

Foreword

The most exciting thing I have seen during my career in medicine is the treatment that is now available to reverse strokes, making it possible for paralyzed and speechless people to return to normal lives. I have been practicing neurology since 1980, and when stroke reversal treatment became available in the mid-1990s, it changed my professional life. The excitement spilled over to the homefront as I began to tell my ophthalmologist husband, Rob, stories about dramatic stroke reversals and the amazing stroke team at Saint Luke's Hospital in Kansas City where I work.

Rob likes to talk to people. In fact, he is likely to engage the person next to him in conversation wherever he is, and for the past three or four years he has often brought up the topic of stroke treatment. Universally, the people he talks to are not aware of the symptoms of stroke or what treatment is available. Further, they do not know when or how to get help for themselves or someone else.

Seeing an opportunity for "spreading the word," Rob wanted to understand how the patients we were treating at Saint Luke's were getting to "the right place at the right time." The stories in this book are the result of personal interviews he taped with patients and their families in his effort to learn the stories behind the statistics. As you are about to read, they are dramatic and emotional.

Our hope is that you will find the stories interesting and informative and that they will inspire you to learn the symptoms of stroke and how to get to the right place at the right time in case you or somebody around you is affected by a stroke.

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Introduction

This is a book of true stories about ordinary people – people who didn't know much about strokes until they experienced one. They got to the right place at the right time and received stroke reversal treatment that got them back to living normal lives. They and their families agreed to tell their stories in the hope that others will have the same successful outcomes.

Stroke is the *leading cause of adult disability* and the third leading cause of death. Every year, 750,000 Americans suffer a stroke, one every 47 seconds. There are 4 million stroke survivors, many living with severe disability.

Despite its prevalence, stroke is poorly understood. Here are a few important facts:

- Strokes happen to the brain, not the heart.
- Many strokes are not associated with any pain or headache.
- People in every age group are at risk for stroke.
- *Strokes can be prevented and reversed.*

In 1996, the Food and Drug Administration (FDA) approved the first treatment to reverse strokes. Despite great hope that the number of disabling strokes could be significantly reduced, ten years later only 2-4 percent of stroke victims in the United States receive this revolutionary treatment. The reasons why so few people receive treatment are complex.

- Because strokes cause paralysis, difficulty with speech, and/or confusion, the patient is often not able to summon help.
- Others must recognize the symptoms and call for emergency assistance, thus initiating what is called “the chain of survival” (see page 6).
- The emergency responders have to recognize the symptoms, gather important information and transport the patient to a “stroke-ready hospital” (see page 7).
- The “stroke-ready” hospital must have specialized staff and equipment ready to provide stroke reversal treatment at all times of the day and night.

The stories in this book are about cases where everything fell into place to produce great results. The symptoms were recognized in time, the emergency personnel on the scene were prepared to act quickly, and the staff at the receiving hospital was competent and “stroke-ready.” This could be the norm rather than the exception if we as a nation focus attention and resources on stroke awareness and treatment as we have for heart attack in the past.



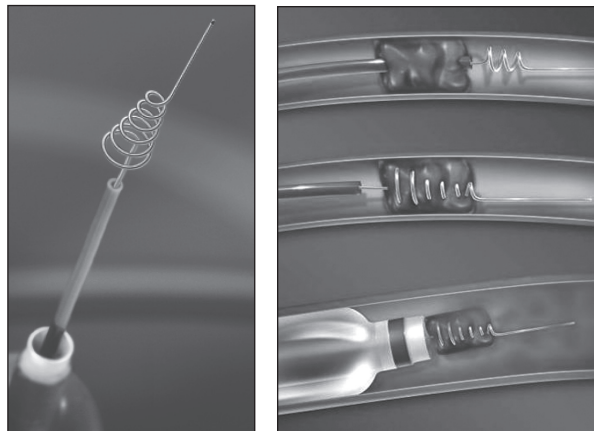
What You Should Know About Stroke

There are two major kinds of strokes. Bleeding in the brain is called *hemorrhagic stroke* and accounts for 15 percent of strokes. The strokes described in the stories in this book are called *ischemic (iss-kee-mik) strokes*. This kind of stroke accounts for 85 percent of all strokes. Ischemic strokes are caused by a blood clot blocking an artery in the brain, much like a clogged plumbing pipe. The arteries of the brain are performing the important function of carrying nutrients and oxygen to the brain cells. Once the artery is blocked, the cells start starving and there is only limited time to unblock the artery before the brain cells die, causing permanent disability.

How to Dissolve Blockage

There are two ways to get rid of the blockage caused by the blood clot. The clot can be dissolved with a clot buster drug called *tissue plasminogen activator (tPA)* and/or the clot can be mechanically removed. The tPA functions like Drano™ in the pipe; the

mechanical device is more like Rotor Rooter™. The mechanical device described in the following stories is the Merci® Retriever, the first device



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developed specifically for removal of clots from arteries in the brain. It is a wire shaped like a corkscrew that can be “screwed” into the clot and extracted. In some of the stories it is referred to as the “corkscrew.”

We have the tools, but first the patient has to arrive at the right place at the right time – a critical factor as you will read.

Time – The Chain of Survival

The following steps make up what has come to be called “the chain of survival.” Each step is extremely critical if the stroke victim is to have a chance for successful treatment and reversal.

1. Recognition of Symptoms

Because of paralysis, speech or visual impairment, confusion or other symptoms, it is usually someone other than the stroke victim who recognizes that something is wrong. Therefore, it is important for *everyone* to know the warning signs of stroke:

- Sudden weakness or numbness on one side of the body
- Sudden loss of vision, especially if one eye is affected
- Sudden difficulty speaking or understanding speech
- Sudden severe dizziness or headache

Note: Most ischemic strokes are NOT associated with headache so the absence of pain does not rule out a stroke.

A quick and easy way to assess the situation is to use the **FAST** system.

- F** See if the two sides of the *face* look the same. If one side is drooping, something is wrong.
- A** Ask the person to hold his or her *arms* up. If one side is weak, something is wrong.
- S** Ask the person to *speak*. If the speech is garbled or slurred, something is wrong.
- T** T is for **TIME**. If any of the **F**, **A**, or **S** components indicates that something is wrong, call 911.
*It is very important to note the **TIME** the symptoms started.*

2. 911

Get help as fast as possible by calling 911.

3. EMS (emergency medical services)

Recognition of stroke symptoms is part of EMT training. EMT personnel are very knowledgeable about stroke and can play a major role in making a quick decision to get the patient to a “stroke-ready hospital.” However, in most states, policy requires that they take the patient to the closest hospital unless the patient (or somebody acting on his or her behalf) makes a request for a specific “stroke-ready” hospital. It is important for everyone in every community to know which local hospitals are “stroke ready.”

4. Hospital Arrival

In most cases a patient with stroke symptoms is transported to the closest hospital as mentioned above. Ideally, the hospital is ready to handle the stroke. Hospitals of any size can be “stroke ready.” This simply means that when a patient arrives, a plan is in place to act quickly to treat the patient or transport him or her to a place where proper treatment can be given.

Many small hospitals have a referral relationship with a larger hospital where acute stroke treatment can be given. In some instances the initial treatment is begun in the small hospital and the patient is then transported by ambulance or helicopter to the comprehensive stroke center hospital.

The regional network model, pioneered by Saint Luke’s Hospital in Kansas City, can be replicated in most regions of the United States. A hub-and-spoke stroke care network can be developed to serve patients within a 150-mile radius. As treatment windows (the optimal time of treatment after the onset of symptoms) expand to eight or nine hours, the radius can be extended.

A central comprehensive stroke center partnered with metropolitan, suburban and rural hospitals can be very effective in providing stroke reversal treatment to every patient who reaches the hospital in time via ambulance or helicopter. Telemedicine consultation can expand the geographic limits even further, even to western Kansas where there are six people per square mile. Everyone deserves access to care.

5. CT Head Scan

A computerized tomography (CT) scan of the head is a specialized X-ray that can visualize the brain in detail. It is very important that the CT scan is done quickly after arrival at the emergency room. This test is done to evaluate stroke symptoms to make sure there is no bleeding in the brain. If there is bleeding, it is a hemorrhagic stroke, which is treated with other types of therapy. It is dangerous to treat hemorrhagic strokes with clot buster drugs or mechanical devices so an immediate CT scan is essential in determining what comes next.

6. Stroke Treatment

As mentioned, there are two primary ways of treating an ischemic stroke, the most common type of stroke.

Clot buster treatment, tissue plasminogen activator (tPA), can be given in two ways:

- *Intravenous tPA* (injection of the drug into the vein) is approved by the FDA. It can be given IF the treatment can start within THREE HOURS after the onset of the stroke symptoms.

Note: If someone awakens with stroke symptom, the time of onset is set by the last time the person was observed or reported to be normal.

- *Intra-arterial tPA* (injection of the drug into the brain artery that is clogged) is not approved by the FDA and, therefore, requires special consent from the patient or family. This method of treatment is performed in the radiology department by an interventional neuroradiologist, who threads a catheter up into the brain artery much the same way cardiac catheterization is done.

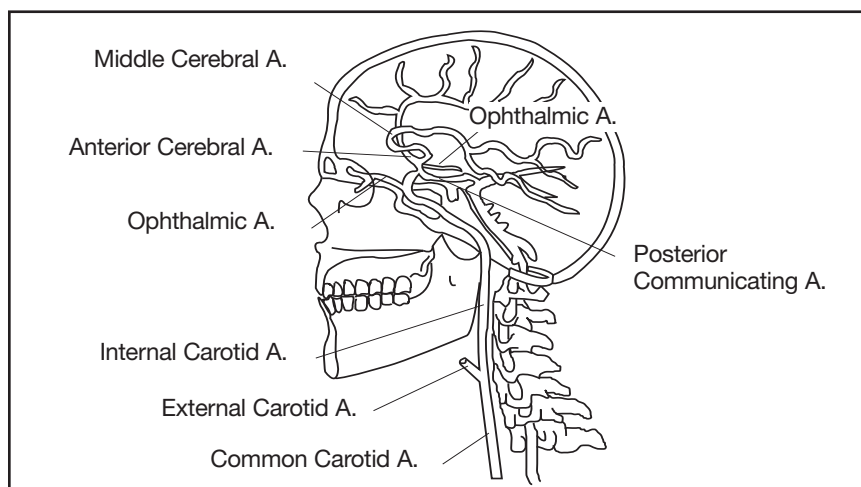
This procedure can be done up to SIX HOURS after the start of the stroke.

The Merci® Retriever (approved by the FDA for clot removal in 2004) is often used in combination with tPA. *It can be used to remove the clot mechanically up to EIGHT HOURS after the start of the stroke.*

In many of the stories you are about to read, intravenous tPA was given at a local hospital, and the patient was then transported to Saint Luke's Stroke Center by ambulance or helicopter for further treatment. The physicians and nurses in the emergency departments in and around Kansas City who are meeting this challenge make an essential contribution to the great outcomes for these patients. Regional stroke networks can be established throughout the United States in this same way to produce the same wonderful outcomes.

Brain Arteries

Four major arteries supply the brain: two carotid arteries in the front of the neck and two vertebral arteries in the back of the neck.



Vertebral arteries. These two arteries derive their name from the fact that they run inside the vertebral bones of the neck; their pulse cannot be felt. The vertebral arteries come together at the back of the brain to form the basilar artery. This artery is essential to life as it feeds the part of the brain that controls breathing, heart rate and other vital functions. When the basilar artery is obstructed by a clot, life itself is threatened. The mortality rate for patients with basilar artery clots is 80-90 percent.

Carotid arteries. The pulse of the carotid arteries can be felt at the angle of the jaw on both sides. The carotid arteries on each side divide into the middle cerebral arteries (MCA) and anterior cerebral arteries (ACA).

MCA strokes are the most common. If the right MCA is obstructed (*occluded*) by a clot, the left side of the body is paralyzed. As several of the stories in this book recount, patients often have no understanding of what is happening and cannot even recognize their own limbs. This is called "neglect." If the left MCA is obstructed, the right side of the body is paralyzed.

When this happens, the patient is often unable to speak since the left side of the brain controls speech in most people.

Strokes in the ACA are much less frequent and cause paralysis on the opposite side of the body from where the clot occurs.

The Heart and Stroke

Strokes can be caused by many conditions. High blood pressure, high cholesterol, diabetes and smoking increase the likelihood of a stroke.

As mentioned earlier, stroke happens to the brain, not the heart. However, approximately 30 percent of strokes are caused by conditions of the heart. For example, several of the stories you are about to read mention *atrial fibrillation*. This is an irregular heartbeat that increases stroke risk substantially. Blood thinning with warfarin, a blood thinner taken by mouth, can reduce the risk of stroke in people who have atrial fibrillation. People who have *congestive heart failure* with low pumping strength in the heart are also at risk for stroke and may be treated with warfarin.

Finally, some of the people who are profiled in the stories have a *patent foramen ovale* (PFO), a hole between the upper chambers of the heart that normally closes at birth. Twenty percent of the time it doesn't close completely. This is a potential way for clots to travel to the brain. PFOs can be detected by special ultrasound pictures of the heart called transesophageal echocardiograms (TEEcho or TEE). It is especially important to look for this condition in young people who have strokes because they do not have any of the usual risk factors for stroke such as high blood pressure.

Stroke Prevention

Many strokes are preventable. Therefore, it is important to know how to decrease the risk of stroke. The following parameters are general recommendations for stroke risk reduction, but every person should have a general physical exam and blood tests to determine his or her target ranges.

- Blood pressure – 120/80 or lower
- Cholesterol – 200 or lower
- LDL (bad cholesterol) – 100 or lower
- Optimal control of diabetes
- No smoking
- Atrial fibrillation treated with warfarin (in most cases)
- Regular exercise
- Ideal weight

A Plan for You and Your Family

Stroke is a devastating event made especially so because the onset comes as a total surprise. The best way to ensure the best possible outcome is to be prepared with a plan of action.

- Assess and treat risk factors for stroke – see above.
- Find out what hospitals in your area are “stroke ready” and how often stroke victims get reversal therapy there.
- Know the warning signs of stroke (p. 6).
- If a stroke occurs, direct the emergency responders to the “stroke-ready” hospital you have identified.
- If there is any delay in the emergency department, insist on immediate attention.



Saint Luke's Hospital Stroke Center

Saint Luke's Hospital in Kansas City, Missouri, is a not-for-profit hospital with 580 beds. Approximately 700 stroke patients are cared for in a given year. Opened in 1993 as one of the first organized stroke programs in the United States, the Stroke Center at Saint Luke's is now part of the Mid America Brain and Stroke Institute.

The Stroke Center provides around-the-clock acute stroke care for the entire region surrounding Kansas City. Over 60 metropolitan, suburban and rural hospitals routinely refer patients for acute stroke reversal treatment. Compared to the average treatment rate in the country of 2-4 percent, Saint Luke's Stroke Center is able to treat 25-30 percent of patients suffering from stroke.

The emergency, laboratory and radiology departments work closely with the stroke team neurologists and interventionalists to provide stroke reversal therapies quickly after the patient arrives. In addition, the stroke team neurologists provide phone consultation to emergency department physicians at other hospitals so that stroke treatment can begin even before the patient is transferred to Saint Luke's. This is a model that can be successfully replicated across the United States.

The main reason the treatment rate is low is that the patients reach the hospital too late after the onset of symptoms.

Because of its ability to treat patients quickly, Saint Luke's stroke team is routinely asked to test new drugs and devices for acute stroke reversal. In fact, several of the patients featured in this book participated in such testing. For example, more patients have been treated with the Merci® Retriever at Saint Luke's Hospital than anywhere else in the world. *TIME* magazine, *The New York Times*, *Newsweek*, *Business Week*, *48 Hours*, the *Discovery Channel* and *ABC World News Tonight* have reported on the innovative therapies at Saint Luke's Hospital Stroke Center.

At the time the patients in these stories were treated, the stroke team neurologists were Irene Bettinger, MD, Charles Weinstein, MD, Stephen Arkin, MD, Christine Boutwell, MD, and Michael Schwartzman, DO. The interventional neuroradiologists were Naveed Akhtar, MD, and Thomas Grobelny, MD.



The Stories

The stories you are about to read are dramatic and emotional. They are all about successful stroke reversals. You will note some common themes. Most stroke victims cannot access help for themselves. That is the main reason why it is essential for everyone to be able to recognize the warning signs of stroke. A family member, neighbor, friend or bystander is usually the one who recognizes the problem and summons help. Many times, the family member has to advocate for the patient to make sure that he or she accesses the right hospital and that the tests and treatment are carried out quickly. In some of these cases, the decision by the ambulance crew to get the patient directly to a major stroke center saved precious time.

In all cases, everything fell into place in a very short time, resulting in wonderful outcomes reported here. Unfortunately, this is not always the case. The purpose of telling these stories is to increase stroke treatment awareness so that more people will get to the right place at the right time and will walk back into their lives free of major disability.

The stories are organized by age, from youngest to oldest. This is a reminder that every age group is at risk for stroke. The bold italicized text indicates direct quotes from the patients or families taken from the transcripts. In some cases, the transcripts were edited for brevity. The comments are included to emphasize the message in each story.

