

# Primary Stroke Prevention and Community Education

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**STROKE IS THE FOURTH LEADING CAUSE OF** death in the United States. Stroke affects almost 800,000 people in the United States each year with two-thirds of events being a first occurrence. Approximately 135,000 people die from stroke each year. In 2007, four of every 10,000 people in Rhode Island died from stroke-related complications.<sup>1</sup> According to the *Heart Disease and Stroke Statistics-2011 update*: A Report from the AHA, Rhode Island was third lowest in stroke mortality: 35 per 100,000 population.<sup>2</sup> This low rate in Rhode Island should not lend itself to complacency among health-care providers and patients. In addition to physical disability, the financial impact of stroke on patients, their families, and the healthcare system is significant.

## STROKE RISK FACTORS

Various clinical tools have been designed to assess a person's risk of having a first stroke. No one tool has been proven to be superior to all others. One such example is the **Framingham Stroke Profile (FSP)** tool. In the FSP tool, stroke risk factors [age, systolic blood pressure, diabetes, cigarette smoking, cardiovascular disease, atrial fibrillation, and **left ventricular hypertrophy (LVH)**] are assigned points. The tool predicts the ten-year probability of stroke based upon the number of total points.<sup>3</sup> Several easily accessible online stroke risk calculators can give clinicians and the general public an idea of ten-year stroke risk. These websites can be accessed through popular search engines by using the search terms "stroke risk calculator."

Stroke risk factors can be divided into two major classifications: non-modifiable and modifiable.

### Non-modifiable stroke risk factors

The non-modifiable stroke risk factors include age, gender, low birth weight, ethnicity/race, family history/genetic. As the name implies, these risk factors cannot be altered, and rates of stroke risk amongst them differ.

Stroke risk is lower in people ages 25-44 years old, while the risk of ischemic stroke and intracranial hemorrhage doubles for each successive decade after age 55.<sup>3</sup> Ischemic and hemorrhagic strokes tend to occur more often in men than in women. However, in women there is a bimodal pattern or increased stroke risk which includes women between the ages of 35-44 years old and women > 85 years of age. Possible explanations for this pattern include the use of oral contraceptives and pregnancies in younger women and a survival effect for older women, with more women alive at ages 85 and greater.<sup>3</sup> Low birth weight also appears to be a risk factor for stroke. Studies conducted in England, Wales, and the United States suggest that increased stroke risk in low birth weight infants may be due to lower socioeconomic status, malnutrition, and overall poor health. Babies weighing less than 2,500 grams have twice the risk of stroke when compared to babies weighing 4,000 grams.<sup>3</sup>

Race and ethnicity differences have also been recognized as an important stroke risk factor. By race and ethnicity, the risk of stroke is greatest in blacks and Hispanic Americans. Blacks had a 38% higher risk of strokes than whites in the **Atherosclerosis Risk In Communities (ARIC)** Study. Blacks tend to have a higher incidence of subcortical and lacunar infarcts which has been attributed to the higher incidence of hypertension in blacks when compared to whites.<sup>4</sup> Additionally, the death rate from stroke is twice as high in blacks when compared to whites, and in younger black populations (ages 45-64), it is three to four times higher.<sup>4</sup> Additionally, a family history of stroke leads to an approximately 30% increased risk of stroke.<sup>3</sup> Potential factors contributing to this increased risk for stroke in a patient with a family history of stroke, geographic origin, include inherited genetic disorders, inheritance of other risk factors, shared cultural and environmental lifestyles within families, and the interaction between environmental and genetic factors.<sup>4</sup>

There are also inherited or genetic disorders that may increase a person's risk for stroke. These inherited disorders include **CADASIL (cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy)**, **CARASIL (cerebral autosomal recessive arteriopathy with subcortical infarcts and leukoencephalopathy)**, **MELAS (mitochondrial myopathy, encephalopathy, lactic acidosis, and stroke)**, and a family history of intracranial aneurysms. Non-invasive screening for aneurysms is recommended when there are two or more affected first degree relatives with intracranial aneurysm or prior subarachnoid hemorrhage.<sup>3</sup> Inherited coagulopathies such as protein C and S deficiencies, factor V Leiden mutations, and other factor deficiencies can lead to increased risk for venous thrombosis, and are often inherited in an autosomal dominant fashion.<sup>3</sup>

### Modifiable Stroke Risk Factors

By definition, these risk factors can be potentially altered through dietary changes, lifestyle changes and/or medications. The most common and well-documented modifiable risk factors include hypertension, cigarette smoking, diabetes, hyperlipidemia, atrial fibrillation, carotid stenosis, and more recently obstructive sleep apnea.

Hypertension is the single most important modifiable risk factor for ischemic and hemorrhagic stroke.<sup>3</sup> In a national survey of hypertension in the United States between 1999 and 2000, it was estimated that 65 million people in the United States suffer from this disorder.<sup>3</sup> As blood pressure increases, so does the risk for stroke. Reducing blood pressure alone offers one of the largest risk reductions (32%) when compared to other modifiable stroke risk factors. According to the **Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC-7)** guidelines, blood pressure should be < 140/90 in the majority of the population and < 130/80 in patients who are diabetics, although the ACCORD study did not find benefit of

blood pressures less than 120 systolic in diabetics.<sup>5</sup> The JNC-8 report is expected to be released in the fall of 2011. Blood pressure goals should be achieved by lifestyle modification as well as medications.<sup>3</sup> Meta-analyses of studies looking at different blood pressure medications have shown no definitive evidence to date that one class of blood pressure medication offers any additional special protection against stroke over another class.<sup>3</sup> However, beta-blockers do not prevent stroke as well as other agents despite achieving similar reductions in blood pressure, in part because the risk of diabetes is higher with beta-blockers.<sup>6,7</sup>

Cigarette smoking has been identified as a potent risk factor for stroke, doubling the risk for ischemic stroke.<sup>3</sup> The stroke and cardiovascular risk reduction seen in people who stop smoking can occur rapidly and quickly approaches but never reaches that of nonsmokers.<sup>3</sup> According to the new AHA/ASA guidelines, a 50% reduction in stroke can be seen within one year of a smoking cessation.<sup>3</sup> Therefore, older patients and long-term smokers should not feel that they are too old or have been smoking too long to stop. Smoking cessation should be the goal of every patient, young or old. Smoking increases the risk for ischemic and hemorrhagic stroke in women on oral contraceptives compared to women who do not smoke. The risk for intracranial hemorrhage is somewhat more inconsistent.<sup>3</sup>

Diabetes has numerous adverse health effects on multiple organ systems in people, including the cerebrovascular system. The risk for stroke from diabetes ranges from two to six times higher.<sup>3</sup> The most recent statistics taken from the CDC website, report approximately 24 million people in the United States suffer from diabetes. In 2007, it was reported that 17.9 million Americans suffered from diabetes.<sup>3</sup> In Rhode Island, it is estimated that 6-8% of the population suffer from diabetes.<sup>1</sup> The American Diabetic Association website reported that in 2004 68% of patients with diabetes died from heart disease and 16% of patients with diabetes died from stroke. Consequently, a large number of diabetic patients die from the #1 and #4 most common causes of death. Improved glycemic control reduces other microvascular disease complications of

diabetes.<sup>3</sup> To date, intensive glycemic control has not been shown to reduce the risk of a first stroke in diabetic patients. In fact, targeting glycosylated hemoglobins below 6% results in increased mortality over five years and does not lower stroke risk.<sup>8</sup> Current recommendations suggest a target of less than 7%. Management of other stroke risk factors becomes more important in diabetics. Trials such as **Collaborative Atorvastatin Diabetes Study (CARD)**<sup>9</sup> and **Treating to New Targets (TNT)**<sup>10</sup> study showed that the use of a statin medication in a patient with the diabetes reduces the risk of stroke by 48% and 40%, respectively. The AHA/ASA guidelines state that statin medications should be used in diabetic patients but the addition of a fibrate is not useful for decreasing stroke risk. The benefit of aspirin for primary stroke risk reduction has not been demonstrated for patients with diabetes but should be considered in those patients with high cardiovascular disease risks.<sup>3</sup>

Dyslipidemia has been shown in most epidemiological studies to be associated with a higher risk for ischemic stroke. One meta-analysis estimated that statins can reduce the risk of all strokes by approximately 20%.<sup>3</sup> The **National Cholesterol Education Program (NCEP)** states that in general, an optimal LDL would be < 100 and near optimal levels would be between 100-129 mg/dL. HMG-CoA reductase inhibitor medications are recommended for primary prevention of stroke in patients with CAD or other high risk of populations.<sup>3</sup> The AIM-HIGH trial was recently stopped early because a futility analysis showed that high-dose extended release niacin added to simvastatin did not confer an advantage compared with simvastatin alone.<sup>11</sup> Further, the ACCORD lipid study found that the addition of fenofibrate to simvastatin did not further reduce the rate of fatal cardiovascular events, nonfatal myocardial infarction, or nonfatal stroke, as compared with simvastatin alone.<sup>12</sup> In the ILLUMINATE trial, torcetrapib, an investigational agent, raised HDL and reduced triglycerides but increased the rate of cardiovascular events.<sup>13</sup>

**Atrial fibrillation (AF)** is associated with a five-fold increased risk for ischemic stroke. Four other clinical features have also been found to increase the risk for stroke in patients with AF: prior stroke

or TIA, advancing age, hypertension, and diabetes.<sup>3</sup> Active screening for AF in patients >65 years old using EKG is recommended. Anticoagulation with warfarin (INR 2.0-3.0) in patients thought to be at significant risk for stroke with a low bleeding risk is recommended. Antiplatelet therapy using aspirin is recommended in patients who are thought to have a low risk of stroke related to their AF and/or in patients who may have an increased risk of bleeding/bleeding complications on warfarin.<sup>3</sup> A more recent study showed that for AF patients with high risk for stroke deemed not a candidate for warfarin therapy, the combination of clopidogrel plus aspirin is recommended.<sup>3</sup> From the **RE-LY (Randomized Evaluation of Long-term Anticoagulation Therapy)** trial<sup>14</sup>, dabigatran etexilate, an oral thrombin inhibitor, has been approved for the prevention of stroke in patients with AF.

**Asymptomatic carotid stenosis (ACS)** has been identified as a risk factor for first-time stroke. Patients with ACS should be screened for other modifiable stroke risk factors, and appropriate stroke risk modification should be initiated for each of these risk factors.<sup>3</sup> It is reported that with "best medical therapy" today, the annual risk of stroke from ACS is < 1%.<sup>3</sup> Surgical or other intravascular treatments should be decided after thorough review of the degree of carotid artery stenosis (> 60% by angiography, > 70% by Doppler, > 80% by CTA or MRA) patient's life expectancy, comorbidities, risks versus benefits, and a low complication risk (< 3%) by the treating physician(s).

Recently, it has become recognized that **obstructive sleep apnea (OSA)** is an independent risk factor for stroke. It is recommended that OSA patients be treated although its effectiveness on reducing stroke still remains unknown.<sup>3</sup> It is recommended that patients with risk factors for developing OSA be screened with a detailed history and physical examination along with identification and treatment of other stroke risk factors.

Other potentially modifiable stroke risk factors include sickle cell disease, oral contraceptive use, migraine headaches, metabolic syndrome, physical inactivity, alcohol consumption, drug use, elevated glycoprotein-a, hypercoagulable disorders, hyperhomocysteinemia, and infection and inflammation.

Aspirin is not useful in preventing a first-time stroke in a patient with a low stroke risk. Aspirin should be considered in patients with a high risk for cardiovascular events, which includes strokes, where the benefits outweigh the risks. From the **Women's Health Initiative (WHI)**, aspirin 81-100 mg every other day can be useful for preventing a first-time stroke in women >65 years old and in whom the risk of bleeding is outweighed by the potential benefit.<sup>3</sup> However, a large meta-analysis expressed uncertainty about aspirin in primary prevention.<sup>15</sup>

## COMMUNITY EDUCATION

Because stroke risk factor identification and modification can lead to a reduction in stroke, a number of organizations have initiated campaigns to educate healthcare providers and the public about stroke risk factors and warning signs and symptoms. Only a small percentage of patients suffering from stroke recognize the warning signs and symptoms. This contributes to a low number of people coming to the hospital within the time window to receive tPA. In a study of 163 patients, 39% were not able to identify a single sign or symptom of stroke and, more concerning, higher-risk patients (> 65yo) were less likely to do so.<sup>16</sup>

The F.A.S.T. media campaign was started by the Massachusetts Department of Health in 2006 and adopted by the Rhode Island Department of Health to educate the public about stroke. This media campaign uses a simple four letter acronym **Face-Arm-Speech-Time** and an animated video that comes in four different languages: English, Spanish, Portuguese, and Khmer/Cambodian.

The Power To End Stroke campaign, which began in 2006, was developed from the AHA/ASA with a mission to reduce stroke and the risk of stroke by 25% by 2010. This campaign targets blacks, given their increased risk for heart disease, hypertension, and stroke.

Give Me 5 for Stroke is a campaign started in 2007 by the Stroke Collaborative to educate health-care providers and patients about stroke. The Stroke Collaborative is made up of different groups including the American Academy of Neurology, American College of Emergency Physicians, and the AHA/ASA. Their stated goals are to combine

resources and increase stroke awareness among the public.

The **National Stroke Association (NSA)** has a web site dedicated to stroke education and advocacy. The Stroke Advocacy Network website is designed to improve quality care for stroke survivors by helping people communicate with legislators about stroke. The NSA also publishes *StrokeSmart Magazine*, a book called *Hope: The Stroke Recovery Guide*, and the *Brain Alert Newsletter* all of which are designed to provide further information about stroke to healthcare providers and the public. The National Stroke Association also has a website called Brainiac Kids dedicated to providing stroke education to children in a manner that encourages learning.

The Rhode Island Heart Disease and Stroke Prevention Steering Committee, made up of more than 60 organizations and individuals, developed the RI HDSP State Plan 2009 to reduce the impact of heart disease and stroke on the state. Certified Primary Stroke Centers, of which there are currently four in Rhode Island, are required to provide community education as part of their certification. Additionally, some hospitals have stroke support groups that meet regularly with stroke survivors and/or their caregivers to provide continuing education and support.

## CONCLUSIONS

While stroke continues to have a major impact on patients, their caregivers, and their community, continued efforts at stroke risk factor identification and management along with stroke education may provide one of the best opportunities for reducing the impact of this disease. These goals can only be achieved by active participation from healthcare providers, the public, and legislators.

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## Disclosure of Financial Interests

The author and/or their spouse/significant other have no financial interests to disclose.

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