Perception of Recurrent Stroke Risk among Black, White and Hispanic Ischemic Stroke and Transient Ischemic Attack Survivors: The SWIFT Study

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Key Words

Risk perception · Stroke knowledge · Health beliefs

Abstract

Objectives: Risk modification through behavior change is critical for primary and secondary stroke prevention. Theories of health behavior identify perceived risk as an important component to facilitate behavior change; however, little is known about perceived risk of vascular events among stroke survivors. **Methods:** The SWIFT (Stroke Warning Information and Faster Treatment) study includes a prospective population-based ethnically diverse cohort of ischemic stroke and transient ischemic attack survivors. We investigate the baseline relationship between demographics, health beliefs, and knowledge on risk perception. Regression models examined predictors of inaccurate perception. **Results:** Only 20% accurately estimated risk, 10% of the participants underestimated risk, and 70% of the 817 study participants significantly overestimated their risk for a recurrent stroke. The mean perceived likelihood of recurrent ischemic stroke in the next 10 years was $51 \pm 7\%$. We found no significant differences by race-ethnicity with regard to accurate estimation of risk. Inaccurate estimation of risk was associated with attitudes and beliefs [worry ($p < 0.04$), fatalism ($p < 0.07$)] and memory problems ($p < 0.01$), but not history or knowledge of vascular risk factors. **Conclusion:** This paper

provides a unique perspective on how factors such as belief systems influence risk perception in a diverse population at high stroke risk. There is a need for future research on how risk perception can inform primary and secondary stroke prevention.

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Introduction

Risk factor modification through lifestyle behavior change is important for stroke prevention. Theories of health behavior identify perceived risk as a key component in facilitating behavior change [1, 2]. Research on behavior change suggests that patients with accurate perceptions of risk are more likely to comply with prevention practices compared to those with inaccurate perceptions [2]. Underestimation of risk or ‘optimistic bias’ may undermine prevention strategies. Perceived risk may also be overestimated leading to difficulty in communication, excess patient anxiety and fear [3–7]. Accurate perception of risk provides a valuable foundation to begin behavior modification strategies to reduce risk [2–7]. There is no standardized health literacy measure to determine perception of risk and varying strategies have been employed to capture patient risk perception. Risk perception is captured as ‘low, medium, high’; or as a comparison to aver-

age [6–12]. Few studies ask patients to quantify risk or have examined the relationship between risk perception and factors such as health beliefs [5–10]. This study seeks to explore stroke risk perception in an ethnically diverse population of individuals with recent ischemic stroke or transient ischemic attack (TIA) and to examine the relationship between stroke risk perception and demographics, health beliefs, stroke knowledge and risk factors.

Materials and Methods

The overall objective of the SWIFT (Stroke Warning Information and Faster Treatment) study was to evaluate the efficacy of an interactive stroke preparedness educational program on improved times to the emergency department using a randomized controlled trial design described elsewhere [13]. Participants were enrolled in the prospective SWIFT study at Columbia University Medical Center. Eligibility for the SWIFT study included a diagnosis of ischemic stroke or TIA, over 18 years of age, ability to consent, and residing in Northern Manhattan. Patients were excluded if they were unable to give informed consent, discharged to a nursing home or requiring 24-hour care, if they had a modified Rankin scale score >4 at baseline, severe aphasia limiting comprehension, prestroke dementia history, or end-stage disease resulting in probable mortality ≤ 1 year. Subjects had to be able to participate in an intervention session given in either English or Spanish. The NIHSS score ranged from 0 to 17 with a mean close to 1. Less than 10% of the eligible patients refused participation [13]. All data in this article represent information from the baseline preintervention interview. After informed consent, a structured in-person interview, including demographic information and validated surveys, was performed in English or Spanish. Standardized questions were adapted from the Behavioral Risk Factor Surveillance System [14]. Measurements of blood pressure, height, weight, hip and waist were recorded. The health belief questions asked the participants to agree or disagree to the following statements: 'Some people are more likely to have a stroke than others'; 'I can protect myself from having a stroke'; 'If I follow my doctor's advice I will be less likely to have a stroke'; 'I worry about having a stroke', and 'Some people are fated to suffer a stroke and there is nothing that can be done to prevent this' [13].

Measurement of Risk Perception

Patients were asked to quantify their 10-year stroke risk using a verbally administered scale of 0–10 (with 0 being extremely unlikely and 10 being extremely likely). We defined accurate estimation of recurrent events to be 20–40%, which was selected after a literature review and our experience in recurrent events in the community [15–19]. Underestimation was defined as risk perception of <2 , and overestimation was defined as risk perception of >4 .

Statistics

We evaluated the relationship between perceived stroke risk and factors including health beliefs, knowledge, and risk factors by testing bivariate associations between variables and perceived

stroke risk. We performed a multivariate logistic regression analysis to examine factors associated with inaccurate risk perception adjusting for age, gender, race-ethnicity and significant factors ($p < 0.1$) from univariate analysis. The perceived risks categorized into underestimated (0–1), accurate (2–4) and overestimated (5–10) were dichotomized into accurate versus inaccurate for the multivariate model.

Results

The first 817 SWIFT study participants were used for this analysis. All data in this article represent information from the baseline prerandomization interview. Mean age was 63 ± 12 years; 50% were female; 46% Hispanic; 27% white; 23% black; 4% other. Three quarters of participants were diagnosed with ischemic stroke and 25% were diagnosed with TIA. Only 44% of the participants completed high school.

The mean perceived likelihood of having a stroke in 10 years was 51%, (median, 50%), or 5% per year. Only 20% of participants accurately estimated risk of recurrent events. The majority of participants (70%) overestimated their recurrent stroke risk but 10% reported no perceived risk. We found no significant differences by race-ethnicity with regard to accurate estimation of risk. In univariate analysis (table 1), we report that greater perception of stroke risk was associated with individuals who agreed with the statements, 'Some people are fated to suffer strokes and there is nothing that can be done to prevent them', or 'I worry about having a stroke'. Poorer educational experience was also associated with risk overestimation. Vascular risk factors associated with greater perception included diabetes, previous ischemic stroke, presence of two or more risk factors, and memory problems. Stroke and risk factor knowledge of individual risk were not associated with higher risk perception.

The multivariate model demonstrated that inaccurate estimation of risk (<20 or $>40\%$) was significantly associated with health beliefs such as worry as well as a statistical trend for fatalistic beliefs. Participants reporting they could 'protect themselves from a stroke' were significantly more likely to accurately estimate recurrent risk events. Self-reported memory problems were significantly associated with inaccurate risk perception. Vascular risk knowledge or information was not associated with risk perception but a trend for inaccurate estimation was seen among those with prior stroke or TIA (table 2). Educational level and race-ethnic differences were attenuated in the multivariate model.

Table 1. Bivariate analysis examining associations between risk perception and health beliefs, risk factors and demographics: the SWIFT study

	Positive response		Negative response		p value
	number	mean 10-year risk estimate, %	number	mean 10-year risk estimate, %	
<i>Health beliefs</i>					
Fated to have a stroke	274	54	445	49	0.04 ^a
Protect from stroke	542	49	178	54	0.15
Worry about stroke	485	54	235	45	0.00 ^a
Some are more likely to have a stroke	603	51	115	49	0.25
Follow doctor's advice about stroke	677	49	41	53	0.79
<i>Knowledge of risk factors</i>					
Knowledge of hypertension as a risk factor	684	50	36	48	0.87
Knowledge of diabetes as a risk factor	568	51	152	47	0.13
Knowledge of obesity as a risk factor	619	51	101	48	0.20
Knowledge of family history as a risk factor	634	51	86	47	0.55
Knowledge of smoking as a risk factor	621	51	99	48	0.47
Trouble with memory	300	50	427	47	0.00 ^a
<i>Demographics</i>					
Greater than high school education	391	48	293	53	0.02 ^a
Black versus white	164	51	191	50	0.89
Hispanic versus white	339	51	191	50	0.99
Medicaid versus private/other	265	49	448	52	0.40
<i>Risk factors</i>					
Age >65 years	322	50	393	50	0.79
Physical activity	362	51	358	50	0.50
Hypertension	524	51	196	48	0.17
Diabetes	258	53	459	49	0.09
Family history of stroke	131	54	582	50	0.15
Family history of heart attack	111	55	603	50	0.13
Smoker	434	52	287	49	0.18
Two or more risk factors for stroke	396	52	323	48	0.08 ^b
Previous stroke	118	58	592	49	0.10
^a Significant at the p < 0.05 level. ^b Trend at the p < 0.08 level.					

^a Significant at the $p < 0.05$ level. ^b Trend at the $p < 0.08$ level.

Discussion

Our results (the mean perceived likelihood of having a stroke in 10 years being 50%) suggest that patients in our ischemic stroke cohort perceive themselves to be at high risk of recurrent stroke over the next decades. This finding is contradictory to previous research which report that individuals at high risk underestimate stroke risk [6–9]. In a family practice cohort, 11% of patients at significant stroke risk recognized their increased risk; 48% reported average risk, and 41% below average risk [7]. Another study reported that less than half of individuals with a minor stroke/TIA considered themselves to be at increased vascular risk [12]. Among the studies

reporting underestimation, risk was most often assessed in a qualitative manner. These studies asked patients to rate risk perception as lower than average/average/or higher than average or they were simply asked: ‘Do you believe that you are at risk of stroke?’ [2–12]. Indeed, the manner in which the question of risk perception is presented may alter the risk estimate. In another study of 1,557 individuals at high vascular risk but with no diagnosed atherosclerotic disease, participants significantly overestimated their 10-year risk of stroke. Ten-year risk was assessed using a visual analogue scale between 0 and 100%. The mean perceived 10-year risk was 31% for myocardial infarction and 30% for stroke [5]. One quarter of participants did not provide risk estimates [5]. Pre-

Table 2. Multivariate model of perceived 10-year ischemic stroke risk

Variable	Estimate	p value
Fated to suffer a stroke	0.434	0.07 ^b
Protect from a stroke	-0.584	0.04 ^a
Worry about stroke	10.3	0.006 ^a
Hispanic versus white	-0.419	0.2
Black versus white	-0.153	0.5
Memory problems	0.618	0.01 ^a
Education > high school	-0.402	0.1
Identifies obesity risk factor for stroke	0.509	0.1
Has >2 risk factors for stroke	0.358	0.1
Previous ischemic stroke or TIA	0.565	0.07 ^b

^a Significant at the $p < 0.05$ level. ^b Trend at $p < 0.08$ level.

dictors of risk overestimation included older age, smoking, family history of vascular disease and self-rated fair/poor health [5]. The participants in our SWIFT study were asked about risk perception using a similar methodology and likewise were likely to overestimate recurrent stroke risk.

People react to risk at two levels; they evaluate risk cognitively and they react to it emotionally [20]. Post-stroke cognitive decline may alter risk perception [20]. Indeed, we report that prestroke memory problems were significantly associated with increased risk perception. Emotional processes and affective factors such as worry and how people feel about risk influence risk perception [20–22]. In our study, those who worry about stroke or feel they are fated to have a stroke were more likely to overestimate risk. Beliefs of ‘fatalism’ have been associated with Hispanic culture and may be important in influencing risk perception in our largely Hispanic cohort [23, 24]. Individuals may overestimate risk when they feel

they have little to no control over the risk [2]. Lay populations may view information about the ‘brain’ as extremely complex and overlaid with cultural nuances resulting in feelings of intimidation and loss of control.

Theories of health behavior identify perceived risk as an important component to facilitate behavior change. Several intervention studies report that risk perception change is associated with improvement of health behaviors [2, 25]. Adequate estimates of risk provide the individual with a sense of control while both underestimation and overestimation of risk may lead to behaviors counter to health and wellness. For stroke prevention, the focus has been on increasing knowledge and eliminating underestimation of risk, but risk theory suggests that overestimation is also problematic. Specifically, overestimation of stroke risk may leave individuals feeling overwhelmed and unable to modify vascular risk factors. Indeed, feeling out of control can also actually promote continuation of bad health behaviors such as sedentary life choices, poor adherence and unhealthy eating.

Limitations of the study include selection bias because of the exclusion criteria of the randomized controlled trial design, potential overestimation bias due to surveying hospitalized participants as the acute setting may heighten awareness or fear of a future stroke and estimate of recurrent stroke risk in the 20–40% range based on literature and experience [15–19]. This study highlights the importance of health beliefs and attitudes on risk perception.

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