RACIAL/ETHNIC DIFFERENCES IN STROKE AWARENESS AMONG VETERANS

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Objective: To examine racial/ethnic differences in stroke recognition and knowledge of appropriate first action if someone was having a stroke.

Methods: We examined data from 36,150 veterans from the 2003 Behavioral Risk Factor Surveillance System (BRFSS). Respondents indicated recognition of five stroke warning signs/symptoms and first action they would take if someone were having a stroke. Multiple logistic regression was used to assess the independent effect of race/ethnicity on stroke recognition and appropriate first action, controlling for relevant covariates.

Results: Most respondents recognized at least one warning sign: 96% recognized sudden confusion or trouble speaking; 97% recognized sudden facial, arm, or leg weakness; 88% recognized sudden vision loss; 94% recognized sudden trouble walking; and 80% recognized sudden headache; 86% recognized calling 911 as the appropriate first action. However, only 17% recognized all five warning signs/symptoms, and only 15% recognized all five warning signs/symptoms and would call 911 as the first action. In multivariate models with Whites as reference, Hispanics (OR .34, 95% CI .22–.51) and Others (OR .68, 95% CI .50–.92) were less likely to recognize all five stroke warning signs/symptoms. Hispanics (OR .37, 95% CI .24–.58) and Others (OR .68, 95% CI .48–.96) were less likely to recognize all five warning signs/symptoms and call 911 as the first action.

Conclusions: Most veterans recognize individual stroke warning signs, but very few recognize all five and would take appropriate action to call 911 in the event of a stroke. Low rates of stroke recognition and taking appropriate action are more pronounced in racial/ethnic minority veterans. (*Ethn Dis*. 2008;18:198–203)

Key Words: Stroke, Ethnicity, Health Disparities, Survey Research, Health Education

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INTRODUCTION

In the United States, 500,000 new and 200,000 recurrent strokes occur each year, and the risk of stroke is almost two times greater among racial and ethnic minorities.[1] A number of studies indicate the existence of significant gaps in the public's knowledge of warning signs and symptoms of stroke,[2–9] even though current national health objectives include improved recognition of warning signs.[10] More alarming, the recognition of warning signs of stroke is poorest among those that are at highest risk: racial/ethnic minorities and the elderly.[3,5,6,9,11] One consequence of poor recognition of warning signs of stroke is self-imposed delays in taking the proper course of action.[12–15]

Data suggest that racial/ethnic minorities are least likely to recognize early warning signs of stroke and are most likely to delay access to emergency acute stroke therapy.[6,16] Low stroke recognition and lack of appropriate action in racial/ethnic minorities have been attributed to poor stroke education due to lack of access to quality health care.[17–20] However, little is known about recognition of warning signs of stroke among racially diverse groups with equal access to primary care services, such as veterans.

We used nationally representative data on veterans to examine racial/ethnic differences in recognition of stroke warning symptoms and the likelihood that appropriate action would be taken in the event of a stroke. We hypothesized that after controlling for relevant covariates in an equal access system with equal opportunities for stroke education, no significant differences in recognizing all five major stroke warning symptoms would be observed. We further hypothesized that no significant racial/ethnic differences would exist in taking appropriate first action to call 911 if someone were having symptoms suggestive of a stroke.

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RESEARCH DESIGN AND METHODS

Study Setting and Sample

We analyzed data from the 2003 Behavioral Risk Factor Surveillance System (BRFSS). The BRFSS is a state-based, random-digit-dialed telephone survey of the United States population aged ≥18 years sponsored by the Centers for Disease Control and Prevention.[21] The BRFSS uses a complex sampling involving stratification, clustering, and multistage sampling to yield nationally representative estimates. Surveys include core questions asked of all participants in modules on specific public health topics of interest to state health programs. Our sample included only persons who identified themselves as veterans.

Measures

We created four age categories: 18–34, 35–49, 50–64, and ≥65 years. We combined race and ethnicity to create four racial-ethnic groups: non-Hispanic Whites (Whites), non-Hispanic Blacks (Blacks), Hispanics, and Non-Hispanic other (Other). Four levels of education were created: less than high school graduate, high school graduate, less than

college graduate, and college graduate; and four income categories were created: <$25,000, <$50,000, <$75,000, and ≥$75,000. We defined marital status as married and not married; employment status as employed and unemployed; and insurance status as insurance and uninsured. Health status was categorized as excellent/very good/good vs fair/poor, and access to care was defined as having a usual primary care provider.

Recognizing stroke warning signs and action to initiate treatment were based on self-report. Responses were derived from the BRFSS Heart Attack and Stroke module. Respondents indicated whether any of the following warning signs were an indication of an imminent stroke: 1) sudden confusion, trouble speaking or understanding; 2) sudden numbness or weakness of the face, arm or leg; 3) sudden trouble seeing in one or both eyes; 4) sudden trouble walking, dizziness, loss of balance or coordination; and 5) sudden headache with no known cause. Respondents were also asked, "If you thought someone was having a stroke, what is the first thing you would do?" Respondents chose from a list of actions that included 1) take the patient to the hospital, 2) tell them to call the doctor, 3) call 911, 4) call their spouse or family member, or 5) do something else.

Data Analysis

STATA version 8.0[22] was used for statistical analysis to control for the complex survey design of the BRFSS and provide estimates that generalize to the US population. We performed three types of analyses. First, we compared demographic characteristics of veterans by race/ethnicity. Second, we compared recognition of stroke symptoms and appropriate first action to call 911 by race/ethnicity. Third, we ran seven separate multiple logistic regression models to examine the independent effect of race/ethnicity on recognition of each of the five stroke warning signs, recognition of all five warning signs, and recognition of all five warning signs and appropriate first action to call 911, controlling for relevant covariates. White veterans served as the control group in the multivariate models. Covariates were selected based on clinical relevance, evidence of confounding effect on stroke recognition in prior studies, and significant differences across racial/ethnic groups in bivariate analysis. The covariates used in all the models were age, sex, education, income, marital status, employment, health insurance, and access to primary care. Findings were considered significant at $P<.05$.

RESULTS

The 2003 BRFSS sample included 264,684 adults. Of this number 36,150 (13.6%) were veterans. Among those who were veterans, 28,859 (79.8%) were White, 3105 (8.6%) were Black, 2314 (6.4%) were Hispanic, and 1872 (5.2%) belonged to other racial/ethnic groups. Approximately 66% were ≥50 years old, 94% were men, 93% were at least high school graduates, 41% had household incomes ≥$50,000, 71% were married, 52% were employed, 91% had health insurance, 81% reported that their health was excellent/very good,/good, and 83% had a usual care provider (Table 1). Significant racial/ethnic differences were observed for age, sex, education, income, marital status, employment status, insurance status, and access to primary care.

Most veterans recognized individual warning signs of stroke (Table 2). Approximately 96% recognized sudden confusion, trouble speaking or understanding; 97% recognized sudden facial weakness or numbness of the arm or leg; 88% recognized sudden trouble seeing in one or both eyes; 94% recognized sudden trouble walking, dizziness, or loss of balance or coordination; and 80% recognized sudden headache with no known cause as warning signs of stroke. Approximately 86% recognized calling 911 as the appropriate first action to take if someone was having a stroke. However, only 17% of veterans recognized all five warning signs of stroke, and only 15% recognized all five warning signs and would call 911 as the first action if someone were having a stroke.

No significant racial/ethnic differences in recognizing individual stroke warning signs existed, except sudden trouble seeing in both eyes (Table 2). However, significant racial/ethnic differences were observed in recognizing all five warning signs and appropriate first action. Hispanics were least likely to recognize all five warning signs; Hispanics were also least likely to recognize all five warning signs and call 911 if someone were having a stroke.

With Whites as the reference group and adjusting for relevant covariates, there were no significant racial/ethnic differences in recognition of individual stroke warning symptoms or appropriate first action to call 9-1-1 except recognition of sudden trouble seeing in both eyes as a stroke warning symptom. Blacks were less likely to recognize this symptom compared to Whites (OR 0.55, 95% CI 0.39, 0.77), while Hispanics (OR 0.65, 95% CI 0.32, 1.30) and Others (OR 0.68, 95% CI 0.42, 1.10) did not differ significantly from Whites. However, there were significant racial/ethnic differences in odds of recognition of all five stroke warning signs and appropriate first action. Hispanics (OR 0.34, 95% CI 0.22, 0.51) and Others (OR 0.68, 95% CI 0.50, 0.92) were less likely to recognize all five stroke warning signs/symptoms compared to Whites, whereas Blacks (OR 1.18, 95% CI 0.99, 1.42) did not differ significantly from Whites. Hispanics (OR 0.37, 95% CI 0.24, 0.58) and Others (OR 0.68, 95% CI 0.48, 0.96) were also less likely to recognize all five warning signs/symptoms and call 9-1-1 as the first action compared to Whites, whereas Blacks (OR 1.10, 95% CI 0.91, 1.32)

Table 1. Demographic characteristics of veterans by race/ethnicity, Behavioral Risk Factor Surveillance System, 2003

	Total Sample	White	Black	Hispanic	Other	*P* value
Age						<.0001
18–34 years	12.4	10.1	20.6	27.3	15.6	
35–49 years	19.8	17.3	33.9	23.4	29.1	
50–64 years	32.3	33.7	24.4	26.4	31.0	
≥65 years	35.5	38.9	21.1	22.9	24.3	
Sex: Male	93.7	94.4	87.8	93.5	92.5	<.0001
Education						<.0001
Less than high school graduate	6.5	6.3	7.1	8.2	7.3	
High school graduate	30.9	30.5	34.3	34.6	26.4	
Less than college graduate	30.9	29.8	34.7	35.7	35.2	
College graduate	31.7	33.4	23.9	21.5	31.1	
Income						<.0001
<$25,000	23.3	21.2	32.3	33.5	26.8	
<$50,000	35.7	35.8	38.0	32.5	35.9	
<$75,000	18.1	18.8	15.7	13.7	18.2	
≥$75,000	22.9	24.2	14.0	20.3	19.1	
Married	70.8	73.5	56.2	60.0	66.9	<.0001
Employed	52.4	50.7	60.0	58.3	60.0	<.0001
Insured	91.2	92.1	87.9	86.2	89.5	.0001
Health Status: Excellent/Very Good/Good	81.4	81.6	80.8	81.3	81.0	.9499
Usual Health Provider: Yes	83.3	84.8	77.4	73.9	81.8	<.0001

P value is for comparison across four racial/ethnic groups.

did not differ significantly from Whites. (Table 3).

DISCUSSION

This study demonstrated that a high percentage of veterans recognize individual stroke warning signs, but very few recognize all five and would take appropriate action to call 911 in the event of a stroke. The low rates of recognition of multiple presentations of stroke and taking appropriate action is more pronounced in racial/ethnic minority veterans, especially Hispanics and other non-Black minorities.

This study demonstrated that a high percentage of veterans recognize individual stroke warning signs, but very few recognize all five and would take appropriate action to call 911 in the event of a stroke.

Veterans in general appear to be knowledgeable of individual warning signs and the appropriate action to take if they observe someone having a stroke. However, recognizing all five major warning signs and knowing to call 911 were low across the board, regardless of race/ethnicity. Racial/Ethnic minority veterans did not differ from White veterans in the recognition of individual symptoms, but they were less likely to recognize the five collective symptoms of stroke and access emergency care in a timely manner. These results are supported by similar findings in the general population.[4]

Disparities in access to healthcare and stroke education do not appear to be a primary reason for observed differences. Veterans from all racial/ethnic groups are provided equal access to primary and emergency care[23] and have equal opportunity for stroke education. Because racial/ethnic differences in recognizing multiple stroke presentations persisted in spite of adjustments for differences in age, sex, education, income, marital status, employment, insurance status, perceived health status, and access to care, other factors not evaluated in this study are likely to be responsible. Future studies need to explore the role of factors such as health literacy, cultural appropriateness of educational materials, differential attendance at educational programs, differential emphasis and stroke education by primary care providers, and the quality of stroke educational programs.

Individuals experiencing early warning signs of stroke should seek treatment in an urgent manner since poor recognition of early warning signs is believed to negatively influence stroke outcomes. Poor recognition of early warning signs can result in delays in seeking stroke-related care.[24–26] Delays in seeking stroke-related care are linked to greater

Table 2. Recognition of signs/symptoms of stroke and appropriate action by race/ethnicity among veterans, Behavioral Risk Factor Surveillance System, 2003

	Total Sample	White	Black	Hispanic	Other	
	%	%	%	%	%	*P* value
Sudden confusion, trouble speaking or understanding	96.1	96.5	95.9	85.9	95.7	.0533
Sudden numbness or weakness of the face, arm, or leg	97.2	97.1	97.7	99.0	96.0	.2398
Sudden trouble seeing in one or both eyes	88.1	88.8	83.4	88.0	86.7	.0216
Sudden trouble walking, dizziness, loss of balance or coordination	94.4	94.3	94.7	96.1	93.0	.6224
Sudden headache with no known cause	79.8	79.9	80.3	78.6	77.3	.9100
Call 911 as first action	86.1	86.7	84.0	87.6	79.8	.0797
Recognized all five symptoms	16.9	17.5	21.4	6.6	13.0	<.0001
Recognized all five symptoms and appropriate action to call 911	14.5	15.1	17.4	6.0	11.0	<.0001

P value is for comparison across four racial/ethnic groups.

initial stroke severity and higher stroke mortality, both common among racial/ethnic minorities.[27–33] The effectiveness of medications designed to decrease stroke-related disability is decreased when treatment is delayed.[34] Therefore, persons who are having a stroke must be able to recognize the early warning signs and immediately seek treatment because prompt action to initiate emergency care can reduce disability and mortality.[4,12–15] Differences between recognizing individual signs and recognizing all five and calling 911 suggest a critical deficiency in current stroke education programs. The complex presentation of stroke appears to be poorly understood in veterans.

Future stroke education programs should include descriptions of the five major warning sign and instructions to call 911.[5] In addition, racial/ethnic minorities and other high-risk groups should be directly targeted in primary care facilities and through community education programs.[5,6] Finally, stroke educational programs should occur repeatedly using multiple strategies, verbal, written, and visual,[3,6,9,35] and must be sensitive to the diversity (age,

Table 3. Odds of recognizing signs/symptoms of stroke and appropriate action by race/ethnicity among veterans, Behavioral Risk Factor Surveillance System, 2003

	Black Odds Ratio	95% CI	Hispanic Odds Ratio	95% CI	Other Odds Ratio	95% CI
Sudden confusion, trouble speaking or understanding	.75	.45–1.25	.74	.19–2.92	.66	.35–1.24
Sudden numbness or weakness of the face, arm, or leg	.99	.52–1.88	1.91	.55–6.69	.72	.33–1.61
Sudden trouble seeing in one of both eyes	.55*	.39–.77	.65	.32–1.30	.68	.42–1.10
Sudden trouble walking, dizziness, loss of balance or coordination	.85	.56–1.29	1.14	.45–2.84	.60	.32–1.15
Sudden headache with no known cause	1.09	.79–1.49	.76	.33–1.76	.81	.46–1.44
Recognized all five symptoms	1.18	.99–1.42	.34*	.22–.51	.68*	.50–.92
Recognized all five symptoms and appropriate action to call 911	1.10	.91–1.32	.37*	.24–.58	.68*	.48–.96

CI = confidence interval. White race/ethnicity is reference group. Odds ratio adjusted for age, sex, education, income, marital status, employment, insurance, and access to care

* Statistically significant at $P<.05$

race/ethnicity, risk) of the target audiences.[8] Stroke education programs must also emphasize the need to immediately seek emergency medical care. Some stroke survivors report difficulty in distinguishing the onset of stroke symptoms from other illnesses (migraine, food poisoning), delaying much need medical attention.[36]

The results of this study should be interpreted in the light of its limitations. First, the findings of this study should not be generalized to the nonveteran population because veterans have equal access to care regardless of race/ethnicity.[23] Second, telephone surveys may yield biased estimates because of exclusion of households without telephones. However, studies have established the validity of the BRFSS telephone survey.[37,38] Third, factors that may affect knowledge of stroke risk factors were not measured in this study, including health literacy, quality of stroke education, cultural appropriateness of educational materials, and attendance at educational programs. These factors may provide additional explanations for the findings of the study and should be evaluated in future studies. Finally, the use of closed-ended questions may have influenced some responses,[7] and this influence may have differed by ethnicity.

In conclusion, a high percentage of veterans recognize individual stroke warning signs, but very few recognize all five warning and would take appropriate action to call 911 in the event of a stroke. The low rates of recognition of multiple presentations of stroke and taking appropriate action is more pronounced in racial/ethnic minority veterans, especially Hispanics and other non-Black minorities. Interventions are needed to improve stroke awareness among veterans.

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