

## Section Editors

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## Stroke, tPA, and physician decision-making

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**WHAT DID THE RESEARCHERS STUDY?** Intravenous tissue plasminogen activator (IV tPA) is a protein that is used to break up blood clots. A blood clot that forms in an artery can block the flow of blood “downstream.” Areas of brain that rely on the now-blocked blood vessel become starved for oxygen. When a part of the brain is starved for oxygen, it is called ischemia or a stroke. The area of brain where the stroke occurs determines the resultant neurologic problems. For instance, if the stroke occurs in a region of brain that controls movement, the person becomes weak.

When a stroke happens, the use of tPA can open the blood vessel and restore proper blood flow to the brain. Treatment with IV tPA can minimize the damage from a stroke by allowing blood and oxygen to reach its destination. Stroke is a common neurologic condition. It is estimated that stroke occurs in 2.5%–2.7% of people living in the United States or one of its colonies (data from 2006 to 2010: the Centers for Disease Control and Prevention<sup>1</sup>). Surprisingly, fewer than 5% of patients with ischemic stroke receive treatment with IV tPA.<sup>2</sup>

Many factors may affect the use of tPA. For instance, tPA must be given within hours of the onset of the stroke. If a person did not immediately go to the hospital, he or she may not be able to receive tPA. Further, tPA may not be available at all hospitals. In addition, tPA cannot be given in certain medical conditions, limiting its use. Even when these factors are considered, the rate of administration of tPA is low. One factor that has not been carefully studied is the physician’s decision-making process. It was because of this that Dr. Shamy and his colleagues examined the factors that influence physicians’ decisions in treating acute stroke with IV tPA in “The complexities of acute stroke decision-making: A survey of neurologists.”<sup>3</sup>

**HOW WAS THE STUDY DONE?** The authors hypothesized that physician biases, beliefs, personal experiences, uncertainty, and systems factors (e.g., hospital bed availability, cost) could influence a neurologist’s decision-making process during an acute stroke. To test this hypothesis, the authors distributed a 21-item e-mail survey to 70 neurologists in Ontario, Canada. All the neurologists manage acute strokes. More than two-thirds (69%) treated acute stroke more than 5 times per month. The physicians had been in practice for

more than 5 years. In other words, the group of neurologists who answered the surveys was very experienced in the treatment of acute stroke.

**WHAT WERE THE RESULTS?** The survey results were anonymous. Sixty-nine percent answered the questions. Ninety-six percent of respondents believed tPA was an effective treatment for stroke. However, respondents were less likely to give it to patients over the age of 80, patients from nursing homes, and patients diagnosed with dementia. When comparing “younger” vs “older” neurologists, those who were in practice for more than 10 years were more likely to administer tPA to patients with dementia. Interestingly, in response to hypothetical clinical situations with “ideal” tPA candidates with optimal circumstances, 100% would have treated a man over age 80, compared to 64% who would have treated a 64-year-old man with mild dementia.

All respondents recognized that uncertainty in the diagnosis of stroke is an important factor that affects decision-making. However, 96% believed that this was an uncommon occurrence. Most (87%) of the respondents believed that uncertainty lay in the interpretation of diagnostic imaging studies (CT scans, MRIs). The authors revealed that physicians’ uncertainty of diagnostic imaging procedures influenced their decision-making, but this study was unable to identify the source for physician uncertainty.

All respondents reported having witnessed the “Lazarus effect” during their career, which is characterized by rapid recovery after the administration of tPA. Despite this, one-third (35%) of respondents were less likely to administer tPA to patients with presumably worse prognoses, especially if the neurologist had more experience managing acute strokes. Similarly, 29% of respondents were less likely to administer tPA if they believed the patient might require assisted living after the hospitalization. Only 52% of respondents experienced stroke as a family member or friend of a patient, but only about half (52%) believed their own personal experience with stroke and tPA influenced their practice.

There are several arteries that bring blood to the brain, but the middle cerebral artery is a major artery that supplies blood to a large area of brain that contains several important regions. As a result, an obstruction of this artery can cause weakness, deficits in sensation,

impairment of vision, and difficulties with language. Consequently, 70% of respondents believed that a large stroke of the middle cerebral artery was a fate “worse than death.” This belief may partly explain the small percentage of physicians who would treat patients with this devastating type of stroke.

Drs. Shamy and Jaigobin also explored the effect that systems factors like the time of day the patient arrives at the hospital or the availability of hospital rooms have on physician decision-making. It appeared as if these do not have a major impact. In fact, only one respondent was less likely to give IV tPA for a stroke if it happened in the middle of the night, if the intensive care unit was fully occupied, or if the patient could be sent to another hospital without tPA.

**WHY IS THIS STUDY IMPORTANT?** Studies like this one help to highlight and clarify the rationale behind the treatment of acute stroke. They allow us to understand the individual approaches that different physicians take to identical clinical problems. This study suggests that neurologists’ decisions about tPA are based on many factors. Some of these factors include their own opinions about the quality of life a person might have after a severe stroke. For instance, Dr. Shamy discovered that most of the surveyed neurologists were less likely to give tPA to patients with dementia (like Alzheimer disease). This is in contrast to recent studies that have shown that there is no greater risk to tPA in people with dementia. Further supporting this finding was the observation that the physicians were less likely to treat patients with more severe strokes or those who might require assisted living.

Drs. Shamy and Jaigobin proposed that economic considerations like costs of tPA, post-tPA monitoring, and nursing care may outweigh the potential benefits of tPA use in certain populations.

While this study is a step toward recognizing and identifying factors that affect physician decision-making, it has some limitations. For example, this survey only contained a small number of participants from one geographic location in Canada, which means that these responses may not be representative of most physicians. Further, because the medical system is set up differently in Canada, these results may not reflect the factors that influence decision-making in other countries.

Additionally, there was no way of ensuring the respondents were answering honestly. The survey did not allow physicians to provide explanations for their answers. The survey also may not have taken into account all the factors that may affect stroke care like patient race or socioeconomic status. Further studies are needed to elucidate all the factors affecting decision-making and to survey a larger population of physicians. Nevertheless, this study demonstrates that acute stroke care is influenced by uncertainty, personal beliefs, and biases. Identifying and understanding these factors allows physicians to be more mindful of their own decision-making process so that they can provide patients with the best care possible.

## REFERENCES

1. Centers for Disease Control and Prevention. Prevalence of Stroke, United States 2006-2010. Available at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6120a5.htm>. Accessed August 2013.
2. Hills NK, Johnston SC. Why are eligible thrombolysis candidates left untreated? *Am J Prev Med* 2006;31(suppl 2): S210–S216.
3. Shamy MCF, Jaigobin CS. The complexities of acute stroke decision-making: a survey of neurologists. *Neurology* 2013; 81:1130–1133.

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# About stroke

*Adapted from: Leonard AD, Brey RL. Blood pressure control and stroke: an ounce of prevention is worth a pound of cure. Neurology 2002;59: e1–e2.*

**WHAT IS STROKE?** A stroke, or brain attack, is caused by the sudden loss of blood flow to the brain or bleeding inside the head (see below for more details). A stroke causes brain cells to die. This damage can cause paralysis, speech problems, loss of feeling, memory and reasoning problems, coma, and possibly death. Fortunately, there are effective ways to prevent stroke. If you have a stroke, seeking immediate medical attention can help reduce your chances of death and disability.

**WHAT ARE THE WARNING SIGNS OF STROKE?** The “Give Me 5” uses easy-to-remember words to help identify the 5 signs of stroke<sup>1</sup>:

- Walk—is their balance off?
- Talk—is their speech slurred or face droopy?
- Reach—is one side weak or numb?
- See—is their vision all or partly lost?
- Feel—is their headache severe?

**HOW COMMON IS STROKE?** Every year, about 780,000 people in the United States have a stroke and about 160,000 die. Stroke is the nation’s number 3 killer after heart disease and cancer. Stroke is the number one cause of adult disability.

Stroke is an emergency. Call 911 immediately if you or someone you know experiences any of the above warning signs. Jot down the time the symptoms started. Sometimes these warning signs last for only a few minutes and then stop. But even if that happens or if you feel better, call 911 for help.

## RISK FACTORS FOR STROKE THAT CAN BE TREATED OR CHANGED

- High blood pressure
- Atrial fibrillation (an irregular heartbeat)
- Diabetes
- Cigarette smoking
- Hyperlipidemia (high fat level in the blood)
- Alcohol abuse
- Obesity
- Sickle cell disease

**WHAT CAUSES A STROKE?** There are 2 types of stroke or brain attack. Ischemic stroke is caused by an interruption of blood flow to the brain. Hemorrhagic stroke is caused by bleeding inside the brain.

About 85% of all strokes are ischemic. Ischemic stroke can be caused by narrowing of the large arteries to the brain, also known as atherosclerosis. If a clot forms in the neck vessels, pieces can break off and block a brain blood vessel. Clots may also form in the heart and travel by blood flow to the brain vessels, where they become lodged.

Hemorrhagic stroke is caused by the bursting of a blood vessel in the brain. It accounts for about 15% of strokes. Subarachnoid hemorrhage occurs when there are weak spots on brain arteries (aneurysms) that burst and cover the brain with blood. Blood vessels in the brain can also burst if they are weakened by high blood pressure, diabetes, and aging.

**WHAT ARE THE TREATMENTS FOR STROKE?** Immediate medical care is critical for the person who is having a stroke or brain attack. New treatments work only if given within a few hours after the onset of a stroke. For example, a clot-busting drug must be given within 3 hours of stroke onset.

**HOW IS STROKE PREVENTED?** Some risk factors—age, sex, race, and a history of stroke in the family—cannot be changed. However, many others can be controlled. Most controllable risk factors relate to the health of the heart and blood vessels. The following can help prevent stroke:

- Having regular medical checkups
- Controlling high blood pressure
- Not smoking; stopping if you do
- Treating heart disease, especially an irregular heartbeat called atrial fibrillation
- Improving diet: avoid excess fat, salt, and alcohol
- Exercising
- Controlling diabetes
- Seeking immediate medical attention for warning signs of stroke

## REFERENCE

1. Akinwuntan AE, De Weerd W, Feys H, Baten G, Arno P, Kiekens C. The validity of a road test after stroke. Arch Phys Med Rehabil 2005;86:421–426.

**FOR MORE INFORMATION**

AAN.com for Patients & Caregivers

*<http://patients.aan.com/>*

National Stroke Association

*<http://www.stroke.org/site/PageNavigator/HOME>*

American Stroke Association

*<http://www.strokeassociation.org/presenter.jhtml?identifier=1200037>*

National Institutes of Neurologic Disorders and Stroke

*<http://stroke.nih.gov/>*

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