Physical fitness and the stroke survivor

by Sandra A. Billinger, B.S.

"A stroke occurs when a blood vessel that carries oxygen and nutrients to the brain is either blocked by a clot or bursts," according to the American Stroke Association. "When that happens, part of the brain cannot get the blood (and oxygen) it needs, so it starts to die."[1] Individuals usually sustain temporary or permanent neurological damage as a result.

Stroke is a leading cause of death and long-term disability in the United States, accounting for about 1 in 14 deaths.[2] Each year, approximately 700,000 strokes occur in the nation[2]—on average, one every 45 seconds.[2] Of these incidences, approximately 500,000 are first-time attacks and 200,000 are recurrent.[2] Thanks to a better understanding of stroke and resulting lifestyle changes, the stroke death rate has been cut nearly in half in the last two decades.[3] In fact, more than 4.6 million stroke survivors live in the U.S. today.[2]

According to the National Stroke Association, the rates of survival and recovery from a stroke, including the likelihood of disability, are as follows:

- 10% of people who have a stroke make a complete recovery;
- 25% sustain minor impairments;
- 40% acquire moderate to severe impairments that result in their needing special care;
- 10% require long-term care in a nursing home or other facility; and
- 15% die following the stroke.[4]

For many survivors, the damage incurred from the stroke will leave them with lifelong paralysis, loss of speech and poor memory.[3]

Physical, occupational and speech therapy can help improve stroke survivors' rehabilitation by teaching and implementing strategies that improve their quality of life after leaving the hospital. But survivors often have comorbities (or associated diseases, such as obesity, type 2 diabetes, hypertension or coronary artery disease), which severely affect their quality of life and ability to function independently at home and in the community.[5,6]

Many challenges face health and wellness professionals in developing practical, efficient models for wellness/fitness programs for the stroke population. Generally, stroke survivors have decreased physical endurance, muscle weakness and an increase in energy cost due to hemiparesis[5,7] (or weakness on one side

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of the body). However, studies suggest these individuals can increase their aerobic capacity and physical fitness, which improves their performance on functional activities at home.[5,7,8] Research also shows that stroke survivors can build their strength with resistance training, even when they exhibit weakness of the more affected side.[9,10]

Many times after a stroke, an individual will have a contracture or decrease in range of motion in either flexors or extensors as well as stiffness in and around that joint. A joint contracture can limit the person's ability to function because full range of movement is difficult. However, stroke survivors who have a contracture can still make improvements by exercising to their ability in the muscle's shortened range.[9]

Most importantly, increasing a stroke survivor's physical activity is a key component in reducing the risk for a second stroke, as well as improving daily function.

Setting up a program

When working with stroke survivors, health/wellness professionals need to design a program to fit the individualized needs of participants. The following approach will help you, the professional, to discover your clients' needs:

1. Ask individuals what their goals are and their reason(s) for beginning an exercise program.
2. Assess individual ability to use available equipment by asking yourself some key questions:
   - Can this person walk safely without assistance?
   - Does this person have adequate balance to use the treadmill?
   - Does this person have enough grip strength to hold dumbbells?
   - Can this person adjust the equipment without assistance?
   - Does this person have the ability to remember how to program a treadmill or bike?

One way to assess the above is to explain to the individual how a machine operates or proper lifting technique, and ask him/her to repeat or demonstrate the activity. This action will show you that the person understands what is expected and can perform the activity properly and safely.

Also, to assess how much a stroke has affected someone's balance, walk with the person around an indoor track, gym or studio and watch his/her gait pattern to see if assistance is warranted. If the person's walking balance is a concern, he/she should use a stationary bike or recumbent stepper for aerobic exercise, rather than a treadmill.

Finally, make sure the individual gains medical consent before starting any exercise program. Review the form carefully, and follow the healthcare provider's instructions for exercise intensity and duration, as well as other recommendations.

Exercise program guidelines

According to studies, stroke survivors who are sedentary or deconditioned should exercise at 40–60% of their predicted heart rate maximum.[5] Those who are at a higher level of physical fitness can exercise at 70% of their maximal heart rate.[5] However, the ideal way to set intensity level for endurance exercise training is to have a client perform an exercise test using 12-lead ECG, which allows you to observe any cardiac changes during exercise, i.e. arrythmias. Individuals can perform the test on a treadmill or stationary bike. If severe hemiplegia (or paralysis) is present, they can use an arm ergometer instead.

For a stroke survivor, a treadmill and stationary bicycle are good options for aerobic exercise, unless he/she exhibits balance deficits, in which case a recumbent stepper or arm ergometer is safer. A client may need supervision if balance deficits are a concern. If you have too many demands on your time to supervise a client appropriately, you may want to choose an alternative mode of exercise rather than attempt to monitor the individual from a distance.

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Resistance training is an important and somewhat controversial component of exercise programs for stroke survivors. "Some therapists…maintain that strength training causes greater spasms and contractures," says Karl Knopf, professor of adaptive physical education at Foothill College in Los Altos Hills, California, and president, Fitness Educators of Older Adults Association. "Other therapists believe that in order to maintain greater independence, you must have enough strength to meet the demands of your activities of daily living."[11] Knopf recommends mild strength training to prevent muscle atrophy, if this meets the client's needs as outlined by the healthcare provider. He suggests starting with proprioceptive neuromuscular facilitation (PNF) or manual resistance, then gradually introducing weight training. However, he advises trainers and therapists to cut back on a client's strength training or ensure the individual spends more time in stretching range of motion activities if the client displays a loss of flexibility.[11]

This author recommends that you incorporate supervised resistive training with resistance bands or isotonic contractions using machines or free weights. A client's own body weight can also provide appropriate resistance.[8] Isometric exercises may be an ideal way for a client to begin some exercise training immediately after a stroke, but should be performed with one-on-one supervision only. Isometrics can also increase blood pressure, so you may want to avoid these exercises when working with individuals who have hypertension.[12] After someone demonstrates adequate and appropriate skill with resistive exercises, he/she should be able to perform them without close, constant supervision. Keeping a daily log of repetitions, sets and resistance will help you evaluate a client's progress and ensure the individual knows what he/she did in the previous session. Individuals who have a flaccid hand that's incapable of gripping movements can use adaptive equipment, such as special gloves, to help hold their hand to a dumbbell, barbell or weight stack.

When performing isotonic exercises, a client may sometimes "hike" the weakened limb to compensate for loss of strength. But the individual should perform exercises using the correct body mechanics to prevent injury. For example, if someone is performing a right lateral shoulder raise (abduction of the upper arm), he/she may do a side bend to the left and contract the trapezius muscle to raise the arm to 90°, rather than using the deltoid muscle to reach 90°. It's important for the client to work within his/her range of motion. So if the individual can perform this exercise properly from only 0-50°, he/she must work in that range.

Assess a client's shoulder joint for the possibility of partial dislocation. Caution is warranted as weak deltoid or scapular muscles may not hold the head of the humerus in correct position during movements of shoulder flexion, extension and abduction. Resistance training can help to strengthen the deltoid and scapular muscles if they are weak from disuse. However, if the stroke has caused lower motoneuron damage to the deltoid, the muscle will have severe weakness and atrophy due to decreased innervation. Check with a client's healthcare provider to see what types of exercises would be appropriate for the individual.

Meeting the needs of stroke survivors

To reduce the risk of a second stroke, individuals must have the opportunity to use fitness/wellness facilities and participate in programs designed to accommodate people with disabilities. Many stroke survivors will enjoy participating in an exercise program that meets their needs, i.e. accessibility, individualized programming and adequate supervision for current level of functioning. The best way to address individualized needs is for health/wellness professionals to educate themselves about stroke and learn how they can improve their services to the stroke population. (See "Resources" on page 10 for helpful books and web resources.)

Finally, if your facility offers programs for stroke survivors, let healthcare providers in your community know about your offerings or speak about your programs at community service events. This networking

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will help increase awareness in your community that your facility can help stroke survivors after the rehabilitation phase.

Sandra A. Billinger, B.S., has instructed exercise classes for older adults for five years and started a unique exercise program designed for stroke survivors. She owns Stroke Dynamics, a research and consulting business, and currently pursues a Ph.D. in Rehabilitation Sciences at the University of Kansas Medical Center. Sandra can be reached at sandrabillinger@strokedynamics.com.

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Types of stroke

According to the National Institute on Neurological Disorders and Strokes, there are two broad categories of stroke: those caused by a blockage of blood flow and those caused by bleeding.

While not usually fatal, a blockage of a blood vessel in the brain or neck, called ischemic stroke, is the most frequent cause of stroke and is responsible for about 80% of strokes. These blockages stem from three conditions:

- The formation of a clot within a blood vessel of the brain or neck, called thrombosis;
- The movement of a clot from another part of the body such as the heart to the neck or brain, called embolism; or
- A severe narrowing of an artery in or leading to the brain, called stenosis.

Bleeding into the brain or the spaces surrounding the brain causes the second type of stroke, called hemorrhagic stroke. When a weakened blood vessel ruptures, it usually results in this type of stroke. The American Stroke Association states that hemorrhagic stroke can result from two kinds of weakened blood vessels:

- The dilation, bulging or ballooning out of part of the wall of a vein or artery in the brain, called aneurysm; and
- A group of abnormally formed blood vessels, called arteriovenous malformation (AVM).

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