Chapter 1

A Brain Attack

In This Chapter

- Taking a sudden hit from stroke
- Targeting the different types of stroke and their causes
- Profiling the likeliest stroke victims
- Responding to stroke for the best outcome
- Coping and adjusting to life after stroke

Let me hit you with the bad news first: Stroke kills, stroke destroys, stroke debilitates. Stroke is the third most common cause of death in the United States, and the number-one cause of serious disability. One year after the most common kind of stroke, approximately 30 percent of those afflicted will have died, and another 30 percent will have a moderate to severe disability.

Now for some good news: Of those who experience the most common type of stroke, approximately 40 percent are left with only a mild or no disability one year later. And each year more people survive and recover from stroke as medical research continues to advance effective treatment. Today, recovery with improvement is the rule rather than the exception.

Stroke is sometimes called a brain attack. I wish this label would catch on, because I think that people might then understand that stroke is an emergency — like a heart attack — and call 911 right away! A heart attack threatens your heart; a stroke threatens your brain. In truth, most stroke *is* like a heart attack: It's a problem with blood vessels, and time is really important. However, heart attack is a little easier to recognize. First of all, the pain tells you something is wrong — and it is usually near your heart. Most strokes are painless, and the symptoms, a paralyzed arm or leg for instance, are not obviously related to the brain.

Clearly, the more you know about stroke — its symptoms, causes, risks, treatment, and prevention — the better your chances of living a full and productive life with or, better yet, without stroke. And the first lesson is to learn what stroke is and how and why stroke occurs.

Real-life examples

A 57-year-old man arrives early at work to prepare for an important presentation he has to make at 10 a.m. At about 9:15 he notices a headache. He thinks this is unusual, because he doesn't have many headaches. He remembers that he did forget his blood pressure medication. He continues to work for a few minutes and then notices his right hand is not working and he can't concentrate. He calls for his assistant who finds him looking very unusual. His mouth is twisted. He starts to talk but his speech is difficult to understand. She asks if he is okay. He says no. He starts to get up but his right arm gives way and he almost falls. His assistant calls 911.

A 68-year-old woman is preparing breakfast for herself and her husband. He has made the coffee and is reading the newspaper. He hears her drop a plate and looks up to see her standing and looking at her left hand. He asks her what's wrong. She says she doesn't know. Her face — particularly the way she is holding her mouth — looks unusual. She keeps looking at her hand. "My hand is numb," she says. He asks her to sit down. She seems confused as he leads her to a chair. He asks if it hurts. She says no. "I think you're having a stroke," he says. He dials 911.

A 38-year-old lawyer is out jogging on a canal towpath. She starts to feel pain in her head that gets worse and worse. She stops, puts her hand to her head, and falls to the ground. A man walking ahead of her sees her fall. He runs to her but she is unconscious. He pulls out his cellphone and dials 911.

If you've already had a stroke, there are many opportunities to reduce the disability that stroke causes and prevent another stroke attack. A serious stroke will affect your entire family. You can fight back together.

Attacking Out of the Blue

Stroke is nothing if not *fast.* Each year, as many as 750,000 people in the United States suffer a sudden and unexpected attack of the brain. When part of the brain is deprived of oxygen — which is what is happening when stroke hits — it doesn't take long for the catastrophe to make itself evident. A minute or less.

Whether it's a sudden inability to speak, the crash of a dish from a hand that can no longer grasp, or loss of consciousness, a brain attack strikes its victims quickly and powerfully and without warning.

Or does it? Although your stroke may occur in a lightning flash, it has most likely been years in the making, with conditions such as high blood pressure, high cholesterol, obesity, and diabetes possibly serving as warning signs that the brain is in danger. Basically, as these conditions cause wear and tear on your blood vessels, your risks increase of suffering either a blockage or rupture of a brain artery. And — suddenly — you're in stroke mode.

So how does it happen? It starts with the brain.

Going to the source: Stroke is in the brain

Because of a number of possible causes — which I explain in detail in this book — part of your brain may be deprived of blood. When that happens, it doesn't take long for your brain to suffer. In a nutshell, the glucose and oxygen transported by one of the brain's arteries are not reaching some part of the brain, which in less than a minute will begin to shut down. And you will show signs of stroke.

The 50 professional groups forming the Brain Attack Coalition describe the signs of stroke as follows:

- Sudden numbness or weakness of face, arm, or leg, especially on one side of the body
- Sudden confusion, trouble speaking or understanding speech
- Sudden trouble seeing in one or both eyes
- Sudden trouble walking, dizziness, loss of balance or coordination
- Sudden severe headache with no known cause

Most of the time, a stroke victim feels no pain as the stroke is occurring — so there is not much evidence to clue you in that the reason your hand looks funny and doesn't move when you want is because there's something wrong in your head.

Most people who have a stroke don't know what is happening to them. Most people who see someone who's had a stroke don't know what is happening.

A stroke doesn't hurt (except if a headache accompanies it), and its most obvious effects are far from the brain where the problem is located. This means a lot of people don't recognize they are having a stroke and can't use the opportunities they have to get into the hospital quickly and be treated.

Damage in your brain, symptoms someplace else

So, why is it that a blocked artery in your brain causes you to lose control of your legs and fall to the floor? Suppose a small blood clot forms in your heart and flows with the blood up into your brain and plugs an artery that feeds a part of your brain near the top of your head. Normally, that part of the brain sends nerve impulses down threadlike fibers through the base of your brain and along your spinal cord down to a point a couple of inches below your lowest rib. There those nerve fibers connect to other nerve fibers that extend down to muscles in your legs.

But without blood flow, the affected part of the brain stops sending messages. Your leg muscles only work when they receive messages, so they stop working. But the other parts of your brain that *are* getting oxygen and glucose don't understand that the whole team's not on board and look at the leg in confusion, trying to comprehend why it's not cooperating, not realizing that the problem is right upstairs.

The brain is sensitive to the slightest touch of your skin, but completely insensitive to serious injury to itself. As remarkable as it may seem, the brain is very poor at recognizing when it has been injured. This makes it hard for you to figure out what is going on when you have a stroke.

Responding quickly: Time is brain

Your brain is completely unprepared when blood flow is cut off. The organ is so packed full of knowledge and memories that there is no room in the design for storing sugars and fats that could keep brain cells alive in hard times when blood stops flowing.

Most other cells in the body can survive for up to an hour without blood flow. The brain cells stop working in a matter of seconds and start dying after five minutes.

The brain counts on the heart to do its job. That's why when you have a heart attack it is so important to get the heart restarted quickly. Within seconds after your heart stops, your brain stops working. Within minutes of the heart stopping, the brain is permanently injured and can't recover even if the heart gets going again.

In stroke, you have a *little* more time than in a heart attack. Because the heart keeps pumping, some blood can often get around the obstruction or broken portion of the blood vessels, or seep in from areas of the brain that are still getting blood. *But get yourself to a hospital right away. Call 911.* If you are going to get the best treatment, you need to get to a hospital within 60 minutes.

Recognizing Types of Stroke: Same Symptoms, Different Causes

Doctors can typically identify stroke when a patient comes in with symptoms — they're even pretty good at knowing what part of your brain may be damaged by the stroke just by looking at you. With some scenarios, such as a bursting *aneurysm,* a doctor can guess what caused the stroke. With other cases, it is almost impossible to tell what caused the stroke, although there is little doubt that a stroke is in progress.

Sometimes, with severe headache, for example, it's hard to tell whether a stroke is happening at all because the symptoms are similar to those of a migraine headache. A stroke might cause dizziness that is difficult to distinguish from an inner-ear infection.

Fortunately, testing instruments such as CT or MRI scans can indicate if there is a stroke and what its cause might be.

Red or white: Color-coding stroke types

A friend of mine, a cardiologist, once told me that neurologists make stroke too complicated with their jargon and classification. He said he just thinks of stroke like wine: There's red wine and white wine — and red stroke and white stroke.

What did he mean by this? Basically, some strokes are caused by *broken* blood vessels — which results in blood in the brain or brain area (thus, the *red*); other strokes are caused by the *blockage* of vessels to the brain, so no blood gets there (hence, *white*).

I liked his use of the color-coding and have found that when I talk to patients and their families, this explanation helps them better understand the cause of the stroke and what is happening in the brain. So throughout this book, you'll see that I classify the five major types of stroke into two general categories based on whether they are caused by bleeding (red) or blockage (white).

Oh, don't worry — I promise to give you the complex, hard-to-pronounce terminology, as well! Throughout the book, you will find the most commonly accepted medical terms for the types of stroke.

If you're ready now to track it down in a medical textbook, you'll find out more about red stroke under the term *hemorrhagic* stroke or *intracerebral hemorrhage.* White stroke is covered under the term *ischemic* stroke, *embolic* stroke, or *thrombotic* stroke.

A stroke by any other name

Stroke means that part of your brain has suddenly stopped working because of a problem with its blood supply. It may help to think of strokes caused by blockage as *white* strokes; they're most typically referred to as *ischemic* strokes by doctors. But here are some other names for this type of stroke:

occlusive stroke

cerebrovascular accident (CVA)

acute ischemic stroke

atherothrombotic stroke

embolic stroke

small vessel stroke

lacunar stroke

large vessel stroke

cardioembolic stroke

Ischemic stroke and *CVA* are probably the most common terms used. Doctors usually know what all these terms mean and use them each in different situations to mean virtually the same thing. "Little white stroke" and "big white stroke" could probably replace all these fine technical terms just as well, and everyone would know exactly what they meant.

I refer to strokes caused by bleeding in or around the brain as *red* strokes. Names for these types of stroke are equally varied:

subarachnoid hemorrhage (SAH)

intracranial hemorrhage

intracerebral hemorrhage (ICH)

brain bleeding

brain hemorrhage

Understanding white stroke

As you age, your blood pressure, diet, and the ravages of time roughen the fragile lining of your blood vessels and heart.

Your blood-vessel lining is like the coating on your best cookware — it keeps your blood from sticking and clotting. However, as you approach senior status, that Teflon-like protection starts breaking down, and your vessels develop spots where blood and other buildup stick to them.

Blood clots block blood to the brain

The most common sign of blood-vessel damage is *atherosclerosis,* also known as *hardening of the arteries,* the condition in which a rough, scarred area called a *plaque* forms because of high blood pressure and high fat content in your blood. (There is more about atherosclerosis in the Glossary and in Chapter 9.) The roughness makes it more likely that blood inside your arteries will form clots that can block arteries in the brain or break up into smaller pieces that are carried downstream to lodge in small brain arteries. Sometimes blood

clots can break off and flow downstream to form a blockage somewhere else, called an *embolism* (see Figure 1-1 for illustrations of atherosclerosis, blood clots, and embolism).

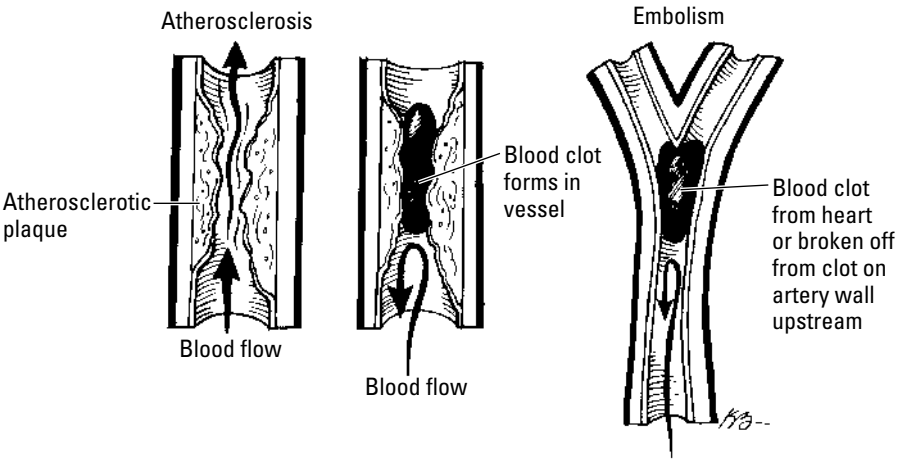

Figure 1-1: Plaque building up in the blood vessel causes a blood clot to form, which can block an artery and cause a stroke. Clots can also travel and block vessels downstream.

If the clot blocks blood to a part of your brain, you have a stroke. If the clot stays in place for even a short time, part of your brain dies, leaving a hole called a brain *infarction.* The affected area of brain turns from pink to white because there is no red blood flowing (another good reason to refer to this type of stroke as *white*).

Dissection: Blood vessel lining splits

White ischemic strokes are also caused by *dissection.* No, this doesn't mean somebody is practicing brain surgery on you. *Dissection* refers to the splitting of the blood vessel lining, typically occurring at a place where the blood vessel bends back and forth, such as in your neck. It can also happen where *atherosclerotic plaque* has built up in a brain artery. At the bend point or at the rough surface of atherosclerosis, a little flap of the vessel lining peels off and catches the blood as it flows quickly past. The blood dives under the flap and keeps tearing it. Eventually the blood can pack the lining against the other side of the vessel and stop blood flow completely. When the blood stops flowing, a white stroke occurs. Figure 1-2 shows how dissection causes stroke.

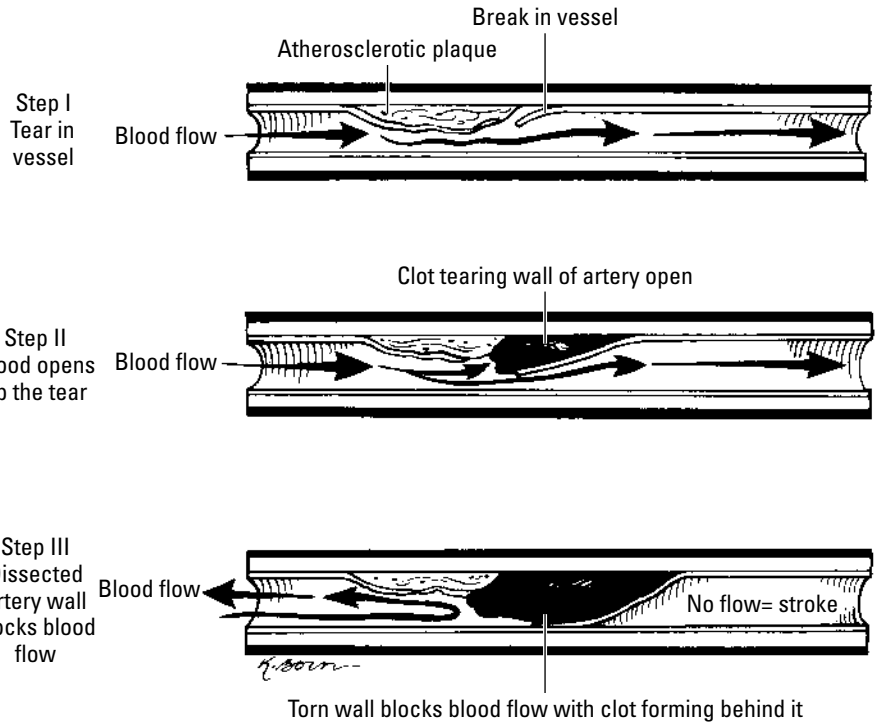

Figure 1-2: Blood flow can worsen a tear in the lining of a blood vessel and end up blocking it.

Transient strokes: Just as serious

White ischemic strokes may last just a couple of minutes and then clear completely. If the blood clot breaks up right away, the stroke is *transient* — so fleeting that no permanent tissue death occurred. These transient strokes are officially called *transient ischemic attacks.* Try to say that ten times fast. Doctors abbreviate it as *TIA.*

I don't like the term TIA or what it stands for because it doesn't tell you plainly that you had a stroke. A stroke is very serious even if it is transient, and you still need to consider it a medical emergency requiring a rapid response. After a TIA stroke, your next stroke may *not* be transient and you need to get busy to prevent it from happening. It could happen tomorrow.

You can have more than one transient ischemic stroke. As the number of these small strokes add up, your brain can just slow down generally, and you can suffer from dementia, as each small stroke erodes away more of your brain. Small white ischemic stroke dementia is often called *vascular dementia* or *vascular cognitive impairment.* This is the death of the brain by a thousand cuts.

Getting a handle on red stroke

Blood vessels can break and bleed into or around the brain, causing some of the most serious and deadly strokes. These type of strokes may result in similar symptoms to white stokes — although some are unique to red stroke — but in many cases, they should be treated differently.

Bleeding within the brain

A stroke caused by a blood vessel that breaks inside the substance of the brain is called *intracerebral hemorrhage, brain hemorrhage,* or *brain bleeding.* The brain goes from pink to red. Hence, the term *red stroke.* The vessels that bleed are often damaged extensively by high blood pressure or diabetes (Figure 1-3). The blood vessels have thick, fibrous, but weak walls. They form little *blebs* — bubble-like growths — from time to time. These brain vessels are very prone to break, especially when blood pressure is high.

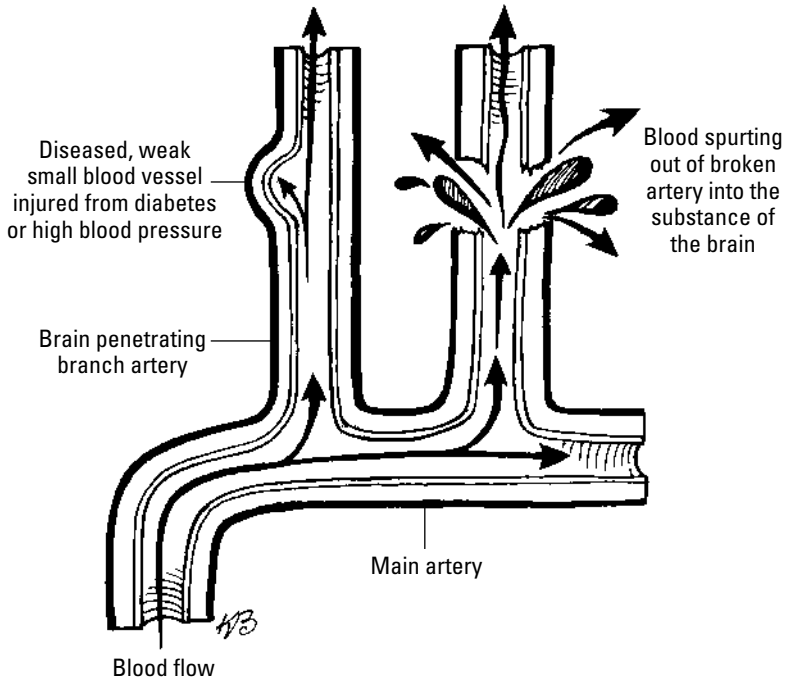

Figure 1-3: When a weakened blood vessel bursts inside the brain, an intracerebral hemorrhage is the result.

Bleeding around the brain

Sometimes red — or hemorrhagic — strokes are caused by bleeding just outside the brain, but still inside the skull (Figure 1-4). This type of red stroke is known as *subarachnoid hemorrhage.* The most common cause in this case is a little peanut or marble-sized bubble or pouch that forms at a Y-junction in a brain-bound artery. This bubble is called an *aneurysm.* It has tough, thin, rubbery walls and may actually be present for years before it starts causing trouble. Some never do cause trouble. But aneurysms may get larger as time passes and, as they do, doctors believe they are more likely to burst.

The result can be devastating as high-pressure blood from larger brain arteries floods into the space around the brain. If you aren't killed immediately, you have to survive weeks of recovery as your body tries to clean up the resulting mess. Further injury to your brain and rebleeding are likely, unless you get immediate medical attention.

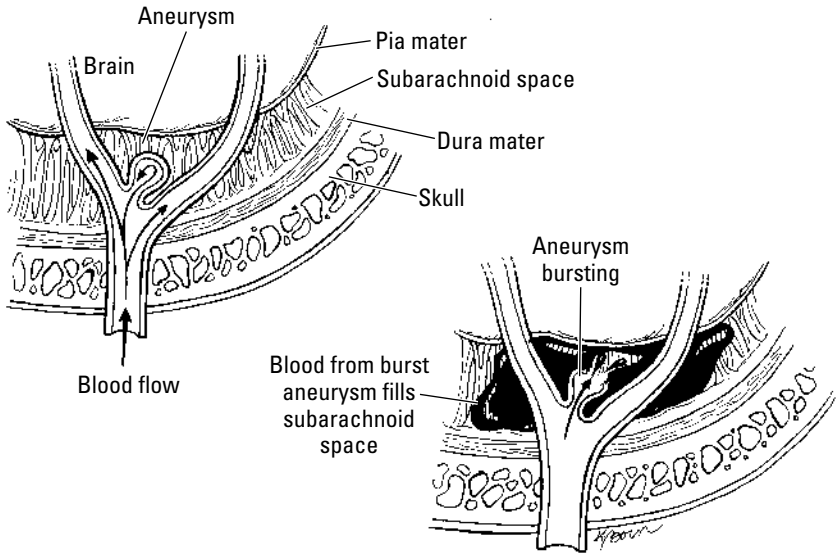

Figure 1-4: When a vessel bleeds into the space surrounding the brain, the result is a stroke called a subarachnoid hemorrhage.

This type of red subarachnoid hemorrhage stroke is usually accompanied by severe headache. Many people also fall down unconscious when the stroke first hits. The pain and loss of consciousness are both strong warnings that something serious is happening.

When red and white stroke occur together

White ischemic strokes can turn red if a blood vessel is injured and breaks in the area where lack of blood flow caused a brain infarction. The bleeding can become a major intracranial hemorrhage or it may just be a small leak that doesn't do much more damage than has already been done by the ischemia.

In a stroke that starts out as subarachnoid hemorrhage caused by an aneurysm, white ischemic strokes can occur 4 to 14 days after the aneurysm bursts. This is a time when the blood around the brain irritates the brain's blood vessels and they clamp shut. Blood flow stops and ischemic stroke can result. This is of course bad news for someone who has just started to recover from the bleeding.

Five stroke scenarios

Blood clots and bleeding aren't the only causes of stroke — but about 99 percent of strokes can be attributed to one of these reasons. In this book, I've identified the five most common stroke scenarios and dedicate a full chapter to each type:

White strokes

- Ischemic stroke, caused by a blood clot (Chapter 3)
- Transient ischemic stroke (TIA), also caused by a blood clot (Chapter 4)
- Multiple small ischemic strokes causing dementia or vascular cognitive impairment (Chapter 7)

Red strokes

- Intracerebral hemorrhage caused by bleeding in the brain (Chapter 5)
- Subarachnoid hemorrhage caused by rupture of an aneurysm and bleeding around the outside of the brain (Chapter 6)

Assessing Stroke Risk

If you've suffered a stroke, let me assure you of one thing: You are not alone. In the United States, 750,000 people experience a stroke each year. Of these three-quarters of a million strokes, here's how they break down in our red and white categories:

- Eighty percent are white ischemic strokes, including TIA and dementia.
- Fifteen percent are red intracerebral hemorrhages.
- Five percent are red subarachnoid hemorrhages.

Survival rates by type of stroke vary greatly. Clearly, your chances of survival are much better with a white stroke than a red subarachnoid hemorrhage:

- 80–90 percent survival rate of ischemic stroke
- 60–70 percent survival rate of intracerebral hemorrhage
- 40–50 percent survival rate of subarachnoid hemorrhage

Taking steps to prevent stroke

Fact is, neither you nor I nor your doctor knows for certain whether a stroke is in your future. It's not really possible to predict with any certainty exactly who will suffer a stroke. To some extent, having a stroke is a matter of bad luck.

But we do know that certain characteristics place you at a greater risk for stroke. We know that you are more prone to this particular form of bad luck if you have high blood pressure, smoke cigarettes, and/or have heart disease, diabetes, or high blood cholesterol levels. Researchers have identified a number of indicators that can help predict the likelihood of stroke. Some you can influence; others you can't.

Risk factors beyond your control

Unfortunately, you may be carrying some genetic, hereditary, gender, or age baggage that you simply can't change, such as:

- You've already had a stroke.
- You are 65 or older.
- You are African American.
- You are Hispanic.
- Stroke runs in your family.
- You are a man.
- You have diabetes.

Risk factors you can control

So you can't change your age (don't we all wish we could?), your sex, your past, or your forebears' genetic makeup. But I can offer you plenty of ways to

make changes in your life that will significantly reduce your risk of stroke. In fact, I devote four chapters of this book (Chapters 8, 9, 10, and 20) to stroke-prevention topics.

Some of the steps you can take to improve your outlook for a stroke-free future include the following:

- Treat high blood pressure with medication, if necessary.
- Reduce sodium in your diet to help control high blood pressure.
- Stop smoking.
- Lower "bad" cholesterol and raise "good" cholesterol through medication and diet.
- Maintain a healthy weight, which may reduce blood pressure and improve cholesterol levels.
- For women, consider the use of oral contraceptives or estrogen replacement therapy with the advice of a physician.

Treating Stroke: Fast Response Is Everything

Damage occurs quickly with the onset of stroke. Whether a brain artery starts bleeding or is plugged by a blood clot, in just minutes the symptoms become apparent. And in the next hours most of the damage will be done and the course set for the future.

In those first minutes and hours, a quick response and prompt course of treatment are critical in terms of reducing the amount of permanent damage and increasing odds for an optimal recovery.

Bottom line? Get to the hospital! If you're having the stroke, call 911. If you're watching the symptoms of stroke overtake an individual, call 911.

Once at the emergency room, the first course of action will likely be a battery of tests to verify which sort of stroke you are having. ER docs will likely take your blood pressure, start an IV, draw blood, check your heart, and perform a CT scan or an MRI to see your brain and determine what's going on. They'll gather this evidence as quickly as possible so they can start the appropriate course of treatment.

Treatment response for white stroke

In ischemic stroke, the goal is to dissolve or remove the blood clot as quickly as possible before the affected brain has gone from ischemia to infarction, or brain cell death. This is most often done with a drug called *tissue plasminogen activator* — or TPA.

TPA is a valuable drug and effective treatment, but it poses some risks. For example, it can aggravate bleeding — so it's critical to ensure that the stroke is a *white* stroke — and not *red.* Because of its risks, emergency-room physicians are cautious about using TPA. If they can't verify that the stroke onset was less than three hours prior, they will not prescribe TPA. After three hours has passed, the damage to the brain is mostly done, and the risks of TPA outweigh any benefit.

Treatment response for red stroke

Red stroke poses greater challenges to the emergency-room team. Treatments to stop bleeding are still being developed, and, currently, little can be done. However, your physicians will be keenly focused on keeping you alive through the first few days after your stroke. They will take efforts to lower your blood pressure, reduce any brain swelling, and keep you breathing.

The bleeding may cause you to stop breathing, or may make your brain swell. If we're talking subarachnoid hemorrhage — bleeding outside the brain — your doctors may consider surgery to patch an aneurysm or repair a ruptured vessel. I cover treatments for intracerebral and subarachnoid strokes in detail in Chapters 5 and 6.

Most people who find themselves in the middle of a stroke are unprepared — and being unprepared means losing precious time for treatment. The good news for you is this: Because you are reading this book, your eyes are now opened to the importance of fast response. Now's the time to research whether your community is one of the growing number of stroke-prepared locations where the emergency medical system and hospitals are fully prepared to respond to stroke. Stake out the best emergency center for stroke and have your "evacuation" plan in place. It's a minimal effort for maximum results.

Recovering from Stroke

If you've already had a stroke, improving your chances of recovery is as important as preventing the next one. And you can take many positive steps to increase your odds of a successful recovery.

Connecting with the best experts

You can prepare your own taxes and repair your car, but evidence is strong that placing your stroke care in the hands of a specialist will result in a healthier outcome than if you try to manage your recovery by yourself.

Stroke specialists from neurologists to physical therapists have a great deal to offer you, including the latest treatment opportunities when you first get to the hospital (quickly, we hope) and throughout your recovery. Some therapists are more experienced than others in taking care of stroke patients, however, and you want to seek out the best.

One of the best steps you can take is to find hospitals in your community that have special certifications as stroke centers. Check with your own doctor and with stroke patients in your community to find stroke specialists and experienced therapists.

Exercising your brain cells

You may have heard that your brain can't regenerate new brain cells to replace those that are injured by a stroke. For any practical application to your stroke, this is probably true. However, scientists are learning that the brain can change significantly in response to injury. Stroke studies of animals have established that new connections do form, and some evidence supports that this happens in humans, as well.

We don't know yet the extent to which exercise and physical and cognitive therapy can increase the extent of the restoration of function after a stroke. Exercising brain doesn't seem to build new brain tissue the same way that exercising muscle does. However, exercising muscles and joints does keep them flexible and strong so that they are more responsive to small improvements in brain function. And it is well-established that if you don't maintain your strength and flexibility after a stroke, you are less likely to regain as much useful function of an arm or leg.

Your full therapy program, developed and supervised by an expert, is likely to play an important role in your recovery. Adhering to the advice of your physical therapists and others on your recovery team will increase your results.

Asking for help

Stroke not only injures your brain and disables you, it also places stress on your family and your financial security. Often these stresses are more than a

married couple or a family can cope with. Recovery can be more complete if you decide to take advantage of a wide array of community, employer, and government programs that suit your needs.

You can learn a lot about the different ways to organize and pay for all the care available after a stroke. It often takes two or more people to keep track of all the different medical, social, and financial interactions that are imposed on you by your stroke disability.

Several million people in the United States are living with the consequences of stroke. Getting to know some of them can help you recover from your own stroke — and perhaps provide emotional support as an added bonus. Community organizations, hospital social workers, and perhaps your own doctor may be able to put you in touch with support groups and helpful resources.

Letting "use it or lose it" be your guiding principal

The basic principle of stroke recovery is *use it or lose it.* Use your muscles or they won't be there for you — even if your brain is able to rewire or relearn old skills. Keep your joints flexible, or you won't be able to bend them when you do recover some strength. Use the opportunities to prevent another stroke, or the next one you have may destroy all the gains of your recovery from your first stroke. Use your community resources and the help of friends when you need it. They often don't offer more than once, if at all.

Living with Stroke: Reasons for Optimism

No doubt about it, stroke is a devastating event, a medical calamity that can leave its victims severely disabled — or worse.

But study after study has shown that patients recovering from stroke do indeed improve with time. They are better at three months than they were when they left the hospital — and further along at a year than they were at three months. Function returns, depression fades, and the skills to live independently are gradually regained by a significant proportion of patients. And as stroke survivors become more knowledgeable about stroke and how to prevent it, they follow treatment plans that can dramatically reduce the chances of a second stroke.

Just as there are a lot of people who have strokes, there are a lot of people who survive their stroke and learn to live with a disability. Life can return to normal after a very mild stroke, but even with residual disability, you can still have a meaningful life.

Stroke comes as an unexpected bolt from the blue and can dramatically change your life. There are many opportunities to take actions that will reduce the bad effects of stroke on your independence and quality of life. Arming yourself with as much information as possible will take you far in your recovery and improve your ability to cope with life after stroke.