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Stroke in Minorities

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Synopsis

Minorities in the United States have higher stroke risks, stroke occurrence at an earlier age, and for some groups, more severe strokes than non-Hispanic whites. Factors contributing to this disparity are explored. Characteristics of African American, Hispanic, and Native American stroke risk and incidence are reviewed. We mention recent interventions to raise the awareness of stroke risk factors and symptoms in minorities. The importance of the problem is discussed, and we suggest ways stroke in minorities may be reduced.

Keywords

Stroke; disparities; epidemiology; African American; Hispanic; Native American

There are several reasons that researchers and clinicians should focus on minority health. The first is the justice principle.¹ As we will demonstrate in this chapter, minority populations in the United States have an increased stroke burden. The justice principle suggests that the fact that some people within a population suffer more than others is an untenable situation. It is the responsibility of all of us in healthcare to rectify this disparity. Another motivation is cost. Recent studies suggest a large disparity in the cost of stroke among minority populations, notably due to the earlier age of stroke in African Americans and Hispanic Americans.² Reducing health disparities could reduce the economic burden. Finally, understanding why the burden of stroke is different in minorities provides information about the cause and treatment of disease across all populations. For example, clustering of cavernous malformations in Mexican Americans led to the discovery of a genetic locus for cavernous malformations.³ We now know that a third to a half of cavernous malformations are familial and inherited in an autosomal dominant pattern. Furthermore, the decreased mortality following stroke among Mexican Americans compared to non-Hispanic whites in this decade, holds hope for clues to improved survival in all populations at risk of stroke.⁴ This discussion will focus on stroke in African Americans, Hispanic Americans, and American Indian/Alaska Natives. Non-Hispanic whites will serve as the reference group for comparison. We will discuss the incidence of modifiable risk factors for stroke within these groups, and what is being done to reduce the burden of stroke in minorities. We begin our discussion with an illustrative example of the implications of social factors and cardiovascular risk factors in two African-American women.

A Tale of Two Women

Abby and Bea are two African-American women in their mid 40's. Both have hypertension, both are over weight, and both have type II diabetes mellitus. Abby is poor, never finished high school, works out of her home providing child care and does not have health insurance. Bea is part of middle class America; she has a college education and a job that provides her medical insurance. Bea takes medication regularly for her hypertension and diabetes. Because of Abby's limited income, she often has to forgo buying her hypertension and diabetes medications to pay her bills.

Both women are at high risk for stroke, and both illustrate some problems of dealing with stroke in minorities. The burden of stroke may weigh heavier on minorities in the United States because of differences in education, frequency and distribution of risk factors, income, and access to health care rather than to differences in region, race, or ethnic background (Table 1).^{5–12} Minorities are over-represented in groups that are less educated and socio-economically disadvantaged. In addition, they may face problems with access to care for reasons related to lack of health coverage, and language and cultural barriers that lead to mistrust (see figure 1). Consequently, risk factors such as hypertension and diabetes, which are more common in some minorities, go unrecognized or incompletely treated. The consequence of failing to address primary and secondary prevention measures may result in higher incidence of vascular disease, with greater morbidity and mortality,^{13–20} and seems to affect those in younger age groups.^{18, 19, 21} Socioeconomic status is indelibly interwoven with our concept of race/ethnicity and disease. Understanding the interaction between poverty and race/ethnicity may be key to understanding health disparities. While we have reasonable measures of differences in health outcomes in minorities, measures of socioeconomic status are more challenging, and they may not fully represent the construct of advantage compared with disadvantage. For the purpose of this discussion, race/ethnicity will refer to self-designated social groups sharing similar cultural heritage and ancestry. Race/ethnicity may simply be a proxy for advantage or disadvantage in our society.

Both Abby and Bea are of the same racial background and share similar risk factors for vascular disease. The difference is Abby's lower economic status that may put her at greater risk for vascular disease. This may not only affect her likelihood for access to care, but also the quality of care that she receives. We will now discuss determinants that may drive inequalities in health.

Health Disparities

There are many determinants of inequalities in health. They can be grouped into four broad categories: (1) environment, (2) access and utilization of services, (3) health status, and (4) difference in health outcomes.²² In the United States, these inequalities are referred to as health disparities. For the purpose of this discussion, disparity will relate to both unavoidable and avoidable inequalities that lead to stroke. The unavoidable factors such as age, gender, and genetics, give us a better understanding of the causes of stroke. It is the avoidable inequities such as mistrust, refusal of treatment, prejudice, and bias that remind us of the justice principle.

The United States is becoming increasingly diverse. The U.S. Bureau of the Census estimates that by the year 2050, half the U.S. population will be "minorities." Therefore, a higher burden of disease and mortality among minorities has profound implications for the entire population. For example, there may be higher costs for health due to the loss of productivity of key individuals in the society, and a greater need for health services. The problems racial and ethnic minority groups face accessing high quality care exposes a weakness within our health delivery system. Overall in the U.S., we rank highly worldwide in the delivery of emergency services,

but relatively poorly when it comes to preventive and other services for the population at large.²³

Determining a person's race/ethnicity in epidemiologic studies can be problematic. Since 1960 persons in the U.S. have specified their own race and ethnicity so that by the 2000 census there were 126 racial and ethnic categories.²⁴ As mentioned above, we define race/ethnicity in terms of history, geography, culture, language, social and economic forces rather than genetics. Actually genetic research suggests a wide genetic diversity within different racial and ethnic groups.²⁵ It is likely that a combination of both genetics and environment explain disease states and their outcomes. Consequently we need to understand the contributions and interactions of both. With so many categories of race/ethnicity to choose from, and the complexities of culture and social influence, self-classification may avoid certain potential shortcomings linked to misclassification.²⁶

An example of how misclassification can skew results can be illustrated in American Indians. For many years it was thought that American Indians had a relatively low incidence of vascular disease. In 1996 a study by the Indian Health Service found large variations in the way race was assigned in American Indians. They found the degree of misreporting race in Native Americans varied from 1.2% in Arizona to 30.4% in California. This resulted in a significant underestimation of coronary artery disease and stroke.²⁷ We now understand that rates of vascular disease are relatively high in Native Americans, which correlates better with our known high prevalence of risk factors within this group.

The Risk and Magnitude of Stroke in Racial and Ethnic Minorities

Stroke is the third leading cause of death in the United States, and a major cause of disability.²⁸ However, the burden of fatal and nonfatal stroke is higher and health related quality of life is lower in racial/ethnic minorities.^{13, 16} Minority individuals seem to have more hypertension, diabetes, obesity, and less leisure time physical activity than non-Hispanic whites. A higher prevalence of cardiovascular risk factors is further complicated potentially by lower education level, poverty, and less access to health care.^{8, 11} Strokes occur at younger ages and result in greater disability in minority individuals than in non-Hispanic whites.¹³ Table 2 lists the findings of age-adjusted stroke incidence for three population-based studies. Non-Hispanic whites were used as the comparison group to calculate rate ratios for each minority group. In table 2 African Americans between the ages of 35 and 44, living in Northern Manhattan, have an attack rate ratio for stroke nine times greater than non-Hispanic whites the same age.²⁹ In Cincinnati and Northern Kentucky the incidence rate ratio for stroke was highest for African Americans in the 45 to 55 year age group.³⁰ Within this age group, the incidence rate ratio for stroke was five times greater than non-Hispanic whites the same age. The attack rate ratio for Hispanics in Northern Manhattan was also nearly nine times higher than the non-Hispanic whites in the 35–45 age group. Stroke attack rate ratio was nearly double that of non-Hispanic whites in all age groups in Northern Manhattan. In Corpus Christi, Texas, the stroke attack rate ratio in Mexican Americans was higher than non-Hispanic whites but this trend was not as great between Hispanics and non-Hispanic whites in Northern Manhattan.³¹ Despite the regional and methodology differences, all three studies showed much higher attack rate ratios for stroke in African Americans and Hispanics compared to non-Hispanic whites, particularly in younger age groups.

In the United States, ischemic stroke tends to be more common than hemorrhagic stroke in non-Hispanic whites. This trend is also true for African American, Hispanic, and American Indian/Alaska Native groups. Lacunar strokes are more common in American Indians compared to Hispanics and non-Hispanic whites.³² Mortality is higher in African Americans compared to non-Hispanic whites for both ischemic and hemorrhagic strokes. In contrast,

mortality is lower for American Indian/Alaska Natives and Hispanics with ischemic strokes compared to non-Hispanic whites.³³ Some risk factors are more prevalent within a population than others. For example, hypertension is higher in African Americans than any other minority group and diabetes is high in both African Americans and American Indians.⁷ This may explain some of the difference in mortality between different minority groups.

Stroke is expensive. The cost was estimated to be \$140,000 per patient, for a total cost estimate of \$64.7 billion dollars in 2007.¹⁶ The cost of prevention can pose a challenge as well. There are a growing number of stroke survivors that are unable to afford medications putting them at risk for recurrent stroke. These are mostly African American, poor, female, non-elderly, and ill stroke survivors.³⁴ Working stroke survivors are unable to afford employer-based health insurance, and disabled stroke survivors age <65 may not be insured because they do not qualify for Medicare health insurance. Per-capita cost of stroke is highest in African Americans at \$25,782 followed by Hispanics at \$17,201 and non-Hispanic whites at \$15,597.² The highest contributor to this cost is loss of earnings. While the patient and family feel the disability from stroke more acutely, also there is lost productivity, lost wages, and worries about affordability of health care.

To better understand the problem of stroke in U.S. minorities, we will look at three representative groups, African Americans, Hispanics, and Native Americans. Although Asian and Pacific Islanders are an important, emerging minority group in the United States with respect to stroke, they are beyond the scope of this review.

Stroke in African Americans

African American refers to a person having origins in a black racial group or Africa.³⁵ African Americans have approximately double the mortality from stroke compared to other race/ethnic groups.³⁶ They may achieve less functional improvement after a stroke, though this requires further validation, but despite the higher disability are more likely to be discharged home. Generally, African Americans have a higher prevalence of hypertension, diabetes mellitus, and obesity, and are less likely to report adequate physical activity than non-Hispanic whites. Interestingly, African Americans are more likely to be aware of their hypertension, are more often on treatment for their hypertension, but are less likely to have it well controlled.³⁷ For African Americans, sickle cell anemia is a risk factor for stroke, particularly in children.³⁸ African-American men may use more tobacco and alcohol, whereas African-American women may have more hypertension, diabetes, family history of stroke and less leisure exercise than African-American men.³⁹

Stroke in Hispanics

Hispanic refers to a person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin, regardless of race.³⁵ Hispanics are the largest minority population in the United States (15%) and Mexican Americans make up the largest sub-group of Hispanics (64%).³¹ Mexican Americans tend to have more diabetes mellitus, and more obesity, lower income, lower education attainment, and report inadequate physical activity compared to non-Hispanic whites.⁴⁰ As table 2 shows, the incidence of stroke in Hispanics is significantly higher than in non-Hispanic whites. Further, the severity and stroke type distributions do not differ from non-Hispanic whites which dispels the myth that stroke in Mexican Americans is predominantly due to small vessel disease.⁴¹ Hispanics are more likely to have a recurrent stroke than African Americans or non-Hispanic whites.⁴² Overall stroke mortality is lower in Hispanics except in younger (ages 20–45) Hispanics who may have a higher mortality.⁴³ Hispanics also may have a higher mortality from subarachnoid hemorrhage than other minority groups.^{31, 33}

Stroke in Native Americans

Native American refers to a person having origins in any of the original peoples of North, Central, and South America, and who maintains a tribal affiliation or community attachment.³⁵ Native Americans include both American Indian and Alaska Natives. Native Americans have among the highest rates of risk factors for cardiovascular disease than other race/ethnic groups,⁴⁴ and the highest prevalence of stroke in non-institutionalized adults.^{16, 28} Other risk factors include the use of tobacco and alcohol in men. Awareness of diabetes is low, and they report less leisure-time physical activity.⁴⁵ Although the prevalence of risk factors is high in this group, they vary by region. Native Americans have more lacunar strokes, and mean age of stroke is generally lower in Native Americans.³²

Little is known about the epidemiology of stroke in Alaska Natives other than the fact that mortality has remained high despite a drop in mortality from stroke nation wide.⁴⁶ The Alaska Native Stroke Registry (ANSR) was established in 2005 with funding from the National Institute of Neurological Disorders and Stroke to learn more about stroke in this population.⁴⁷ ANSR is a population-based, prospective, surveillance study of stroke in Alaska Natives. The Alaska Native population is well defined and health care is provided through a unique health care delivery system based on a hub and spoke model of care. The aims of the registry are to determine more about the epidemiology of stroke in this population, and monitor the treatment and management of stroke to identify areas where quality of care can be improved. Information from the registry will also help identify critical areas for stroke prevention. Patient entry into ANSR began on October 1, 2005. Information about the frequency of risk factors, stroke type, and stroke incidence rates will be available soon.

Health care to the nearly 20,000 Alaska Native people, many of whom are widely dispersed among more than 200 small communities, is provided largely by the Alaska Tribal Health System. Given the large size of Alaska, the distribution of the population in many small frontier communities, the lack of a comprehensive road system, and the cost and challenges of airplane transportation, health care delivery is organized into a primary, secondary, and tertiary tier system. Primary care is provided in village health clinics staffed by approximately 500 Community Health Aides/Practitioners who are community residents trained and certified to provide emergency and primary care in collaboration with physicians based at their regional medical center. Clinics at the farthest reaches of the system, feed into 21 tribally operated health centers and seven tribally operated hospitals. Regional medical centers are based in the transportation hub of the region and are staffed by physicians who provide primary and secondary care. Patients requiring services not available at the regional centers are referred to the Alaska Native Medical Center in Anchorage, Alaska, and in some cases tertiary care is provided in other U.S. cities such as Seattle, Washington, for patients requiring highly specialized services.

Stroke in Non-Hispanic Whites

Non-Hispanic whites may have higher prevalence of hyperlipidemia, myocardial infarction and stroke at an older age than other race/ethnic groups. Cardioembolic stroke is more prevalent including atrial fibrillation compared to many minority groups. Mortality from stroke is higher at older age groups than other ethnic groups.

Socioeconomic status also is an important risk factor for stroke. A study in Ontario Canada, a region with universal healthcare, found an inverse relationship between income and stroke mortality.⁴⁸ Poorer patients were less likely to have access to hospitals and specialty care by neurologists. They were less likely to have brain imaging with CT and MRI and were less likely to receive rehabilitation services. There was an inverse relation between income and both 30-

day and 1-year mortality even after adjustment for age, sex, co-morbid conditions, and hospital and physician characteristics.

A recent study in the United States focused on the relationship between wealth, income, and education in relation to risk of stroke.⁴⁹ Both wealth and income were independent risk factors for stroke in those 50 to 64 years old; however, wealth was more strongly associated with stroke than other socioeconomic factors. This risk was not found in those over the age of 65, presumably due to a survivor effect. It was concluded that greater wealth is not only a buffer during hard economic times but also provides the resources that foster a healthy life style. Wealthy people have lower prevalence of smoking, obesity, diabetes, and alcohol consumption.

Reducing Disparities in Stroke

Healthy People 2010 is a national health promotion and disease prevention initiative instituted by the U. S. Department of Health and Human Services that has a vision for achieving improved health care for all Americans. There are two goals: increase quality and years of healthy life, and eliminate health disparities. With respect to stroke the goals will have to focus on both primary and secondary prevention strategies. Especially important is the recognition and treatment of vascular risk factors such as hypertension. An African-American community in Maryland demonstrated the effectiveness of using indigenous community health workers to improve control of hypertension.⁵⁰ Working in conjunction with an academic health center, local residents were trained to manage, monitor, educate, and counsel people in their community about hypertension. The efforts resulted in a significant reduction in mean blood pressure in the community and an increase in individuals with controlled hypertension. The availability of effective blood pressure lowering drugs may be responsible, at least in part, for the decline in stroke in the United States over the past two decades. In addition, making people aware of stroke symptoms and the need to seek care immediately also may be helpful. The use of thrombolytic therapy is still under utilized in the United States. In a study looking at use of recombinant tissue-plasminogen activator (rt-PA) in academic hospitals, researchers found African Americans were one fifth as likely to receive rt-PA than non-Hispanic whites.⁵¹

Children can have a powerful influence on older adults to encourage them to take their medications, have regular check-ups, recognize stroke symptoms, and can alert emergency medical services when those affected are suddenly disabled. In a randomized, controlled trial to teach middle school children about stroke, researchers showed the effectiveness of an educational intervention.⁵² The study was done in six middle schools in Corpus Christi, Texas. In three schools, students received 12 hours of classroom instruction on stroke pathophysiology, stroke symptom knowledge, and what to do for witnessed stroke. The other three schools received no instruction. Students were tested about their knowledge in these three areas before and after the intervention. Students in the intervention group showed significant improvement in post intervention testing in all three areas, compared with the students that did not receive the instruction. Children left to the care of older adults can help alert emergency medical services in the event of a stroke.

The American Stroke Association, and the National Stroke Association have implemented programs aimed at reaching children, family and community to heighten awareness of stroke.^{53, 54} Brainiac Kids and Hip Hop Stroke, are programs for children with ideas for games, plays, and activities to be used at school, home, and in the community that make learning about stroke fun and easy to remember. Power to End Stroke is a stroke awareness campaign targeting African Americans to heighten awareness of stroke. "Give Me 5 for Stroke" (Walk, Talk, Reach, See, Feel) is a joint campaign of the American Academy of Neurology, the American College of Emergency Physicians and the American Heart Association/American Stroke Association to increase awareness among Americans of stroke symptoms and to call 9-1-1 for

transport to a nearby hospital emergency department. Another program to help the public recognize the symptoms of stroke and to seek stroke care right away is the “F.A.S.T.” campaign (Face, Arm, Speech, Time). Studies to provide scientific evidence that these interventions are effective are needed.

Informal settings such as beauty shops, barbershops, community centers, and churches may be important venues for conducting stroke education. In Atlanta and Cincinnati, beauticians volunteered to learn about the signs and symptoms and risk factors for stroke. Taking what they learned back to the beauty shop, stroke became a frequent topic in their discussions with customers. As a result, researchers found not only did stroke awareness improve within the community, but this way of educating the community about stroke was also very well received.⁵⁵ Blood pressure screenings at community health fairs, grocery stores, and churches can heighten awareness of hypertension. As previously discussed, young people may have an influence on their parents and grandparents by focusing attention on prevention for those at risk. Early intervention to treat or prevent risk factors may lead to lower stroke risk and mortality.

As providers, we need to do our part to reduce risk factors in minorities. The Institute of Medicine report describes and challenges health care providers and systems to overcome prejudicial attitudes toward minorities and stereotyping which may have a deleterious effect on medical decision making.⁵⁶ To determine the diagnosis and course of treatment, doctors rely on information gained from the patients, coupled with their prior expectations about the patient. If the physician does not accurately understand the symptoms, because of language or cultural barriers, then he or she is more likely to give greater emphasis on predetermined beliefs. These beliefs may be influenced by the age, gender, socioeconomic status, and race/ethnic background of the patient. As a result, patient needs and treatment decisions may not be well matched resulting in mistrust and eventually to refusal of treatment altogether. It is important for all physicians to practice with empathy and cultural sensitivity to build trust and foster a meaningful doctor-patient relationship.⁵⁷

Conclusion

Overall, African Americans, Hispanics, and Native Americans have higher stroke risks, stroke occurrence at an earlier age, and for some minorities possibly more severe strokes than non-Hispanic whites. The higher prevalence of risk factors, overall lower socioeconomic status, and health care system challenges for minority patients may contribute to stroke disparities. Stroke is a substantial burden on many minorities in terms of mortality, lost wages, and disability. There are steps, however, that we can take that may reduce this disparity. For example, sensitivity to the difficulties minority patients may have in negotiating a complicated health care system and doing what we can to reduce barriers to access to care may be important practice principles. We can do better in establishing rapport with our patients by better understanding their concerns and the cultural framework that underlie their behaviors and decision making. Whenever possible we should use interpreters to facilitate communication when we do not speak the native language of our patients. Being proactive in recognizing vascular risk factors and doing what it takes to reduce them is essential. We can target populations at risk with programs to heighten awareness of stroke symptoms and risk factors. Informing young people about stroke not only influences the next generation at risk for vascular disease, but also helps their parents and other older family members and friends better understand these disorders, their risk factors, prevention measures, and treatment. By determining what works to change behavior and by breaking down barriers to care we take critical steps toward reducing stroke disparities.

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Figure 1.
Cause and effect diagram of factors that contribute to disease in minorities.

Table 1

Factors that may be associated with stroke in minorities.

Risk Factors: ^{5, 6, 11}	Patient Factors: ⁵⁶
Hypertension	Mistrust and misunderstanding of health care system
Type II Diabetes	Greater tendency to refuse recommended treatment
Hyperlipidemia	Provider Factors: ⁵⁶
Obesity	Bias or prejudice against minorities
Less leisure exercise	Clinical uncertainty about a patient's condition
Tobacco use	Beliefs or stereotypes about minorities
Excessive use of alcohol	Healthcare Systems-Level Factors: ⁵⁶
Socioeconomic Factors: ⁸	Language barriers
Lower education level	Short appointments
Lower income	Geographic availability of services
Poor perception of health status	

Age and sex adjusted incidence per 100,000 and rate ratios, compared to non-Hispanic whites in four population-based studies of stroke in minorities.

Brain Attack Surveillance in Corpus Christy Project 2000-2002 ³¹				
(All ischemic strokes)	Mexican American N=626	Non-Hispanic White N=563	Rate Ratio	
Age				
45-59	593	291		2.04
60-74	1875	1187		1.58
≥ 75	3824	3423		1.12
> 45	1375	1137		1.21
Greater Cincinnati/Northern Kentucky Stroke Study 1993 ³⁰				
(First ever Stroke, including hemorrhagic stroke)	African American N=213	Non-Hispanic White *	Rate Ratio	
Age				
0-34	7	4		1.75
35-44	121	32		3.78
45-54	320	63		5.08
55-64	637	273		2.33
65-74	972	669		1.45
≥ 75	1820	736		2.47
Northern Manhattan Stroke Study 1993-1996 ²⁹				
(All Strokes)	African American N=148	Hispanic N=352	Non-Hispanic White N=162	Rate Ratio African American
Age				Rate Ratio Hispanic
20-24	19	3	13	0.23
25-34	0	11	10	1.10
35-44	54	53	6	8.83
45-54	184	127	49	2.59
55-64	366	265	221	1.20
65-74	636	685	282	2.43
75-84	1153	804	421	1.91
≥ 85	1461	1778	651	2.73

* Non-Hispanic whites in Rochester, MN 1989⁵⁸