improves nitrogen balance and can, combined with adequate nutrition, prevent muscle wasting in institutionalized elderly persons.14,15

The rise in heart rate and blood pressure with resistance work is largely proportional to the percent of maximal voluntary contraction (MVC). Consequently, minimal lifting (e.g., routine housework) can produce a dramatic rise in the rate-pressure product in weak, elderly patients. In addition to absolute strength gains, resistance training attenuates the cardiac demands of any given load because the load now represents a lower percentage of the MVC.16

**Preparticipation Screening**

**HISTORY AND PHYSICAL**

Before initiating an exercise program, most older adults should undergo a history and physical examination directed at identifying cardiac risk factors, exertional signs/symptoms, and physical limitations. There are few contraindications to aerobic exercise or resistance training (Table 2).1,16 Even patients with these conditions can safely exercise at low levels once appropriate evaluation and treatment have been initiated. For example, early exercise-based cardiac rehabilitation has become a mainstay of postmyocardial infarction care. The 26th Bethesda Conference guidelines17 contain specific recommendations for patients with hypertension, valvular, and other cardiovascular disease.

Simple office tests for cardiovascular fitness and global strength have been described.18,19 While these tests may be useful in following a patient’s progress, they are generally not necessary for the initial exercise prescription. A resting office-based electro-

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**TABLE 2**

**Potential Contraindications to Aerobic Exercise and Resistance Training**

<table>
<thead>
<tr>
<th>Absolute</th>
<th>Relative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recent ECG change or myocardial infarction</td>
<td>Cardiomyopathy</td>
</tr>
<tr>
<td>Unstable angina</td>
<td>Valvular heart disease</td>
</tr>
<tr>
<td>Third-degree heart block</td>
<td>Complex ventricular ectopy</td>
</tr>
<tr>
<td>Acute congestive heart failure</td>
<td></td>
</tr>
<tr>
<td>Uncontrolled hypertension</td>
<td></td>
</tr>
<tr>
<td>Uncontrolled metabolic disease</td>
<td></td>
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</tbody>
</table>

ECG = electrocardiogram.

Exercise stress testing can also be used to determine a patient’s fitness level, generally expressed as metabolic equivalents (METs; one MET = 3.5 mL O₂ per kg per minute), and to define an appropriate range of exercise intensity.

The Exercise Prescription

The exercise prescription consists of three components: aerobic exercise, strength training, and balance and flexibility (Table 4).¹

Specific exercise recommendations for a given patient will depend on existing comorbidities and on the baseline level of physical activity. Initially, sedentary patients should begin at a very low level and gradually progress to a goal of moderate activity. Moderate activity can be defined using heart rate and VO₂ max ranges, rating of perceived exertion, and MET charts for specific activities (Table 5).¹² More simply, patients should exercise at the maximal intensity at which they are still able to comfortably carry on a conversation (the “talk test”). This may require some trial and error for patients. Warm-up and cool-down periods consisting of five to 10 minutes of less intense activity (e.g., slow walking, stretching) should be included to...
decrease the risk of hypotension, and musculoskeletal and cardiovascular complications. As in aerobic exercise, initially sedentary or irregularly active older adults beginning resistance training should start slowly and gradually advance the intensity of their training regimen. Patients should start with resistive bands/tubing, light weights (e.g., 2 lb hand weights or a can of food), or simple exercises such as repeatedly rising from a chair. Although health benefits are achievable with less intense training, significant strength gains require patients to train at an intensity in which they can complete 10 to 15 repetitions per set before reaching fatigue. Training needs to be progressively more intense with increasing weight to continue to derive additional strength gains and, possibly, to prevent the long-term loss of previous strength gains.22

The evidence for balance and flexibility training is inconclusive. Nevertheless, empiric evidence suggests that balance programs, such as repeatedly standing on one leg, can improve stability and decrease the risk of falls.1 Deconditioned and sedentary elderly patients should be encouraged to improve their functional ability with strength and balance training before beginning aerobic exercise. A physical therapist can be helpful in identifying physical limitations and designing a specific exercise routine. Personal trainers or other athletic club personnel also may be helpful for relatively healthy patients who are already generally active. Trained geriatric exercise leaders are becoming increasingly common at health clubs and senior centers.

The complete exercise prescription, as demonstrated by the Activity Pyramid (Figure 1), includes increased daily activities and regular aerobic, resistance, and balance exercises. Any exercise prescription, however, is a dynamic process that should be structured to fit an individual patient’s current goals and comorbidities and be responsive to changes over time.

**Promoting Physical Activity**

In addition to helping patients to exercise safely, physicians also play an important role in promoting increased activity, especially in older patients.23 The strength of physicians’ advice is significantly correlated with the likelihood of adopting increased physical activity in older cardiac patients.24

There are many approaches to exercise promotion available for physicians. The “stages of change” model is often used to promote a range of positive behaviors.25 Attempts to formalize this model for exercise promotion have met with moderate success.26 Computer templates interacting directly with patients to create tailored messaging is a new focus, and several Web sites with specific exercise programs for adults are available. Many older patients, however, will require individualized counseling because of specific physical limitations, multiple comorbidities, or both.

The most successful compliance with long-term exercise is most likely achieved by
identifying and overcoming barriers to activity, setting specific goals, recruiting spouse/family support, and providing positive reinforcement. Although this can be time consuming for family physicians, brief and repeated counseling has been shown to be highly effective.\textsuperscript{27} Unfortunately, according to current Medicare guidelines, patient visits for exercise promotion are not reimbursable except as treatment for a specific disease or as part of a separate G-code visit. Some evidence exists, however, that exercise promotion is more effective when included as a part of counseling for a chronic disease.\textsuperscript{8}

**Overcoming Barriers to Exercise**

Elderly patients face an array of personal, socioeconomic, and environmental barriers to exercise that are common to the general population, as well as barriers that are unique to the elderly (Table 6).

One half of older adults cite musculoskeletal discomfort or disability as a reason for not exercising.\textsuperscript{28} Decreasing exercise intensity and using a range of exercises can help avoid discomfort. It is often helpful to prescribe a range of exercise intensities that patients can match to their energy or functional level on any given day. Aquatic exercises limit the weight-bearing load while providing cutaneous assistance to proprioception. Cross-training, using a combination of activities, balances the risks and benefits of weight- and non–weight-bearing activities, uses a wider range of muscle groups, decreases the risk of overuse injury, and is less boring.

Habit is the single best predictor of inactivity across all age groups.\textsuperscript{29} Older persons often must overcome a lifetime of ingrained behavior. Some older persons may be comfortable in a role of dependence and feel threatened by the charge of increased activity. Building on previous activities can help overcome the dominant influence of habit on activity levels. For example, patients may be encouraged to move the treadmill or stationary cycle in front of the television, or consider having a low step-aerobics box in the kitchen. An active lifestyle also has health benefits comparable with formal exercise regimens, but with improved rates of long-term compliance.\textsuperscript{30}

Incorporating exercise into a prior routine...
also makes it easier to remember, especially in very old and cognitively impaired persons. Exercises should be simple; any new skills will require specific instructions and repetition.

Self-efficacy—the confidence in one’s ability to carry out a planned behavior—has been shown to be a predictor of stair-climbing ability, balance (i.e., risk of falling), and general functional decline in the elderly. In addition, it is also a strong predictor of exercise participation, especially in women.31 Efficacy scores increase across the stages of change (i.e., patients become more confident of their abilities as their level of activity increases).32 Patients with low self-efficacy should begin exercising with easily accomplished goals and receive frequent encouragement.

Despite the general lack of good exercise role models for older persons on television and through other media, societal norms are not predictive of intention to exercise. Exercise beliefs of family and close friends, however, are important influences. Education of significant others regarding the safety and benefit of exercise in older persons may be helpful.29

### Additional Considerations

Physicians should match their advice to the patient’s perception of how physical activity may be beneficial (e.g., weight loss, improved fitness, reduced coronary risk). Identify and focus on individual beliefs rather than on general health benefits. Help the patient set specific goals and avoid the discouragement of unrealistic expectations.

Understanding a patient’s personality is also helpful. Whether patients are extroverted or introverted will greatly affect their compliance with a group exercise class versus a home program. As they become more functionally dependent, they often have less influence over when and how they exercise. This can be discouraging for those who have previously had a strong internal locus of control.29

For most patients, any additional activity beyond their current level will be beneficial. Patients should be encouraged to add to exercises that they are already performing such as climbing an additional flight of stairs or walking to a further light post or other distance marker each week. More frail elderly patients should increase intensity by adding hills, hand weights, or arm movements rather than increasing velocity.1

Finally, patients are more likely to do activities they consider enjoyable. They are also more likely to resume pleasurable activities following inevitable periods of relapse caused by illness, hospitalization, or travel. Social dancing, for example, is a great exercise and most nursing homes use games as a proxy for exercise. Patients can be helpful in designing their own exercise programs.

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### Table 6

<table>
<thead>
<tr>
<th>Barrier</th>
<th>Approach</th>
</tr>
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<tbody>
<tr>
<td>Self-efficacy</td>
<td>Begin slowly with exercises that are easily accomplished; advance gradually; provide frequent encouragement.</td>
</tr>
<tr>
<td>Attitude</td>
<td>Promote positive personal benefits of exercise; identify enjoyable activities.</td>
</tr>
<tr>
<td>Discomfort</td>
<td>Vary intensity and range of exercise; employ cross-training; start slowly; avoid overdoing.</td>
</tr>
<tr>
<td>Disability</td>
<td>Specialized exercises; consider personal trainer or physical therapist.</td>
</tr>
<tr>
<td>Poor balance/ataxia</td>
<td>Assistive devices can increase safety as well as increase exercise intensity.</td>
</tr>
<tr>
<td>Fear of injury</td>
<td>Balance and strength training initially; use of appropriate clothing, equipment, and supervision; start slowly.</td>
</tr>
<tr>
<td>Habit</td>
<td>Incorporate into daily routine; repeat encouragement; promote active lifestyle.*</td>
</tr>
<tr>
<td>Subjective norms</td>
<td>Identify and recruit influential others; education of patient and influential family/friends.</td>
</tr>
<tr>
<td>Fixed income</td>
<td>Walking and other simple exercises; use of household items; promote active lifestyle.</td>
</tr>
<tr>
<td>Environmental factors (e.g., inclement weather)</td>
<td>Walk in the mall; use senior centers; promote active lifestyle.</td>
</tr>
<tr>
<td>Cognitive decline</td>
<td>Incorporate into daily routine; keep exercises simple.</td>
</tr>
<tr>
<td>Illness/fatigue</td>
<td>Use a range of exercises/intensities that patients can match to their varying energy level.</td>
</tr>
</tbody>
</table>

*—Examples of an active lifestyle include using a golf pull cart while golfing, using a push mower, participating in activities such as stand and cast fishing or gardening, and taking the stairs.
Exercise for the Elderly

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