

## Stroke: A Treatable Emergency

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## The Basics of Stroke

- How Common is Stroke?
- The Who, What, and Why of Stroke
- Primary Prevention
- Current and Potential Future Treatments for Stroke
- Stroke Education Resources

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## How Common is Stroke?

- Stroke is the 3rd leading cause of death in the US
- In the US, 700,000 strokes occur each year
- Approximately 1 in 4 people die within one year after having an initial stroke
- In the US, approximately 46,000 more women than men have a stroke annually
- The number of people who experience a stroke greatly increases with age

American Heart Association. *Heart Disease and Stroke Statistics—2006 Update*. Dallas, Texas: American Heart Association; 2006. ©2006, American Heart Association.  
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## Stroke Prevalence Rates in the US

Population Group (stroke)	Prevalence (2003)
Total population	5,500,000 (2.6%)
Total males	2,400,000 (2.5%)
Total females	3,100,000 (2.6%)
White males	2.3%
White females	2.6%
African American males	4.0%
African American females	3.9%
Mexican American males	2.6%
Mexican American females	1.8%
Hispanic or Latino	2.2%

American Heart Association. *Heart Disease and Stroke Statistics—2006 Update*. Dallas, Texas: American Heart Association; 2006. ©2006, American Heart Association. Accessed December 9, 2005.  
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## Stroke Is a Major Medical Concern

- Every 45 seconds, someone in the US has a stroke
- Every 3 minutes, someone in the US dies from a stroke
- 30% to 50% of stroke survivors do not regain functional independence
- 15% to 30% of all stroke survivors are permanently disabled (ie, not able to walk, talk clearly, or feed themselves with a favored hand)
- Public awareness about the signs of stroke should be improved, so that patients and their loved ones realize when a stroke is occurring

American Heart Association. *Heart Disease and Stroke Statistics—2006 Update*. Dallas, Texas: American Heart Association; 2006. ©2006, American Heart Association.  
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## What is Stroke's Cost to Society?

**Total costs: \$57.9 billion**

### Direct costs

- Hospital: \$15.5 billion
- Nursing home: \$14.3 billion
- Home health care: \$3.1 billion

### Indirect costs

- Lost productivity/morbidity: \$6.4 billion
- Lost productivity/mortality\*: \$14.2 billion

\*Lost future earnings of people who will die in 2006, discounted at 3%.

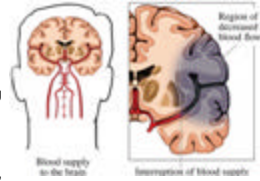
American Heart Association. *Heart Disease and Stroke Statistics—2006 Update*. Dallas, Texas: American Heart Association; 2006. ©2006, American Heart Association.  
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## What is a Stroke?

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## What is a Stroke?

- Blood traveling to the brain supplies oxygen and nutrients needed for survival
- A stroke occurs when an artery, leading to the brain or within the brain, is blocked or damaged. A clot can block an artery or an artery can burst reducing or completely blocking blood flow to an area of the brain
- Without the needed glucose and oxygen provided by the blood, brain cells may be irreversibly damaged. When a part of the brain is damaged, the part of the body it controls is affected



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What causes a stroke? American Stroke Association. Available at: [www.strokeassociation.org/presenter.jhtml?identifier=4755](http://www.strokeassociation.org/presenter.jhtml?identifier=4755). Accessed December 9, 2005. 236198 2/06

## What Are Signs of a Stroke?

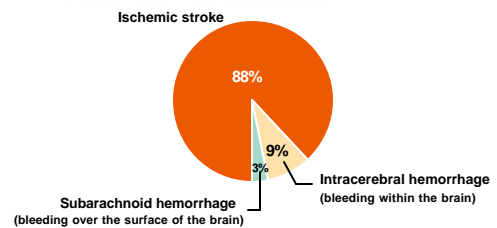
- Sudden numbness or weakness of the face, arm, or leg, especially on one side of the body
- Sudden trouble seeing in one or both eyes
- Sudden confusion or trouble speaking or understanding
- Sudden trouble with walking, dizziness, or loss of balance or coordination
- Sudden, severe headache with no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

**Call 911 immediately if you or someone you know experiences stroke symptoms**

Learn to recognize a stroke. American Stroke Association. Available at: [www.strokeassociation.org/presenter.jhtml?identifier=1020](http://www.strokeassociation.org/presenter.jhtml?identifier=1020). Accessed December 9, 2005.

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## Types of Stroke: Ischemic and Hemorrhagic<sup>1-3</sup>



1. What causes a stroke? American Stroke Association. Available at: [www.strokeassociation.org/presenter.jhtml?identifier=4755](http://www.strokeassociation.org/presenter.jhtml?identifier=4755). Accessed December 9, 2005. 2. American Heart Association. *Heart Disease and Stroke Statistics—2006 Update*. Dallas, Texas: American Heart Association; 2006. ©2006, American Heart Association. 3. What are the types of stroke? American Stroke Association. Available at: [www.strokeassociation.org/presenter.jhtml?identifier=1014](http://www.strokeassociation.org/presenter.jhtml?identifier=1014). Accessed December 9, 2005.

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## Ischemic Stroke: How Does it Occur?

- Cerebral thrombosis: blood clot (thrombus) that develops in an artery supplying the brain
- Cerebral embolism: typically caused by a clot that forms at another location, breaks loose and enters the bloodstream, passes into the brain, and blocks an artery

What are the types of stroke? American Stroke Association. Available at: [www.strokeassociation.org/presenter.jhtml?identifier=1014](http://www.strokeassociation.org/presenter.jhtml?identifier=1014). Accessed December 9, 2005.

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## Transient Ischemic Attacks (TIAs)

- TIAs are known as “ministrokes” or “warning strokes”<sup>1,2</sup>
- TIAs have stroke-like symptoms that last for a very short time (most are <5 minutes; average time ~1 minute), with no permanent effects<sup>2</sup>
  - Sudden trouble seeing in one or both eyes
  - Sudden numbness or weakness of the face, arm, or leg, especially on one side of the body
  - Sudden confusion or trouble speaking or understanding
  - Sudden trouble walking (dizziness or loss of balance or coordination)
- **Don't ignore TIAs – take immediate action:** call 911 so you can get to the hospital immediately. You may be able to prevent a major stroke from occurring<sup>2</sup>

1. What are the types of stroke? American Stroke Association. Available at: [www.strokeassociation.org/presenter.jhtml?identifier=1014](http://www.strokeassociation.org/presenter.jhtml?identifier=1014). Accessed December 9, 2005. 2. Transient ischemic attack (TIA). American Heart Association. Available at: [www.heart.org/presenter.jhtml?identifier=4781](http://www.heart.org/presenter.jhtml?identifier=4781). Accessed December 9, 2005.

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## Risk Factors for Stroke That Can't Be Modified

- Age<sup>1</sup>
- Gender<sup>2</sup>
- Family history<sup>3,4</sup>
- Race<sup>2</sup>
- Prior stroke or heart attack<sup>5</sup>

1. Brown RD Jr, et al. *Stroke*. 1996;27:373-380. 2. American Heart Association. *Heart Disease and Stroke Statistics—2006 Update*. Dallas, Texas: American Heart Association; 2006. ©2006, American Heart Association. 3. Kiely DK, et al. *Stroke*. 1993;24:1366-1371. 4. Welin L, et al. *N Engl J Med*. 1987;317:521-526. 5. Stroke risk factors. American Heart Association. Available at: [www.heart.org](http://www.heart.org). Accessed December 5, 2005.

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## Risk Factors for Stroke That Can Be Modified

- Diabetes<sup>1</sup>
- Excessive alcohol consumption<sup>2</sup>
- Heart disease (especially atrial fibrillation)<sup>1</sup>
- High blood pressure<sup>1</sup>
- High total cholesterol<sup>3</sup>
- High levels of C-reactive protein (CRP)<sup>4</sup>
- Metabolic syndrome<sup>5</sup>
- Obesity or inactivity<sup>4</sup>
- Smoking<sup>6-8</sup>

1. Sacco RL, et al. *Stroke*. 1997;28:1507-1517. 2. Gorelick PB. *Cerebrovasc Dis*. 1995;5:379. 3. Am I at risk? American Heart Association. Available at: [www.heart.org](http://www.heart.org). Accessed December 9, 2005. 4. Jialal I, et al. *Hypertension*. 2004;44:6-11. 5. Ninomiya JK, et al. *Circulation*. 2004;109:42-46. 6. Kawachi I, et al. *JAMA*. 1993;269:232-236. 7. Shinton R, et al. *Br Med J*. 1989;298:789-794. 8. Wolf PA, et al. *JAMA*. 1988;259:1025-1029.

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## You Can Be Prepared

If you or someone you know is at risk for a stroke, be prepared

- Get a list from your primary care physician of the hospitals in your area that can treat stroke
- Keep information about medical history in a convenient place
  - Make a list of current prescriptions, over-the-counter medications, and nutritional supplements, including doses and frequencies
  - Write down pertinent information about medical and surgical history
  - Note where insurance card is stored
- Note at what time the first symptom occurred
- Ensure all family members know to contact an ambulance by calling 911

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**Remember:**  
Call 911 immediately if you or someone  
you know experiences stroke symptoms

“Time lost is brain lost”

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## Preventing a Stroke

## Stroke Prevention

- Maintain a healthy body weight<sup>1</sup>
- Eat fruits and vegetables, especially broccoli, cabbage, cauliflower, brussels sprouts, green leafy vegetables, citrus fruits, and other vitamin C-rich fruit and juice<sup>2</sup>
- Eat whole grains<sup>3</sup>
  - Dark bread, whole grain cereal, popcorn, cooked oatmeal, wheat germ, brown rice, bran, bulgur, kasha, couscous
- Exercise (even brisk walking is beneficial)<sup>4</sup>
- Eat fish at least once a month<sup>5</sup>
- Don't smoke<sup>1</sup>

Note: please seek your doctor's advice before starting any of these prevention measures.

1. Pearson TA, et al. *Circulation*. 2002;106:388-391. 2. Josphipura KJ, et al. *JAMA*. 1999;282:1233-1239. 3. Liu S, et al. *JAMA*. 2000;284:1534-1540. 4. Hu FB, et al. *JAMA*. 2000;283:2961-2967. 5. He K, et al. *JAMA*. 2000;288:3130-3136.

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## Stroke Prevention (Cont'd)

- Treat modifiable risk factors
  - Lower high blood pressure<sup>1</sup>
  - Control diabetes<sup>1</sup>
  - Lower cholesterol<sup>1</sup>
  - Limit alcohol consumption<sup>2</sup>
  - Treat atrial fibrillation<sup>3</sup>
- Your doctor may recommend drug therapy for stroke prevention
- Recognize the warning signs of stroke and TIA<sup>3,4</sup>

1. Pearson TA, et al. *Circulation*. 2002;106:388-391. 2. Sacco RL, et al. *JAMA*. 1999;281:53-60. 3. What are the types of stroke? American Stroke Association. Available at: [www.strokeassociation.org/presenter.html?identifier=1014](http://www.strokeassociation.org/presenter.html?identifier=1014). Accessed December 9, 2005. 4. Transient ischemic attack (TIA). American Heart Association. Available at: [www.heart.org/presenter.html?identifier=4781](http://www.heart.org/presenter.html?identifier=4781). Accessed December 9, 2005.

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## Current Treatments, Preventive Drug Therapy, and Research in Stroke Therapy

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## Medications Used to Treat Ischemic Stroke

- Current treatments attempt to restore blood flow to the stroke region
- Intravenous rt-PA (recombinant tissue plasminogen activator) is currently the only drug therapy approved by the FDA to treat ischemic stroke

FDA = U.S. Food and Drug Administration.  
Albers GW, et al. *Chest*. 2004;126(suppl 3):483S512S.

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## Nondrug Treatments for Ischemic Stroke

- Acute treatment
  - Mechanical clot removal devices<sup>1</sup>
- Prevention
  - Carotid endarterectomy: surgery to open neck arteries<sup>2</sup>
  - Stenting: metal mesh tube that is inserted by means of a radiologic procedure

1. Becker K, et al. *Stroke*. 2005;36:400-403. 2. What is carotid endarterectomy? American Heart Association. Available at: [www.heart.org/downloadable/heart/110065676921546%20WhatIsCarotidEndArterect.pdf](http://www.heart.org/downloadable/heart/110065676921546%20WhatIsCarotidEndArterect.pdf). Accessed December 9, 2005.

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## Preventive Medications for Stroke

- A number of antiplatelet medicines such as aspirin, may be used to help prevent an ischemic stroke<sup>1</sup>
- However, not all patients can take aspirin
- Anticoagulants, like warfarin, are most commonly used in patients with atrial fibrillation
- Patients should speak to their health care providers about which treatment is right for them based on their current medication regimens and medical histories

1. Albers GW, et al. *Chest*. 2004;126(suppl3):483S512S.

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## Some Cells May Be Saved!

- When an artery is blocked (occlusion) and brain cells do not receive the oxygen they need, brain cells in the infarct (ischemic core of the stroke) may be damaged beyond recovery<sup>1-3</sup>
- The brain cells in the penumbra (the area that surrounds the ischemic core) still receive some blood<sup>2,4</sup>
- Cells in the penumbra have the potential to recover under the right conditions<sup>2</sup>

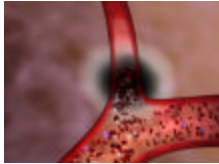


1. What causes a stroke? American Stroke Association. Available at: [www.strokeassociation.org/presenter.html?identifier=4755](http://www.strokeassociation.org/presenter.html?identifier=4755). Accessed December 9, 2005. 2. Lipton P. *Physiol Rev*. 1992;72:1431-1588. 3. Guido G, et al. *Stroke*. 1997;28:209-210. 4. Lo EH, et al. *Neuroscience*. 2003;4:399-415.

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## Ischemic Core

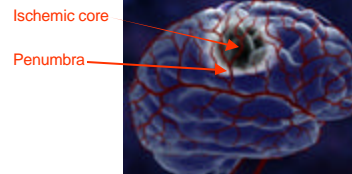
- The area receiving little or no blood flow, where cells die rapidly, is known as the ischemic core<sup>1</sup>
- The ischemic core is where blood flow is severely reduced to <15 to 20%<sup>2</sup>



1. Lo EH, et al. *Neuroscience*. 2003;4:399-415. 2. Lipton P. *Physiol Rev*. 1999;79:1431-1568.  
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## The Penumbra

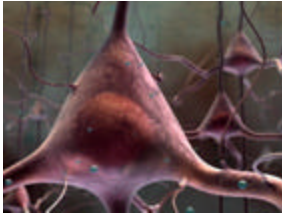
- Surrounding this ischemic core is an area of reduced blood flow called the ischemic penumbra<sup>1</sup>
- The penumbra's cells receive suboptimal blood flow (<40%)<sup>2</sup>



1. Lo EH, et al. *Neuroscience*. 2003;4:399-415. 2. Lipton P. *Physiol Rev*. 1999;79:1431-1568.  
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## Cells Within the Penumbra

- After a stroke, cells in the penumbra are in danger of cell death but are not immediately irreversibly damaged



Lo EH, et al. *Neuroscience*. 2003;4:399-415.  
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## Research in Stroke Therapy

- Current thrombolytics (drugs that break up the clot )
  - Few patients are eligible
- Goals of potential future thrombolytics
  - Fewer complications
  - Expanded time window and eligibility criteria

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## Research in Stroke Therapy

### Neuroprotective agents

- Aim to preserve viable brain cells in the penumbra by interfering with the damaging events that may lead to brain cell death
- May preserve brain cells in the penumbra, which could improve recovery from stroke

Fisher M. *Cerebrovasc Dis*. 2004;17 (suppl 1):1-6.  
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## Summary

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## Stroke Prevention and Treatment Summary

- Decrease your risk of stroke
  - Modify behaviors
  - Adopt a healthy lifestyle
  - Adequately control medical conditions under the care of a physician
- Know the signs and symptoms of stroke
- If you think you are having a stroke, call 911 immediately
  - “Time lost is brain lost”
  - Medications and surgical interventions may work best when started early

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## Resources

- American Heart Association: 1-800-242-8721; [www.americanheart.org](http://www.americanheart.org)
- American Stroke Association: 1-888-4-STROKE (1-888-478-7653); [www.strokeassociation.org](http://www.strokeassociation.org)
- Brain Attack Coalition: 301-496-5751; [www.strokesite.org](http://www.strokesite.org)
- Internet Stroke Center: [www.strokecenter.org](http://www.strokecenter.org)
- Joint Commission on Accreditation of Healthcare Organizations: 630-792-5000; [www.jcaho.org](http://www.jcaho.org)
- National Stroke Association: 1-800-STROKES (1-800-787-6537); [www.stroke.org](http://www.stroke.org)

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