Gender, Social Networks, and Stroke Preparedness in the Stroke Warning Information and Faster Treatment Study

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Background and Purpose: The study aimed to investigate the effect of gender on the association between social networks and stroke preparedness as measured by emergency department (ED) arrival within 3 hours of symptom onset. *Methods:* As part of the Stroke Warning Information and Faster Treatment study, baseline data on demographics, social networks, and time to ED arrival were collected from 1193 prospectively enrolled stroke/transient ischemic attack (TIA) patients at Columbia University Medical Center. Logistic regression was conducted with arrival to the ED ≤3 hours as the outcome, social network characteristics as explanatory variables, and gender as a potential effect modifier. *Results:* Men who lived alone or were divorced were significantly less likely to arrive ≤3 hours than men who lived with a spouse (adjusted odds ratio [aOR]: .31, 95% confidence interval [CI]: .15-0.64) or were married (aOR: .45, 95% CI: .23-0.86). Among women, those who lived alone or were divorced had similar odds of arriving ≤3 hours compared with those who lived with a spouse (aOR: 1.25, 95% CI: .63-2.49) or were married (aOR: .73, 95% CI: .4-1.35). *Conclusions:* In patients with stroke/TIA, living with someone or being married improved time to arrival in men only. Behavioral interventions to improve stroke preparedness should incorporate gender differences in how social networks affect arrival times. **Key Words:** Stroke—gender—social epidemiology—pre-hospital delays.

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Introduction

Patients are often ineligible for time-sensitive stroke treatments, specifically intravenous tissue plasminogen activator (tPA), because of delays between symptom onset and emergency department (ED) arrival. Patients who present to the ED later are at higher risk for poor outcomes after stroke as they may receive tPA later in their course or not at all.[1,2] Maximizing stroke preparedness is essential to minimize treatment delays, to ensure that patients are eligible for time-sensitive therapies, and to improve chances of favorable outcomes.[1,2]

Social networks, the "web of social relationships that surround an individual,"[3] have important effects on vascular health outcomes[4] by affecting disease risk, outcomes, and recurrence rates.[5-7] Although there are several ways in which social networks may be operationalized, for the purposes of this paper, we have defined patients' social

networks as a combination of their marital status, household composition, support from a professional caretaker, and source of daily help. One way that social networks may affect stroke outcomes is through their impact on stroke preparedness,[8] or the ability to recognize stroke symptoms as an emergency and to seek immediate medical care.[8] The presence of others at the time of symptom onset may lead to earlier recognition of warning signs and earlier access to medical care. The relationship between one's social network and stroke preparedness behavior is a complex one, though; previous work with Stroke Warning Information and Faster Treatment (SWIFT) data showed that marriage but not other types of social networks significantly improved stroke preparedness.[8]

In addition to the complexity introduced by the differential effects of various types of social networks on stroke preparedness, the relationship between social networks and health behaviors may be impacted by patient demographics, specifically gender. There is known variability in the social networks of stroke patients by gender.[9] Women are more likely to be widowed or live alone at the time of stroke than men,[10,11] and living alone may impact one's social network and reduce social support. Although some data suggest that the presence of a bystander at the time of stroke onset affects men and women differently,[12] it is largely unknown whether the effects of social networks on stroke preparedness differ between women and men.

Gaining an increased understanding of social network models, how they differ by gender, and how they affect stroke preparedness by gender has the potential to lead to more innovative, effective behavioral interventions to improve stroke preparedness and decrease delays between onset of stroke warning signs and arrival at an ED for acute medical care.

Our primary study objective was to assess potential gender differences in the effect of social networks on stroke preparedness, as measured by arrival to the ED within 3 hours of symptom onset. Our secondary objective was to determine whether reliance on one's social network was a significant part of the decision to delay seeking care among patients with stroke or transient ischemic attack (TIA).

Methods

Study Population

This study is a secondary analysis of patients enrolled in the SWIFT Study, a randomized controlled trial of a behavioral intervention designed to increase stroke preparedness and decrease time from symptom onset to ED arrival. Patients with a diagnosis of ischemic stroke or TIA presenting to Columbia University Medical Center between 2005 and 2011 were eligible for enrollment. Patients had to be ≥18 years of age, able to consent to the study, and reside in northern Manhattan. Patients were excluded from the study if (1) they were discharged to a skilled nursing facility or required 24-hour care; (2) they had baseline modified Rankin score >4; (3) they had severe aphasia or a history of dementia prior to their stroke; or (4) they had any end-stage disease with a probability of mortality of less than 1 year. Further details regarding the SWIFT methodology can be found elsewhere.[13] This study was approved by Columbia University Medical Center's Institutional Review Board.

Data Collection

Data for this study come from baseline interviews with patients enrolled in SWIFT. Demographic variables in this analysis included gender, race/ethnicity, age, highest level of education completed, and insurance status.

The main outcome measure was time from symptom onset or last known well time to ED arrival. Last known well time refers to the time when the patient was last seen or known to be at their baseline, prior to onset of symptoms or deficits. Time of symptom onset and ED arrival times were collected using both interviews and patients' electronic records. Time to ED arrival was treated as a binary variable with 3 hours as the cutoff based on a combination of the Food and Drug Administration-approved time window for intravenous tPA and the American Heart Association/American Stroke Association-recommended time window of 4.5 hours.[14]

Data pertaining to participants' social networks were collected during baseline interviews and included information on 4 variables: marital status, household composition, support from a professional caretaker, and source of daily help. Martial status was operationalized into 5 categories: single, married, living with partner, divorced, and widowed. The household arrangement variable had 4 categorizations: lives alone, lives with spouse, lives with non-spouse, and lives with more than one other person. Participants were categorized as currently receiving or not receiving professional help from a caretaker. Finally, source of daily support was based on participants' answer to the question, "Who would be most likely help you with your daily activities?" — spouse, child/ other relative, friend/neighbor/church member, or maid/other.

Other covariates collected during baseline interviews included mode of arrival (emergency medical services/ walk-in/transfer/other), initial stroke severity, history of prior stroke, and depression. Stroke severity was as measured using the National Institute of Health Stroke Scale (NIHSS), which was treated as a categorical variable (NIHSS 0-2, NIHSS 3-7, NIHSS >7) to separate very mild, mild, and moderate strokes; NIHSS >7 has also been shown to be associated with significantly worse outcomes.[15] We controlled for depression as previous literature has demonstrated associations between depression, gender, social isolation, and functional outcomes.[16] Depression at baseline was defined as a score of ≥16 on the 20-item Center for Epidemiologic Studies Depression scale, which asks participants to report the frequency of their depressive