After a Stroke
How Quickly Should Exercise Begin?

Steven Karceski, MD

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The benefits of exercise and rehabilitation after stroke are well-known. A regimen of exercise after stroke helps to improve strength and balance. These benefits have both short-term and long-term effects: people function much better in the long run if they have had a focused, challenging course of rehabilitation. The lead author of an article published in this issue of *Neurology®,* Dr. Julie Bernhardt, had reported in 2017 on the benefits of beginning exercise within 7 days after stroke.¹ In the article appearing in this issue, “Fatal and Nonfatal Events Within 14 Days After Early, Intensive Mobilization Poststroke,”² Dr. Julie Bernhardt and her colleagues tried to answer a simple question: Are there any concerns that arise if a person recovering from a stroke begins an exercise regimen that starts within 24 hours after the stroke?

**How Was the Study Done?**

To answer this question, Dr. Bernhardt and her colleagues studied patients who were hospitalized at 56 medical centers. These hospitals were in Australia, New Zealand, Singapore, Malaysia, and the United Kingdom. Across these centers, there were 2,104 people who were admitted after a stroke. To determine the risks of early exercise after stroke, the patients were randomly placed by a computer into 1 of 2 groups. The very early mobilization (VEM) group started exercise within 24 hours after the stroke occurred. The second group received exercise regimens and rehabilitation as well, but in a usual timeline, which the researchers called usual care (UC). The groups were evenly divided: 1,054 people were in the VEM group and 1,050 were in the UC group.

The characteristics of the groups were the same. The average age was 72. Twelve percent had experienced a hemorrhagic stroke; the remaining 88% had had an ischemic stroke. One modern treatment of stroke is tissue plasminogen activator, an IV clot-busting medication. This medication is administered within hours after a patient has had a stroke. When looking at both groups, there was no difference in the number of
people who had received this treatment. However, the groups differed in one way: namely, when and how often they received exercise therapy after stroke. In the VEM group, exercise was started much earlier. In addition, the VEM patients had more exercise: on average, they had 3 more sessions of exercise per day than patients in the UC group did.

Dr. Bernhardt and colleagues looked at several serious possible effects of early exercise. The first was death. A careful analysis of both groups assessed death at 14 days after stroke. Initially, this would seem to be easy to measure. However, the reality was more complicated. The usual time of hospitalization after stroke was 7 days. Some of the people who were in this study were discharged from the hospital and later died. But depending on the country in which the study participants lived, such as Malaysia and Singapore, there was not always a national death register that could be used to determine whether these patients had died before or after they left the hospital. In addition to death, the researchers assessed the following effects: worsening of stroke, recurrent stroke, and medical issues related to stroke such as falls, injuries, blood clots due to immobility (known as deep venous thrombosis), pressure sores, and other medical illnesses in both treatment groups.

What Did the Study Show?

One of the results the researchers found was that the overall death rate for the study participants was 3.8%. This is in line with other similar trials in which the death rate at 14 days after stroke was 5%. However, when analyzing the rate of death in both groups in their study, Dr. Bernhardt and colleagues found that there was a higher rate of death in the VEM group, the group of people who had started earlier, more aggressive exercise regimens. When comparing the 2 groups, there was a 1.76% higher chance of patients dying at 14 days after stroke if they had exercised early. Although it was not entirely clear why this result occurred, it seemed that age (patients who were 80 years or older) may have been one factor in the higher rate of death in the VEM group. The other was that there was a higher rate of death in those who had experienced a hemorrhagic stroke than for those who experienced an ischemic stroke.

What Does This Tell Us About Stroke?

The reasons for this are uncertain. However, Dr. Bernhardt and her colleagues proposed an explanation in their article. After a stroke, blood flow to the injured brain is abnormal, especially in the region of the brain where the stroke occurred. Due to the effects of gravity, changes in body position (such as sitting upright or standing) could reduce blood flow, which may have been the cause of the difference the researchers found between the 2 groups. Though perhaps unimportant in a healthy brain, these changes may be harmful to a recently injured brain. In short, aggressive, upright exercises could reduce blood flow to an already injured area of brain, making things worse. If this is true, it could mean that the most sensitive time with regard to rehabilitation could be the first 48 hours after a stroke. Because of this, it may be important to avoid intense exercise in this time period to minimize the risk of death or worsening of a patient with stroke's overall condition. Dr. Bernhardt and her colleagues have already modified their medical centers' stroke and rehabilitation protocols.
About Stroke

How Does the Brain Work?

It can be difficult to find a simple way to think about how the brain works. One possible way, however, is thinking about the brain as though it were an orchestra. There are many parts to an orchestra: percussion, wind instruments, string instruments, and so on. Each instrument has a part to play in the overall, more complex musical story. When playing together, which requires that the musicians listen to one another, the orchestra can perform complex, beautiful music. The brain is just like this. It is divided into sections like language, movement, and sensation. The difference is that the brain is much more complex than an orchestra. A philharmonic may have 150 members. The brain contains tens of billions of neurons.

Suppose that while the orchestra members are playing together as one, someone suddenly turns out the lights on the strings section—these players would not be able to see the music they were playing. The rest of the orchestra would continue to play without them, but the music would be missing an important part. Likewise, if the section of the brain that was no longer “playing” after a stroke was “language,” the person would suddenly be unable to speak, or to understand spoken and written words. However, in a stroke, the lights cannot be simply turned back on, so to speak, as the affected brain cells die and are never replaced. Because we do not yet have a way to rejuvenate or regrow brain cells after a stroke, treatments have been aimed at stroke prevention, at restoring blood flow to an area of stroke (as with tissue plasminogen activator therapy), or at finding ways to recover function after a group of brain cells has died. This last focus is similar to what might happen if some of the remaining musicians in our orchestra example were retrained to take over the parts of the missing musicians. They would likely never be as proficient as the original musicians, but they would be able to cover their parts well enough to keep the music going.

What Is Stroke?

A stroke is a sudden neurologic event. There are several symptoms common to most strokes. The American Stroke Association suggests a very simple strategy called FAST (F = face drooping, A = arm weakness, S = speech difficulty, and T = time to call 911) to help people identify whether someone is experiencing a stroke. There are other signs of stroke as well, such as sudden numbness, sudden confusion, difficulty seeing, or trouble walking. Any of these symptoms could be a sign of stroke, but regardless of the symptoms present, a stroke is always sudden.

There are 2 main types of stroke: ischemic and hemorrhagic. Ischemic strokes account for about 87% of strokes. Ischemic strokes are usually caused by clots that block an artery in the brain. Because blood cannot get past the blockage, neither can oxygen. The brain cells that rely on this oxygen then begin to die. Because of this, time is critical: the longer the cells lack oxygen, the greater the number of brain cells that die. There are many treatments that are designed to break up this type of blockage. One of them is called tPA, or tissue plasminogen activator. When given intravenously within a short time after the ischemic stroke occurs, tPA can reopen the affected blood vessel and restore blood flow and oxygen. Another treatment, called mechanical thrombectomy, involves surgery. A medical device is inserted into the affected artery and is sent to the clot. It removes the clot, restoring blood flow to the brain. The effects of both treatments are rapid and can result in a reversal of the neurologic damage.

In hemorrhagic stroke, bleeding occurs in the brain. This could be due to a weak blood vessel in the brain or an aneurysm that has ruptured. One of the most common causes of hemorrhagic stroke is poorly managed high blood pressure. Constant high blood pressure puts strain on the blood vessels, which can cause them to burst.

Most treatments of stroke are designed to prevent the problem from occurring in the first place. Common causes of stroke include high blood pressure, cigarette smoking, diabetes, obesity, and eating a high-fat diet. For some people, preventing stroke may be a matter of improving their diet: eating healthier foods overall and avoiding foods that contain high fat or high cholesterol. For others, preventing stroke may include good, consistent control of blood pressure or diabetes. Cigarette smoking should be stopped or avoided. Physical inactivity is also a risk factor. Studies have shown the long-term benefits of exercise over and over again. The more we move and exercise, the healthier we are.

For more information:

- **Brain & Life**
  - Brainandlife.org

- **American Stroke Association**
  - Stroke.org

- **Brain Aneurysm Foundation**
  - Bafound.org

- **Brain Attack Coalition**
  - Brainattackcoalition.org

References

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