Physician Advice, Patient Actions, and Health-Related Quality of Life in Secondary Prevention of Stroke Through Diet and Exercise

Kurt J. Greenlund, PhD; Wayne H. Giles, MD; Nora L. Keenan, PhD; Janet B. Croft, PhD; George A. Mensah, MD

Background and Purpose—Healthy diet and exercise are recommended for secondary prevention in stroke patients. We examined the prevalence of persons with stroke who received physician advice for, and engaged in, dietary change and exercise, and we also sought to determine whether engaging in these actions was associated with differences in health-related quality of life (HRQOL).

Methods—Data are from 51,193 participants in the 1999 Behavioral Risk Factor Surveillance System, a state-based telephone survey. The participants noted whether they were advised to eat fewer high fat/high cholesterol foods and to exercise more and whether they engaged in these activities. HRQOL measures were the reported number of the preceding 30 days when physical health was not good, mental health was not good, usual activities were limited, and both physical and mental health were good (healthy days).

Results—Overall, 2.4% of the participants reported a history of stroke. Sixty-one percent of those who reported a history of stroke had been advised to eat fewer high fat/high cholesterol foods, and 85.4% of those who had received such advice reported a dietary change compared with 56.0% of those who did not receive such advice. Almost 64% of those who reported a stroke had been advised to exercise more, and 76.5% of those who received such advice reported exercising more versus 38.5% of those who did not receive such advice. Persons with stroke who reported exercising had fewer limited activity days and days when physical health was not good and more healthy days than did persons who did not exercise. Dietary actions were not associated with differences in HRQOL.

Conclusions—Results highlight the importance of provider advice for secondary prevention among persons with stroke. (Stroke. 2002;33:565-571.)

Key Words: counseling ■ diet ■ exercise ■ health-related quality of life ■ secondary prevention ■ stroke

Although death rates from stroke have declined throughout the last century, stroke remains the third leading cause of death in the United States. Nonfatal stroke is a major cause of long-term disability and accounts for the greatest number of hospitalizations for neurological disease. It is estimated that there are >4 million stroke survivors and >700,000 incident strokes annually. Although there have been some major advances in the treatment of acute stroke, prevention of stroke remains the best approach to reducing the burden of this major public health problem. Persons who have had a stroke are at significant risk of recurrent cerebrovascular events as well as other cardiovascular conditions, but this risk may be reduced through preventive measures, including lifestyle factors. Beyond reducing the risk of subsequent events, preventive lifestyle factors may improve health-related quality of life (HRQOL) for persons with stroke.

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Health-care providers are an important source of preventive health information for patients, and provider encouragement is an effective avenue for promoting healthy lifestyle changes. Multiple studies suggest that physicians do not follow recommendations for primary and secondary prevention of cardiovascular disease (CVD), but several studies suggest a higher rate of counseling for high-risk patients. Few studies have examined the effects of preventive counseling and actions taken to reduce the risk of stroke and recurrent events among stroke survivors in the general population, and information is insufficient regarding whether engaging in healthy lifestyle actions is related to improved HRQOL among persons with stroke. The Behavioral Risk Factor Surveillance System (BRFSS) of the Centers for Disease Control and Prevention collects data on health
behaviors in the general population and includes information on persons with reported stroke. We examined the prevalence of self-reported physician counseling and actions regarding lifestyle behaviors to reduce the risk of heart disease and stroke among persons with a prior stroke, and we also sought to determine whether lifestyle-related actions for secondary prevention were related to perceived HRQOL.

**Subjects and Methods**

The BRFSS is a state-based telephone survey using random-digit dialing of the community-resident population aged ≥18 years; the methods used have been described elsewhere. The survey, conducted throughout the year, includes a set of core questions asked of all participants as well as modules on specific topics of interest to particular state public health programs. In 1999, 52,623 persons in 20 states (Alabama, Arizona, District of Columbia, Georgia, Indiana, Iowa, Kentucky, Louisiana, Maine, Mississippi, Montana, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, South Carolina, Virginia, and Wisconsin) answered questions regarding reported stroke, prevention counseling, and preventive actions. Participation rates for these states (Council of American Survey Research Organizations response rate) ranged from 43% to 76%.

History of stroke was based on whether participants were ever told by a health professional that they had experienced a stroke. Participants were asked whether a doctor had advised them to eat fewer high fat or high cholesterol foods or to exercise more and also whether they engaged in either action. Data were not available regarding counseling for smoking cessation. HRQOL was measured by questions ascertaining overall health status and the number of healthy days during the preceding 30 days when physical health was not good, mental health was not good, and the person could not carry out usual activities because of poor physical or mental health. Additionally, an index of healthy days was calculated: the total number of days when physical or mental health was not good was subtracted from 30 days, with the remainder considered the number of healthy days during the preceding 30 days. A minimum value of 0 healthy days was assigned to persons who reported ≥30 days of impaired physical and mental health. Other variables of interest included sex, age, race/ethnicity, educational level, and state. CVD risk factors included in the analysis were reported hypertension, high blood cholesterol, diabetes, current smoking, obesity, and the total number of risk factors reported. Persons with positive responses after they had been asked whether they had ever been told by a doctor or health-care provider that they had high blood pressure, high blood cholesterol, or diabetes were considered to have these conditions. The presence of hypertension in an individual was based on his/her having been told on at least 2 occasions that he/she had high blood pressure. Current smokers were those who smoked at least 100 cigarettes in their lives and who still smoked. Persons with a body mass index ≥30.0 kg/m² on the basis of reported height and weight were considered obese.

We examined the prevalence of reported stroke by selected demographic characteristics and the prevalence of CVD risk factors by stroke status. We then examined differences in physician advice and preventive behaviors regarding diet and exercise, also by stroke status. Among persons with and without stroke, we assessed the prevalence of taking action to reduce risk with diet and exercise by receipt of physician advice for these behaviors. Finally, among those with reported stroke, we assessed whether reported actions to reduce risk were related to HRQOL measures. The χ² test (for categorical variables) and ANOVA (for continuous variables) were used to examine overall differences, and multiple logistic regression and ANCOVA were used to examine differences after adjusting for sex, age, race/ethnicity, educational level, and CVD risk factors. We excluded from analyses persons who were pregnant (n=577) or missing information on stroke status (n=853), leaving data for 51,193 persons available for analysis. Data were weighted according to state population estimates and aggregated. Estimates and standard errors were calculated by using SUDAAN (Research Triangle Institute) to account for the complex sampling design.

**Results**

Overall, 2.4% (weighted percentage) of the study group reported having had a stroke. For the 20 states, the percentage of persons with a history of stroke ranged from 1.7% (Virginia) to 3.4% (Kentucky) (Table 1). The overall prevalence of stroke did not differ between men and women but was slightly higher among

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**Table 1. Percentage of Persons Reporting Stroke, by Selected Characteristics (20 States, BRFSS 1999)**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Persons</th>
<th>Weighted Percentage ±95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>20,734</td>
<td>2.5±0.33</td>
</tr>
<tr>
<td>Female</td>
<td>30,459</td>
<td>2.4±0.33</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Hispanic white</td>
<td>40,701</td>
<td>2.5±0.24</td>
</tr>
<tr>
<td>Non-Hispanic African American</td>
<td>6130</td>
<td>3.3±0.73</td>
</tr>
<tr>
<td>Hispanic</td>
<td>2821</td>
<td>2.1±0.94</td>
</tr>
<tr>
<td>Other</td>
<td>1340</td>
<td>1.7±0.82</td>
</tr>
<tr>
<td>Age group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18–34 y</td>
<td>13,248</td>
<td>0.5±0.20</td>
</tr>
<tr>
<td>35–49 y</td>
<td>16,078</td>
<td>1.0±0.25</td>
</tr>
<tr>
<td>50–64 y</td>
<td>11,241</td>
<td>3.1±0.49</td>
</tr>
<tr>
<td>≥65 y</td>
<td>10,406</td>
<td>7.6±0.86</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Up to high school</td>
<td>7,753</td>
<td>4.9±0.73</td>
</tr>
<tr>
<td>High school</td>
<td>17,299</td>
<td>2.7±0.39</td>
</tr>
<tr>
<td>Some college</td>
<td>13,211</td>
<td>2.2±0.43</td>
</tr>
<tr>
<td>College</td>
<td>12,833</td>
<td>1.1±0.25</td>
</tr>
<tr>
<td>State</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alabama</td>
<td>2,063</td>
<td>3.0±0.73</td>
</tr>
<tr>
<td>Arizona</td>
<td>17,22</td>
<td>2.6±0.90</td>
</tr>
<tr>
<td>District of Columbia</td>
<td>1,237</td>
<td>2.0±0.37</td>
</tr>
<tr>
<td>Georgia</td>
<td>2,209</td>
<td>2.6±0.80</td>
</tr>
<tr>
<td>Indiana</td>
<td>2,398</td>
<td>2.4±1.14</td>
</tr>
<tr>
<td>Iowa</td>
<td>3,474</td>
<td>2.4±0.51</td>
</tr>
<tr>
<td>Kentucky</td>
<td>7,369</td>
<td>3.4±0.61</td>
</tr>
<tr>
<td>Louisiana</td>
<td>1,625</td>
<td>1.9±0.63</td>
</tr>
<tr>
<td>Maine</td>
<td>1,647</td>
<td>2.3±0.80</td>
</tr>
<tr>
<td>Mississippi</td>
<td>2,121</td>
<td>2.8±0.76</td>
</tr>
<tr>
<td>Montana</td>
<td>1,782</td>
<td>2.3±0.71</td>
</tr>
<tr>
<td>New Mexico</td>
<td>3,382</td>
<td>2.0±0.53</td>
</tr>
<tr>
<td>New York</td>
<td>2,508</td>
<td>2.3±0.71</td>
</tr>
<tr>
<td>North Carolina</td>
<td>2,346</td>
<td>3.3±0.74</td>
</tr>
<tr>
<td>North Dakota</td>
<td>1,946</td>
<td>2.3±0.71</td>
</tr>
<tr>
<td>Ohio</td>
<td>1,595</td>
<td>2.4±0.78</td>
</tr>
<tr>
<td>Oklahoma</td>
<td>2,903</td>
<td>2.4±0.59</td>
</tr>
<tr>
<td>South Carolina</td>
<td>3,335</td>
<td>2.1±0.55</td>
</tr>
<tr>
<td>Virginia</td>
<td>3,395</td>
<td>1.7±0.45</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>2,136</td>
<td>2.0±0.63</td>
</tr>
</tbody>
</table>
non-Hispanic African Americans than among other race/ethnic groups. Prevalence of stroke was higher among older age groups and decreased with greater educational level. In multivariable logistic regression analyses including sex, ethnicity, education, and age as independent variables, men were more likely than women to report a history of stroke (odds ratio [OR] 1.3, 95% CI 1.1 to 1.6), as were non-Hispanic African Americans (OR 1.6, 95% CI 1.3 to 2.1) compared with non-Hispanic whites. Those with less education were more likely to report a stroke history than those with at least a college education (less than high school education, OR 2.6 and 95% CI 1.9 to 3.5; high school education, OR 2.1 and 95% CI 1.6 to 2.8; and some college education, OR 2.1 and 95% CI 1.6 to 2.9), whereas those at younger ages were less likely to report a stroke history than those aged ≥65 years (18 to 34 years, OR 0.06 and 95% CI 0.04 to 0.09; 35 to 49 years, OR 0.13 and 95% CI 0.10 to 0.18; and 50 to 64 years, OR 0.40 and 95% CI 0.32 to 0.59).

The prevalence of hypertension, high cholesterol, diabetes, current smoking, obesity, and having at least 2 cardiovascular risk factors was higher among persons with a history of stroke than among those without such a history (Table 2). Those with reported stroke were also substantially more likely to rate their health status as poor than were those without a stroke history. In analyses adjusting for sex, ethnicity, education, and age, these differences remained, with the exception of obesity.

Persons with a stroke history were more likely than those without a stroke history to report that they were advised by their health-care provider to eat fewer high fat and high cholesterol foods to lower the risk of heart attack or stroke (Table 2). The overall percentage who reported dietary action was not very different by stroke history status: 73.9% of those with a stroke history and 64.3% of those without a stroke history reported that they were eating fewer high fat and high cholesterol foods to reduce the risk of heart attack or stroke. However, the percentage of persons with a stroke history who were engaged in dietary activities was higher among those who reported a physician’s advice (85.4%) than among those who did not receive such advice (56.0%, Figure). Similar patterns were observed among those without a history of stroke, although observed prevalences were lower than among those with stroke.

Persons with a stroke history were also more likely than those without a stroke history to report that they were advised to exercise more, and 62.9% of persons with a history of stroke reported that they were exercising more to reduce their risk of heart attack or stroke (61.6% among those without a history of stroke, Table 2).
Fruits and vegetables are recommended for both primary and secondary prevention of stroke. They are recommended for the overall reduction in risk as well as reduction in risk through their association with risk factors for stroke, including hypertension, diabetes, adverse lipid levels, and overweight/obesity. Our observations highlight the need for increased efforts at both primary and secondary prevention for stroke.

### Discussion

Regular physical activity and a diet low in saturated fat and rich in fruits and vegetables are recommended for both primary and secondary prevention of stroke. They are recommended for the overall reduction in risk as well as reduction in risk through their association with risk factors for stroke, including hypertension, diabetes, adverse lipid levels, and overweight/obesity. Our observations highlight the need for increased efforts at both primary and secondary prevention for stroke.

Although many health-care providers report that they lack training in counseling and believe that their counseling is not effective, our observations highlight the importance of provider advice for CVD risk reduction, because persons who received dietary and exercise advice were substantially more likely than those not receiving such advice to remember health promotion materials they later received and were also more likely to have multiple CVD risk factors.

### TABLE 3. Impaired and Healthy Days Among Persons With Stroke, by Reported Lifestyle Actions to Reduce Risk of Heart Attack or Stroke (20 States, BRFSS 1999)

<table>
<thead>
<tr>
<th>Days, n</th>
<th>Low Fat Diet</th>
<th>Exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Physical health not good</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unadjusted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mental health not good</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unadjusted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Usual activities limited</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unadjusted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Healthy days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unadjusted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Values are mean±SE.

*Adjusted for sex, ethnicity, age, education, high blood pressure, high cholesterol, diabetes, current smoking, and obesity.

†P≤0.005, ‡P≤0.01, and §P≤0.05.
attempt behavior change. Furthermore, patients may consider the provider’s overall preventive practice approach when deciding to engage in particular preventive actions. Patients may decide to engage in a particular recommendation according to whether the provider also recommends other preventive efforts, whether they be lifestyle or pharmacological efforts. Continuing medical education programs for health-care providers should emphasize the importance of preventive counseling in reducing recurrent events in heart disease and stroke. Additionally, the development of information technology may enable providers to increase the adherence to recommended guidelines and to deliver patient care and provide patients with useful prevention information more efficiently.

HRQOL has gained attention in stroke research as the interest in stroke outcome has extended beyond reduction in mortality and morbidity. HRQOL has the additional component of subjective well-being as an outcome of stroke and stroke rehabilitation. Results from the national 1999 Survey of Income and Program Participation (SIPP) observed an overall 2.1% prevalence of reported stroke, which was similar to that observed in the 20 states reporting in the BRFSS. In the SIPP, stroke was among the 10 leading conditions associated with disabilities, which included impairment in functional activities and activities of daily living as well as use of assistive aids. Although some stroke-specific quality of life scales have been developed, the measures used in the BRFSS reflect general HRQOL but compare well against other HRQOL measures, such as the Medical Outcomes Study Short Form 36 and the Quality of Well-Being scale. In a general health survey such as the BRFSS, a short, valid, generic scale that is applicable across conditions and groups is preferable, although the ideal would be to have a combination of global measures as well as disease-specific measures.

Compared with the effects of clinical and biomedical interventions, the effects of lifestyle changes, such as increased physical activity and dietary changes, on disease outcomes, including HRQOL, have received little attention. We observed that engaging particularly in physical activity to lower future risk was related to better HRQOL among persons with stroke, which suggests the importance of provider counseling regarding secondary prevention through lifestyle. Our data are cross-sectional; thus, we cannot infer causality. The results regarding HRQOL should be taken with additional caution, however, because data were not available on the severity of impairment resulting from stroke and/or comorbidities, which may be likely, especially in older persons. It is possible that persons who are able to exercise had a less severe stroke and/or fewer comorbidities with resulting impairment than did those who were not exercising; thus, stroke severity or comorbidity may be a confounder in the association of exercise and HRQOL. Persons with stroke who were not engaged in physical activity reported more days of limited activity (Table 3) than did those reporting exercise change, which supports the possibility that differences in perceived HRQOL may be due to disease severity and/or comorbidities rather than lifestyle changes. However, moderate physical activity may confer a beneficial effect on stroke risk and may be as beneficial as heavy physical activity. In the Framingham study, physical activity was protective in men but not in women, although other studies have observed that physical activity is associated with a lower risk of stroke in women.

The observation that dietary action was not associated with greater HRQOL among persons with stroke does not imply that such preventive measures are unimportant. Dietary changes may reduce risk without having an impact on (positively or adversely) perceived HRQOL. It is also possible that those with more severe stroke were engaged in dietary actions only (and not physical activity); thus, no association was observed. Also, our dietary measures were general and may not capture dietary changes that are particular to stroke prevention. The association of dietary fat with stroke is uncertain, although lower fat intake is recommended for the reduced risk of coronary heart disease, a risk factor for stroke. Other dietary factors that may be related to reduction in stroke risk include increased antioxidants and potassium through greater consumption of fruits and vegetables and reduced salt intake, which may lower high blood pressure, the major risk factor for stroke. Results of recent studies, such as the Dietary Approaches to Stop Hypertension diet (for lowering high blood pressure) and the Lyon Diet Heart Study (demonstrating significant reductions in subsequent cardiovascular events after a myocardial infarction from the adoption of a Mediterranean diet), highlight the need for more well-designed studies examining the effects of lifestyle changes for secondary prevention.

The BRFSS data are subject to several limitations, including the cross-sectional character and the lack of information on disease severity and comorbidity. Limitations of self-reported data include recall bias and overreporting or underreporting of behaviors and existing disease. The validity of self-reported stroke in surveys has been varied. The data do not discern the amount or quality of physician advice received or actual amount or quality of the reported behaviors. Question ordering may influence results, and it is possible that persons who reported that their physicians had counseled them may be more inclined to then answer that they had made recommended changes. Such a bias would result in overreporting of lifestyle changes but underreporting of differences in HRQOL related to those lifestyle changes. Additionally, because the BRFSS targets the noninstitutionalized population, stroke survivors living in long-term care or rehabilitation facilities are not interviewed. As a result, the stroke survivors interviewed through BRFSS may have less severe disabilities than the total population of stroke survivors. Overall, the BRFSS probably underrepresents persons at a low level of health and functioning because time and functional capacity are needed to complete the telephone survey.

Nonetheless, these observations highlight the importance of provider advice for secondary prevention of heart attack and stroke among persons with prior stroke. Whether adopting healthy preventive behaviors results in improved HRQOL as well as reduced risk requires further study. Greater efforts are needed to assist providers in delivering effective advice for secondary prevention among persons with stroke.

References
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survivors had at least 1 risk factor for cardiovascular disease; 53% had hypertension, 41% had high cholesterol, 21% had diabetes, and 26% were obese. While the high levels of risk factors among these stroke survivors are not surprising, these are all conditions that could benefit from improved nutrition and increased physical activity—reason enough for a physician to advise these patients to make lifestyle changes. While this article mainly addresses physician advice on diet and exercise for the secondary prevention of stroke, it also provides some interesting information on physician advice among those without a history of stroke. Risk factor levels were high even among those without a stroke history: almost 60% had at least 1 cardiovascular disease risk factor, 20% were obese, 18% had hypertension, and 21% had high cholesterol. Yet, only 36% reported receiving advice on dietary fat and only 44% reported receiving advice on exercise.

Promotion of physical activity and nutrition for primary and secondary prevention is not a new idea. Regular physical activity and healthy eating habits have been recommended for chronic disease prevention at least since the publication of the Surgeon General’s Report on Nutrition and Health in 1988\(^1\) and the Surgeon General’s Report on Physical Activity and Health in 1996.\(^2\) In 1996, the US Preventive Services Task Force recommended that all primary-care physicians counsel their patients to incorporate regular physical activity into their daily routines and to adopt a healthy diet that limits fat and cholesterol; balances caloric intake with activity; and emphasizes fruits, vegetables, and grain products.\(^3\) More recently, the American Heart Association (AHA) has recommended both regular physical activity and adoption of healthy eating habits for the primary and secondary prevention of stroke.\(^4,5\) The AHA statement on the primary prevention of stroke concluded that “physical activity is a modifiable behavior that requires greater emphasis in stroke prevention campaigns.” Indeed, there is even a Healthy People 2010 objective (objective number 19-17) to increase the proportion of physician office visits made by patients with a diagnosis of cardiovascular disease, diabetes, or hyperlipidemia that include counseling or education related to diet and nutrition.\(^6\)

Unfortunately, some physicians may feel that they lack the training and time to deliver advice on exercise and diet and may not feel confident that their counseling is effective. Providing advice about increasing physical activity levels to stroke survivors with disabilities may be particularly challenging for physicians. Some relatively recent findings, however, suggest that a simple strong recommendation from a physician for a patient to make a specific behavior change (without in-depth counseling from the physician) may be effective when this advice is followed up with additional information, resources, and services that assist the patient in making the change.\(^7\) The reasons behind human behavior are complex, and obviously, physician advice on its own will not be enough to help most people be successful in changing behavior. Making and sustaining lifestyle changes can be particularly difficult for individuals in today’s social environment in the United States, where physical inactivity and unhealthy dietary habits are often the norm, as evidenced by the current epidemic of obesity and type 2 diabetes.\(^8\) The success of an individual in making and sustaining changes in activity levels and diet can depend on many factors on multiple levels, such as the individual’s readiness to change, safe walking opportunities in neighborhoods, availability of low-fat items in grocery stores, opportunities for physical activity at the workplace, insurance coverage for nutrition counseling, and physician advice to make a lifestyle change when it is needed. Interventions to promote physical activity and nutrition for the primary and secondary prevention of stroke must be comprehensive and work across all these levels, and physician advice is a vital component. Receiving a physician recommendation to make changes in activity or diet in order to protect health can provide a patient with a stimulus for change and motivation to sustain these changes. Clearly, more efforts are needed to educate physicians on the importance of advising their patients to increase physical activity levels and improve dietary habits when needed, and to provide physicians with feasible and effective ways of delivering such counseling, particularly to stroke survivors.

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**References**

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