Sex-Based Differences in Symptom Perception and Care-Seeking Behavior in Acute Stroke

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ABSTRACT

Context: Lack of early stroke recognition and delays in seeking emergency care by persons experiencing a stroke severely limit acute treatment options. Sparse and sometimes conflicting evidence suggests sex differences in care-seeking behaviors in stroke, stroke knowledge, perceptions of stroke symptoms, and the importance of physical location at the time of stroke and of having a witnessed stroke.

Objective: To explore specific sex-based differences in stroke presentation and associated care-seeking behaviors.

Design: Descriptive study based on a convenience sample of 60 patients with stroke admitted to an academic medical center in Northern California.

Main Outcome Measures: Impact of the patient's sex on 1) time to presentation (early [≤ 4.5 hours] vs late [> 4.5 hours]); 2) perception of symptoms and clinical signs; 3) stroke knowledge and decision making; 4) physical location at the time of stroke; and 5) bystander presence and assistance with decision making.

Results: There was a discrepancy between how patients perceive symptoms and their medical findings on physical examination. Although most patients had at least one sign or symptom associated with nationally used stroke recognition acronyms, both sexes delayed care because they did not perceive their symptoms as urgent. Early-presenting men were more likely to have a higher stroke severity score at admission, receive alteplase, arrive by Emergency Medical Services, and have a witnessed stroke. Both early- and late-presenting women reported more nonfocal symptoms than did men.

Conclusion: This study suggests that there are sex-based differences in symptom perception and care-seeking behavior in acute ischemic stroke.

INTRODUCTION

Acute ischemic stroke continues to be a leading cause of mortality and adult disability in the US, despite improvements in acute stroke treatment.[1] Although both sexes are negatively affected by stroke, women experience 55,000 more strokes annually compared with men and account for 58% of all stroke-related deaths. By age 85 years, 1 in 5 women will experience a stroke compared with 1 in 6 men.[2] Women are also more likely to be older at the time of their stroke, to have a more severe stroke and worse outcomes, have longer door-to-treatment times, and in some but not all studies, are less likely to receive acute stroke treatment.[1,3-8]

Acute stroke treatments are limited to intravenous (IV) alteplase and endovascular therapy. Both are time dependent, with earlier treatment times associated with better clinical outcomes. Despite the approval of alteplase more than 22 years ago and the continuing increase in certified stroke centers, it is estimated that less than 5% to 10% of all patients with ischemic stroke in the US receive this potentially life-altering medication.[9-11] Endovascular therapy performed within 0 to 6 hours of stroke onset became the standard of care in 2015 for a further subset of patients who have moderate to large strokes and timely access to a medical facility with endovascular capabilities.[12] With the recent publication of results from the DWI (diffusion-weighted imaging) or CTP (computed tomography perfusion) Assessment with Clinical Mismatch in the Triage of Wake-Up and Late Presenting Strokes Undergoing Neurointervention with Trevo (DAWN) and Endovascular Therapy Following Imaging Evaluation for Ischemic Stroke 3 (DEFUSE 3) trials, it is reasonable to treat select patients with endovascular treatment up to 24 hours after stroke onset.[13,14] Although endovascular treatment rates are increasing, overall rates remain extremely low.[15]

An established factor associated with the underutilization of acute stroke treatment is the lack of stroke symptom recognition and delays in seeking emergency care by persons with acute stroke.[6,16-22] In some but not all studies,[23] women with stroke have been shown to have longer delays in seeking treatment compared with men. Some experts believe that these delays are based on sex differences in the perception and internalization of symptoms.[6,20] A small number of studies have reported differences between sexes in reported stroke symptoms, although findings are conflicting.[24] Several studies have reported that men are more likely to experience dizziness and/or loss of balance compared with women,[25-27] whereas other studies report that women are more likely to experience confusion and/or aphasia.[28-30] Data on sex-based differences in stroke knowledge are also inconsistent, with several studies favoring women,[31,32] whereas others report no substantial sex-related differences.[33,34] There is a growing body of research signifying the importance of receiving timely care of a stroke bystander and of the physical location of the patient at the time of the stroke. However, this research remains sparse and is primarily based on hypothetical situations.[16,35,36]

A better understanding of how the perception of symptoms influence treatment-seeking behavior and time to presentation to the Emergency Department (ED) for stroke may improve our understanding of which symptoms are

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most predictive of time to treatment and for targeting community and patient education.[37] Studies completed to date do not differentiate between sexual identity and sex identification assigned at birth.

The objective of the current research was to conduct a pilot study of patients with an acute stroke diagnosis admitted to the ED of a busy academic medical center to examine the relationships among *subjective measures* (symptoms and patient perception), *patient and bystander knowledge* of potential treatment, and *clinically objective* measures of stroke between women and men and the impact of time and physical location at the time of the stroke to ED presentation. Specific study aims were to determine the impact of sex on the following:

1. early (≤ 4.5 hours from stroke symptom onset) and late (> 4.5 hours after symptom onset) presentation to the ED
2. the perception of symptoms and clinical signs
3. stroke knowledge and decision making
4. bystander presence and engagement in the decision-making process
5. location at the time of stroke onset and decision making.

METHODS

Study Setting and Design

This descriptive prospective study took place at a 612-bed academic medical center located in Sacramento, CA. The hospital had Comprehensive Stroke Center capabilities and was certified as an Advanced Primary Stroke Center by The Joint Commission. The study received approval by the hospital's institutional review board and was conducted in accordance with applicable national and local health authorities and institutional review board requirements.

This study was based on a convenience sample of 60 patients admitted between late 2014 and early 2016. All patients were at least 18 years of age and were admitted to the hospital with a suspected or confirmed diagnosis of acute ischemic stroke. Other inclusion criteria included the ability to provide written consent and the ability to answer study questions. Non-English-speaking patients were excluded because there were no resources to translate the consent forms and other study documents. Pregnant patients were excluded because treatment options differ and because the presentation of stroke is rare in this population.

Assessment

Demographics, medical history, and results of the presenting neurologic assessment were obtained from the electronic medical record. In addition, patients confirmed their sex. The neurologic assessment and National Institutes of Health Stroke Scale (NIHSS) score at admission were obtained from the academic neurology team's template-based admitting history and physical examination. In the rare case when the NIHSS score was not recorded, a study registered nurse who was certified in the NIHSS determined the score from the results of the neurologic examination portion of the admitting history and physical examination.[38]

Patients were asked to answer during their hospitalization open-ended questions regarding why they came to the ED, what they thought was wrong, and their decision-making process. They also were asked closed-ended questions regarding the following:

- their stroke knowledge (on a 5-point Likert scale from 1, indicating not likely, to 5, for very likely) and how likely they thought it was they were having a stroke (using the same 5-point Likert scale)
- whether bystanders were present, and if so, their relationship and sex
- whether Emergency Medical Services (EMS) were called, and if so, who made

Table 1. Demographic and clinical baseline characteristics of patients who presented to the hospital or Emergency Department within 4.5 hours of stroke symptom onset versus later

	Time patient presented after onset of stroke symptoms	
Characteristic	**4.5 h or less (n = 17)**	**After 4.5 h (n = 42)**
Men, no. (%)	7 (41.2)	22 (52.3)
Age, years (SD)	71.3 (15.5)	65.5 (17.3)
Wake-up stroke, no. (%)	0 (0)	16 (38.1)
NIHSS score, mean (SD)	6.0 (5.9)	4.1 (4.4)
Race, no. (%)		
White	9 (52.9)	27 (64.3)
Black	3 (17.6)	8 (19.1)
Asian	1 (5.9)	7 (16.7)
Other or not documented	4 (23.5)	0 (0)
Average blood pressure, mmHg (SD)		
Systolic	153.2 (23.1)	154.5 (24.6)
Diastolic	81.3 (14.8)	83.2 (13.6)
Prestroke modified Rankin Scale, no. (%)		
No symptoms (0)	14 (82.4)	38 (90.5)
No significant disability (1)	2 (11.7)	2 (4.8)
Moderate disability (3)	1 (5.9)	0 (0)
Moderately severe disability (4)	0 (0)	2 (4.8)
Ambulatory status before admission, no. (%)		
Able to ambulate independently	17 (100)	40 (95.2)
With assistance	0 (0)	1 (2.4)
Unable to ambulate	0 (0)	1 (2.4)
Other factors		
Average glucose, mg/dL (SD)	141.6 (59.9)	125.2 (47.6)
Treated with IV alteplase, no. (%)[a]	5 (29.4)	1 (2.4)
Treated with endovascular treatment (and no IV alteplase), no. (%)	3 (17.6)	1 (2.4)

[a] Significant difference ($p < 0.05$) between early- and late-presenting groups.
IV = intravenous; NIHSS = National Institutes of Health Stroke Scale; SD = standard deviation.

the decision, and if the decision maker was not the patient, the person's relationship and sex
- whether the patient knew there was a treatment that could possibly reverse a stroke, and if so, did s/he know there was a time limitation for administration of the treatment.

Further questions included patients' prestroke modified Rankin Scale rating and ambulatory status before admission. In addition, patients rated the presence and severity of 28 nonfocal and focal stroke symptoms on a scale from 0 (absent) to 5 (worst possible). All questions were verbally asked, and responses were recorded by study personnel.

Statistical Analysis

Descriptive statistics (χ^2 for categorical data and *t*-test for continuous data) were used to describe bivariate differences between groups. A sample size of 30 patients per group provided a power of 0.70 to detect a 32% difference in knowledge and symptom occurrence ($\alpha = 0.05$; odds ratio = 0.26 or risk ratio = 0.47). A sample size of 15 per group provided 60% power to detect a 40% difference ($\alpha = 0.05$). Unfortunately, many comparisons had much smaller numbers per cell.

Responses to the symptom questionnaire were compared with signs and symptoms noted by the physician in the admitting history and physical examination. Four levels of agreements were recorded (patient and physician reported, patient only, physician only, neither patient nor physician reported). The positive predictive values were then calculated using the physician-reported finding as the gold standard. Because of the large numbers of zero cells and small sample size, confidence intervals and sensitivities were not included.

RESULTS

A total of 60 patients were enrolled; however, 1 patient was deemed not to have a stroke and was deleted from further analyses. All patients were cisgender and admitted from the ED. Of the 59 remaining patients, 17 (28.8%) presented in less than 4 hours from symptom onset (early presenters; Table 1). The early presenters had higher presenting NIHSS

Table 2. Geographic and bystander factors associated with early- and late-presenting patients with acute stroke symptoms seen in an academic medical center in Sacramento, CA, between late 2014 and early 2016

	Early presenters (n = 17)		Late presenters (n = 42)	
Factor	Men (n = 7)	Women (n = 10)	Men (n = 22)	Women (n = 20)
Average age, y	68.3	73.4	65.4	64.9
Average NIHSS score	7.7	4.8	3.7	4.9
At least 1 FAST symptom, no. (%)				
From patient's perspective	6 (85.7)	6 (60.0)	20 (90.1)	19 (95.0)
From practitioner's perspective	7 (100)	10 (100)	22 (100)	20 (100)
Type of acute treatment, no. (%)				
Alteplase	5 (71.1)	2 (20.0)[a]	1 (4.5)	0 (0)
Endovascular	1 (14.3)	2 (20.0)	1 (4.5)	0 (0)
Location at time of stroke onset, no. (%)				
Home	3 (42.9)	7 (70.0)	18 (81.8)	15 (75.0)
Public area	1 (14.3)	2 (20.0)	1 (4.5)	3 (15.0)
Work	3 (42.9)	0 (0)	1 (4.5)	0 (0)
Visiting friends/families	0 (0)	1 (10.0)	1 (4.5)	1 (5.0)
Other	0 (0)	0 (0)	1 (4.5)	1 (5.0)
Witness to stroke onset, no. (%)	5 (71.4)	9 (90.0)	14 (63.4)	9 (45.0)
Relationship of stroke witness to patient, no. (%)				
Spouse/significant other	3 (42.9)	3 (33.3)	5 (22.7)	4 (20.0)
Other family	0 (0)	5 (50.0)	4 (18.2)	4 (20.0)
Friends/coworkers	2 (28.6)	0 (0)	4 (18.2)	1 (5.0)
Caretaker/health care worker, no. (%)	0 (0)	1 (10.0)	1 (4.5)	0 (0)
Stranger	0 (0)	0 (0)	0 (0)	0 (0)
Primary decision maker, no. (%)				
Self (patient)	1 (14.3)	0 (0)	7 (31.8)	3 (15.0)
Spouse	3 (42.9)	3 (30.0)	5 (22.7)	6 (30.0)
Other family	1 (14.3)	4 (40.0)	4 (18.2)	7 (35.0)
Caretaker/health care worker	2 (28.6)	3 (30.0)	3 (13.6)	1 (5.0)
Friend or co-worker	0 (0)	0 (0)	3 (13.6)	2 (10.0)
Location where decision to seek care was made, no. (%)				
Home	3 (42.9)	7 (70.0)	19 (86.4)	17 (85.0)
Public area/driving	4 (57.1)	1 (10.0)	3 (13.6)	1 (5.0)
Visiting friends/families	0 (0)	3 (30.0)	0 (0)	1 (5.0)
Other	0 (0)	0 (0)	0 (0)	1 (5.0)
Person making EMS or 911 call, no. (% of total callers)				
Patient	0 (0)	0 (0)	1 (9.1)	2 (18.2)
Spouse	2 (28.6)	0 (0)	3 (27.3)	3 (27.3)
Family	1 (20.0)	3 (60.0)	2 (18.2)	4 (36.4)
Caretaker/health care worker	0 (0)	1 (10.0)	2 (18.2)	1 (9.1)
Friend or other	2 (28.6)	1 (10.0)	3 (27.3)	1 (9.1)
Males calling EMS or 911, no. (% of total EMS calls)	2 (28.6)	2 (20.0)	5 (22.7)	6 (30.0)
Other factors				
EMS or 911 called, no. (%)	5 (71.4)	5 (50.0)	11 (50.0)	11 (5.0)
Average reported likelihood of having a stroke (ranging from 1, very unlikely, to 5, very likely)	3	2.8	2.5	2.25
Self-reported knowledge of treatment of stroke, no. (%)	1 (14.3)	4 (40.0)	3 (13.6)	4 (20.0)
Knowledge of the need to get to the hospital quickly, no. (%)	1 (14.3)	1 (10.0)	2 (9.1)	3 (15.0)

[a] Significantly different ($p < 0.05$) between early-presenting men and women.
EMS = Emergency Medical Services; FAST = Face, Arms, Speech, and Time; NIHSS = National Institutes of Health Stroke Scale.

scores (mean of 6.0 vs 4.1, not significant), indicating greater stroke severity, and were slightly but nonsignificantly older than the late presenters (Table 1). Both groups had similar prestroke modified Rankin Scale scores, and almost all were independently ambulatory before admission (Table 1). In the 42 patients who presented more than 4.5 hours after symptom onset (late presenters), 16 (38.1%) had wake-up strokes, in which stroke symptoms were newly present on wakening (27.1% of the total sample; Table 1).

Sex Differences and Presentation Times

There was an approximately equal number of men and women in the late- and early-presenting groups (Table 2). Early-arriving men had a higher presenting NIHSS score (7.7 vs 4.8) and were more likely to receive alteplase compared with early-presenting women (71.1% vs 20.0%; Table 2). Underlying disease patterns were similar between men and women, except that a higher percentage of women had previous stroke compared with men (22.6% vs 3.65%), and men were more likely to have a history of drug or alcohol abuse (25.5% vs 9.6%; Table 3).

Symptom Presentation

Both early- and late-presenting women were more likely to report nonspecific stroke symptoms (Tables 4A and 4B). Late-presenting women reported more chest pain; difficulty or more labored breathing; problems with concentration or memory; nausea or vomiting; and feeling anxious, irritable, or uneasy compared with late-presenting men (Table 4B). Early-presenting women were more likely to report problems with concentration or memory and problems with lightheadedness or feeling faint compared with early-presenting men (Table 4B). Early-presenting men were more likely to report traditional stroke symptoms, such as increased numbness or weakness of the face, arm, or leg; difficulties with speech; and/or swallowing difficulty. Other differences can be seen in Table 4A, 4B and 4C. Overall, the positive predictive value of patient-reported symptoms was low, even for focal deficits, in part because of the small sample size.

Stroke Knowledge

Women with prior strokes were slow to seek care, with most being late presenters. Overall, most patients were uncertain or thought it unlikely that they were having a stroke, even if they had a prior stroke. Besides the answer to the question of "how likely they thought it was that they were having a stroke" (which was only slightly higher in the early-presenting group), this theme is evident in the narrative responses (Table 5). Interestingly, in those with a nonwakeup stroke, there was an extended period between the initial awareness of their stroke symptoms and the seeking of lay advice and/or medical consultation. Early-presenting women had the highest self-reported knowledge of treatment of stroke (40%), however all groups did not know that it was important to get to the hospital quickly (range = 9.1% to 15%).

Stroke Symptom Acronyms

Most patients, regardless if they presented early or late, reported at least 1 symptom that met the most commonly used mnemonic acronyms used for educating the public about stroke signs and symptoms. These mnemonics included FAST (face, arm, speech, and time), SAVES (smile, arms, vision, even balance, speech), SAFE (speech, arms, face, and eyes), and the American Heart Association Sudden List (sudden numbness or weakness of the arm, face, or leg, especially on just 1 side of the body; confusion; trouble speaking or understanding speech; trouble seeing in 1 eye or both; trouble walking, loss of balance, lack of coordination or dizziness; and severe headache without a known cause). Percentages of patients with at least 1 FAST symptom ranged from 60% for early-presenting women to 95% for late-presenting women. Because there was very little variation between the different scales, only the FAST results are included (Table 2). Physicians noted at least 1 FAST finding in all patients (Table 2). The major discrepancy between patients and physicians relates to how patients perceive "weakness." Instead of reporting weakness or sensory loss, patients were more likely to equate the symptom to a task they could not perform, such as button their shirt or open a door. Patients were more likely to describe leg weakness as "loss of balance," a problem with falling, dizziness, feeling faint, or difficulty walking. Often the symptoms were described as vague or ambiguous, and with uncertain interpretation.

Importance of Place and Bystanders

Early-presenting men were more likely to report that their onset of symptoms occurred at work or in a public place (85.7%) compared with early-presenting women, most of whom (70%) reported symptom

Table 3. Sex differences in a convenience sample of patients with acute stroke admitted to an academic medical center in Sacramento, CA, between late 2014 and early 2016

Characteristic	Men (n = 29)	Women (n = 30)
Medical history, no. (%)		
Prior stroke or TIA	1 (3.4)	7 (23.3)
Heart disease	8 (27.6)	6 (20.0)
Atrial fibrillation	7 (24.1)	6 (20.0)
Drug or alcohol use	7 (24.1)	3 (10.0)
Diabetes	5 (17.2)	8 (26.7)
Hypertension	22 (75.9)	21 (70.0)
Other factors		
Activated EMS, no. (%)	22 (75.9)	20 (66.7)
Treated with alteplase, no. (%)	6 (20.7)	2 (6.7)
Endovascular treatment, no. (%)	2 (6.9)	2 (6.7)
Presenting average NIHSS score	4.6	4.6

EMS = Emergency Medical Services; NIHSS = National Institutes of Health Stroke Scale; TIA = transient ischemic attack.

Table 4A. Early presenters: Stroke symptom inventory by sex and time to emergency care presentation in a convenience sample of patients with acute stroke admitted to an academic medical center in Sacramento, CA, between late 2014 and early 2016

	Men early presenters (n = 7), no. (%)			Women early presenters (n = 10), no. (%)		
Symptom question	Patient-reported positive predictive value (physician as gold standard)	Reported by a patient	Reported by a physician	Patient-reported-positive predictive value (physician as gold standard)	Reported by a patient	Reported by a physician
S1: Generalized overall weakness	0/1 (0)	1/7 (14.3)	1/7 (14.3)	1/2 (50.0)	2/10 (20.0)	2/10 (20.0)
S2: Chest pain	0/1 (0)	1/7 (14.3)	0/7 (0)	0/0 (0)	0/10 (0)	0/10 (0)
S3: Difficulty or more labored breathing including shortness of breath	0/2 (0)	2/7 (28.6)	0/7 (0)	0/2 (0)	2/10 (20.0)	0/10 (0)
S4: Problems with concentration or memory including feeling confused or in a "fog"	0/0 (0)	0/7 (0)	0/7 (0)	0/3 (0)	3/10 (30.0)	0/10 (0)
S5: Nausea or vomiting	0/1 (0)	1/7 (14.3)	0/7 (0)	1/1 (100.0)	1/10 (10.0)	1/10 (10.0)
S6: Feeing anxious, irritable, or uneasy as if something really bad is (was) happening	0/3 (0)	3/7 (42.9)	0/7 (0)	0/6 (0)	6/10 (60.0)	0/10 (0)
S7: Dizziness	0/3 (0)	3/7 (42.9)	0/7 (0)	1/4 (25.0)	4/10 (40.0)	1/10 (10.0)
S8: Vertigo such as room spinning	0/0 (0)	0/7 (0)	0/7 (0)	0/2 (0)	2/10 (20.0)	0/10 (0)
S9: Lightheadedness/feeling faint	0/0 (0)	0/7 (0)	0/7 (0)	0/4 (0)	4/10 (40.0)	0/10 (0)
S10: Trouble with balance or steadiness or equilibrium	0/2 (0)	2/7 (28.6)	0/7 (0)	0/3 (0)	3/10 (30.0)	1/10 (10.0)
S11a: Face tingling or numbness	1/2 (50.0)	2/7 (28.6)	2/7 (28.6)	1/1 (100.0)	1/10 (10.0)	3/10 (30.0)
S11b: Arm tingling or numbness	3/4 (75.0)	4/7 (57.1)	3/7 (42.9)	0/3 (0)	3/10 (30.0)	2/10 (20.0)
S11c: Leg tingling or numbness	2/3 (66.6)	3/7 (42.9)	2/7 (28.6)	0/2 (0)	2/10 (20.0)	1/10 (10.0)
S12: Unable to grip, hand clumsiness, or hand weakness	2/3 (66.6)	3/7 (42.9)	3/7 (42.9)	2/2 (100.0)	2/10 (20.0)	5/10 (50.0)
S13a: Weakness or heaviness in the face	3/4 (75.0)	4/7 (57.1)	3/7 (42.9)	2/2 (100.0)	2/10 (20.0)	4/10 (25.0)
S13b: Weakness or heaviness in the arm	3/4 (75.0)	4/7 (57.1)	4/7 (57.1)	1/3 (33.3)	3/10 (30.0)	3/10 (33.3)
S13c: Weakness or heaviness in the leg	2/3 (66.6)	3/7 (42.9)	2/7 (28.6)	0/2 (0)	2/10 (20.0)	11/10 (10.0)
S14: Problems walking or unable to walk	2/4 (50.0)	4/7 (57.1)	2/7 (28.6)	2/2 (50.0)	4/10 (40.0)	4/10 (40.0)
S15: Problems with tumors or uncontrolled movements	0/1 (0)	1/7 (14.3)	0/7 (0)	2/2 (50.0)	2/10 (20.0)	1/10 (10.0)
S16: General problems with vision	2/3 (66.6)	3/7 (42.9)	2/7 (28.6)	1/5 (20.0)	5/10 (50.0)	2/10 (20.0)
S17: Double vision	0/1 (0)	1/7 (14.3)	0/7 (0)	0/1 (0)	1/10 (10.0)	0/10 (0)
S18: Blurred vision	0/2 (0)	2/7 (28.6)	0/7 (0)	0/4 (0)	4/10 (40.0)	0/10 (0)
S19: Loss of vision or unable to see things	2/2 (100.0)	2/7 (28.6)	2/7 (28.6)	0/2 (0)	2/10 (20.0)	1/10 (10.0)
S20: Problems focusing eyes	0/2 (0)	2/7 (28.6)	0/7 (0)	0/5 (0)	5/10 (50.0)	0/10 (0)
S21: Increased visual sensitivity to light	0/1 (0)	1/7 (14.3)	0/7 (0)	0/1 (0)	1/10 (10.0)	0/10 (0)
S22: Difficulty speaking or communicating	3/5 (60.0)	5/7 (71.4)	3/7 (42.9)	2/3 (66.7)	3/10 (30.0)	4/10 (40.0)
S23: Word slurring or "thick" tongued	5/5 (100.0)	5/7 (71.4)	5/7 (71.4)	2/3 (66.7)	3/10 (30.0)	4/10 (40.0)
S24: Word-finding difficulty or difficulty expressing thoughts	3/4 (75.0)	4/7 (57.1)	3/7 (42.9)	2/3 (66.7)	3/10 (30.0)	4/10 (40.0)
S25: Difficulty understanding others	1/1 (100.0)	1/7 (14.3)	1/7 (14.3)	0/2 (0)	2/10 (20.0)	1/10 (10.0)
S26: Trouble swallowing or handling secretions such as drooling	3/3 (100.0)	3/7 (42.9)	4/7 (57.1)	0/1 (0)	1/10 (10.0)	0/10 (0)
S27: Headache	1/3 (33.3)	3/7 (42.9)	1/7 (14.3)	0/4 (0)	4/10 (40.0)	1/10 (10.0)
S27a: Migraine	0/0 (0)	0/7 (0)	0/7 (0)	0/1 (0)	1/10 (10.0)	0/10 (0)
S28: Other	0/0 (0)	0/7 (0)	0/7 (0)	0/0 (0)	0/0 (0)	0/10 (0)

Table 4B. Late presenters: Stroke symptom inventory by sex and time to emergency care presentation in a convenience sample of patients with acute stroke admitted to an academic medical center in Sacramento, CA, between late 2014 and early 2016

	Men late presenters (n = 22), no. (%)			Women late presenters (n = 20), no. (%)		
Symptom question	Patient-reported positive predictive value (physician as gold standard)	Reported by a patient	Reported by a physician	Patient-reported-positive predictive value (physician as gold standard)	Reported by a patient	Reported by a physician
S1: Generalized overall weakness	11/14 (21.4)	14/22 (63.4)	3/22 (13.5)	3/13 (23.1)	13/20 (65.0)	3/20 (15.0)
S2: Chest pain	0/1 (0)	1/22 (4.5)	0/22 (0)	0/3 (0)	3/20 (15.0)	0/20 (0)
S3: Difficulty or more labored breathing including shortness of breath	0/1 (0)	1/22 (4.5)	0/22 (0)	2/4 (50.0)	4/20 (20)	2/20 (10.0)
S4: Problems with concentration or memory including feeling confused or in a "fog"	0/4 (0)	4/22 (18.2)	1/22 (4.6)	0/15 (0)	15/20 (75.0)	2/20 (10.0)
S5: Nausea or vomiting	0/1 (0)	1/22 (4.5)	0/21 (0)	1/5 (20.0)	5/20 (25.0)	2/20 (10.0)
S6: Feeling anxious, irritable, or uneasy as if something really bad is (was) happening	0/7 (0)	7/22 (31.8)	0/0 (0)	0/10 (0)	10/20 (50.0)	0/20 (0)
S7: Dizziness	0/4 (0)	4/22 (18.2)	0/22 (0)	0/5 (0)	5/20 (25.0)	0/20 (0)
S8: Vertigo such as room spinning	0/3 (0)	3/22 (13.6)	0/22 (0)	1/4 (25.0)	4/20 (20.0)	1/20 (5.0)
S9: Lightheadedness/feeling faint	1/7 (14.3)	7/22 (31.8)	1/22 (4.5)	0/6 (0)	6/20 (30.0)	0/20 (0)
S10: Trouble with balance or steadiness or equilibrium	7/12 (58.3)	12/22 (60.0)	8/22 (36.4)	1/10 (10.0)	10/20 (50.0)	1/20 (5.0)
S11a: Face tingling or numbness	1/4 (25.0)	4/22 (19.0)	2/22 (9.1)	1/7 (14.3)	7/20 (35.0)	2/20 (10.0)
S11b: Arm tingling or numbness	2/5 (40.0)	5/22 (23.8)	4/22 (19.0)	1/7 (14.3)	7/20 (35.0)	2/20 (10.0)
S11c: Leg tingling or numbness	1/5 (20.0)	5/22 (22.7)	3/22 (13.6)	1/8 (12.5)	8/20 (40.0)	2/20 (10.0)
S12: Unable to grip, hand clumsiness, or hand weakness	3/5 (60.0)	5/22 (22.7)	4/22 (19.0)	5/11 (45.4)	11/20 (55.0)	6/20 (30.0)
S13a: Weakness or heaviness in the face	1/2 (50.0)	2/22 (9.1)	3/22 (13.6)	3/4 (75.0)	4/20 (20.0)	6/20 (30.0)
S13b: Weakness or heaviness in the arm	7/10 (70.0)	10/22 (45.5)	10/22 (45.5)	5/11 (45.4)	11/20 (57.9)	7/20 (35.0)
S13c: Weakness or heaviness in the leg	6/11 (54.5)	11/22 (50.0)	7/22 (31.8)	6/12 (50.0)	12/20 (60.0)	7/20 (35.0)
S14: Problems walking or unable to walk	12/17 (70.6)	17/22 (77.3)	14/22 (63.6)	8/12 (66.7)	12/20 (60.0)	8/20 (40.0)
S15: Problems with tumors or uncontrolled movements	1/2 (50.0)	2/22 (9.1)	2/22 (9.1)	0/3 (0)	3/20 (15.0)	1/20 (5.0)
S16: General problems with vision	0/4 (0)	4/22 (18.2)	0/22 (0)	0/3 (0)	3/20 (15.0)	1/20 (5.0)
S17: Double vision	0/2 (0)	2/22 (9.1)	0/22 (0)	0/0 (0)	0/20 (0)	0/20 (0)
S18: Blurred vision	1/1 (100.0)	1/22 (4.5)	1/22 (4.5)	0/1 (0)	1/20 (5.0)	0/20 (0)
S19: Loss of vision or unable to see things	1/2 (50.0)	2/22 (9.1)	1/22 (4.5)	0/1 (0)	1/20 (5.0)	3/20 (15.0)
S20: Problems focusing eyes	0/0 (0)	3/22 (13.6)	0/22 (0)	0/1 (0)	1/20 (5.0)	0/20 (0)
S21: Increased visual sensitivity to light	0/0 (0)	0/22 (0)	0/22 (0)	0/2 (0)	2/20 (10.0)	0/20 (0)
S22: Difficulty speaking or communicating	1/8 (12.5)	8/22 (38.1)	1/22 (4.5)	2/12 (16.7)	12/20 (60.0)	3/20 (15.0)
S23: Word slurring or "thick" tongued	4/10 (40.0)	10/22 (45.4)	6/22 (27.3)	4/12 (33.3)	12/20 (60.0)	6/20 (30.0)
S24: Word-finding difficulty or difficulty expressing thoughts	1/5 (20.0)	5/22 (22.7)	1/22 (4.50)	2/9 (22.2)	9/20 (42.9)	4/20 (20.0)
S25: Difficulty understanding others	1/3 (33.3)	3/22 (13.6)	1/22 (4.5)	2/3 (66.7)	3/20 (15.0)	2/20 (10.0)
S26: Trouble swallowing or handling secretions such as drooling	1/4 (25.0)	4/22 (22.7)	3/22 (13.6)	3/5 (60.0)	5/20 (25.0)	3/20 (15.0)
S27: Headache	3/6 (50.0)	6/22 (27.3)	3/22 (13.6)	2/8 (25.0)	8/20 (40.0)	3/20 (15.0)
S27a: Migraine	0/1 (0)	1/22 (4.5)	0/22 (0)	0/0 (0)	1/20 (5.0)	0/20 (0)
S28: Other	0/0 (0)	0/0 (0)	0/0 (0)	0/0 (0)	0/0 (0)	0/10 (0)

Table 4C. All patients: Stroke symptom inventory by sex and time to emergency care presentation in a convenience sample of patients with acute stroke admitted to an academic medical center in Sacramento, CA, between late 2014 and early 2016

	All men (n = 29), no. (%)			All women (n = 30), no. (%)		
Symptom questions	Patient-reported positive predictive value (physician as gold standard)	Reported by a patient	Reported by a physician	Patient-reported-positive predictive value (physician as gold standard)	Reported by a patient	Reported by a physician
S1: Generalized overall weakness	3/14 (21.4)	14/29 (48.3)	4/29 (13.8)	4/15 (26.7)	15/30 (50.0)	5/30 (16.7)
S2: Chest pain	0/2 (0)	2/29 (6.9)	0/29 (0)	0/3 (0)	3/30 (10.0)	0/30 (0)
S3: Difficulty or more labored breathing including shortness of breath	0/3 (0)	3/29 (10.3)	0/29 (0)	2/6 (33.3)	6/30 (20.0)	2/30 (6.7)
S4: Problems with concentration or memory including feeling confused or in a "fog"	0/4 (0)	4/29 (13.8)	1/29 (3.4)	0/18 (0)	18/30 (30.0)	2/30 (6.7)
S5: Nausea or vomiting	0/2 (0)	2/29 (6.9)	0/29 (0)	2/6 (33.3)	6/30 (20.0)	1/30 (6.7)
S6: Feeing anxious, irritable, or uneasy as if something really bad is (was) happening	0/10 (0)	10/29 (34.6)	0/29 (0)	0/16 (0)	16/30 (53.3)	0/30 (0)
S7: Dizziness	0/7 (0)	7/29 (24.1)	0/29 (0)	1/9 (11.1)	9/30 (30.0)	1/30 (6.7)
S8: Vertigo such as room spinning	0/3 (0)	3/29 (10.3)	0/29 (0)	1/6 (16.7)	6/30 (20.0)	1/30 (6.7)
S9: Lightheadedness/feeling faint	1/7 (14.3)	7/29 (24.1)	1/29 (3.4)	0/10 (0)	10/30 (33.3)	0/30 (0)
S10: Trouble with balance or steadiness or equilibrium	7/14 (50.0)	14/29 (48.3)	8/29 (27.6)	1/13 (7.7)	13/30 (43.3)	2/30 (6.7)
S11a: Face tingling or numbness	2/6 (33.3)	6/29 (20.7)	4/29 (13.8)	2/8 (25.0)	8/30 (26.7)	5/30 (16.7)
S11b: Arm tingling or numbness	5/9 (55.5)	9/29 (31.0)	7/29 (24.1)	1/10 (10.0)	10/30 (33.3)	4/30 (13.3)
S11c: Leg tingling or numbness	3/8 (37.5)	8/29 (27.6)	5/29 (17.2)	1/10 (10.0)	2/10 (20.0)	3/30 (10.0)
S12: Unable to grip, hand clumsiness, or hand weakness	5/8 (62.5)	8/29 (27.6)	7/29 (24.1)	7/13 (53.8)	13/30 (43.3)	11/30 (36.7)
S13a: Weakness or heaviness in the face	6/9 (66.6)	9/29 (31.0)	7/29 (24.1)	5/6 (83.3)	6/30 (20.0)	10/30 (33.3)
S13b: Weakness or heaviness in the arm	10/14 (71.4)	14/29 (48.3)	14/29 (48.3)	6/14 (42.8)	14/30 (46.7)	10/30 (33.3)
S13c: Weakness or heaviness in the leg	8/14 (57.1)	14/29 (48.3)	9/29 (31.0)	6/14 (42.8)	14/30 (46.7)	8/30 (26.7)
S14: Problems walking or unable to walk	14/21 (66.7)	21/29 (72.4)	16/29 (55.2)	10/16 (62.5)	16/30 (53.3)	12/30 (40.0)
S15: Problems with tumors or uncontrolled movements	1/3 (33.3)	3/29 (10.3)	2/29 (6.9)	1/5 (20.0)	5/30 (16.7)	1/30 (3.3)
S16: General problems with vision	2/7 (28.6)	7/29 (24.1)	2/29 (6.9)	1/8 (12.5)	8/30 (26.7)	3/30 (10.0)
S17: Double vision	0/3 (0)	3/29 (10.3)	0/29 (0)	0/1 (0)	1/29 (3.4)	0/29 (0)
S18: Blurred vision	1/3 (33.3)	3/29 (10.3)	1/29 (3.4)	0/5 (0)	5/30 (16.7)	0/30 (0)
S19: Loss of vision or unable to see things	3/4 (75.0)	4/29 (13.8)	3/29 (10.3)	0/3 (0)	3/30 (10.0)	4/30 (13.3)
S20: Problems focusing eyes	0/5 (0)	5/29 (17.2)	0/29 (0)	0/5 (0)	5/10 (50.0)	0/10 (0)
S21: Increased visual sensitivity to light	0/1 (0)	1/29 (3.4)	0/29 (0)	0/1 (0)	1/30 (3.3)	0/30 (0)
S22: Difficulty speaking or communicating	4/13 (30.8)	13/29 (44.8)	4/29 (13.8)	4/15 (26.7)	15/30 (50.0)	7/30 (23.3)
S23: Word slurring or "thick" tongued	9/15 (60.0)	15/29 (51.7)	11/29 (37.9)	6/15 (60.0)	15/30 (50.0)	10/30 (33.3)
S24: Word-finding difficulty or difficulty expressing thoughts	4/9 (44.4)	9/29 (31.0)	4/29 (13.8)	4/12 (33.3)	12/30 (40.0)	8/30 (26.7)
S25: Difficulty understanding others	2/4 (50.0)	4/29 (13.8)	2/29 (6.9)	4/6 (66.7)	6/30 (20.0)	5/30 (16.7)
S26: Trouble swallowing or handling secretions such as drooling	4/7 (57.1)	7/29 (24.1)	7/29 (24.1)	3/6 (50.0)	6/30 (20.0)	3/30 (10.0)
S27: Headache	4/9 (44.4)	9/29 (31.0)	4/29 (13.8)	2/12 (16.7)	12/30 (40.0)	4/30 (13.3)
S27a: Migraine	0/1 (0)	1/29 (3.4)	0/29 (0)	0/2 (0)	2/30 (6.7)	0/30 (0)
S28: Other	0/0 (0)	0/29 (0)	0/29 (0)	0/0 (0)	0/0 (0)	0/10 (0)

Table 5. Narrative responses, by sex, for late (> 4.5 hours) and early (≤ 4.5 hours) presenters to the Emergency Department of an academic medical center in Sacramento, CA, because of stroke symptoms between late 2014 and 2016

Question responses	Question 1: Why did you decide to come to the Emergency Department today?	Question 2: In your own words, what did you think was wrong?	Question 3: Describe what you were doing when the symptoms started.
Early presenters: Men	Speech was slurred.	I didn't know what was wrong. My wife noticed that there was a problem.	Eating lunch.
	I knew something was wrong.	I had a feeling it was a stroke.	I had just left work and was sitting in my car. I went to another hospital and was told I had Bell's palsy and then came to this hospital and was told I had a stroke.
	I didn't make the decision. I was at work with a glazed look on my face.	My coworkers wouldn't let me continue to work. They also noted that I had some speech problems earlier in the day.	Walking at work.
	I was lying on the ground working on my van and was having problems using the tools.	My wife made the decision.	I was working on a van.
	Suddenly, I couldn't move.	I thought it was a ministroke.	Eating.
	I was walking my dog at the lake and started feeling weak. I rested for a while by sitting down on the sidewalk, and then I couldn't get back up. As I had my cell phone, I called my mother. She came to me. She then went to the police department, and they called 911.	I really didn't know.	Walking my dog.
	My boss called an ambulance.	I knew I couldn't talk, and then I couldn't move my right side.	Talking to the boss discussing a project when the boss noticed something wasn't right.
Early presenters: Women	The last thing I remember is waking up on the sofa and trying to sit up.	I didn't know anything was wrong.	Watching TV with some friends.
	My caretaker made the decision.	Unsure.	I was trying to get up.
	My arm was weak, and the fingers were tingly. Also felt dizzy.	I didn't know, I just knew that I kept leaning to the right.	Getting out of car at the post office; I then drove home.
	I was driving home when I pulled into the driveway and realized something wasn't right. I couldn't dial the phone, so I went to my neighbors.	I didn't know, I knew I wasn't [feeling] normal.	In the driveway.
	Was vomiting and experiencing dizziness.	Thought it was an upset stomach.	Sitting down.
	I was staying with my son, and I didn't eat for 3 days. My son thought this was unusual and took me to the ED.	I had no idea.	I can't remember; maybe cooking.
	Change in vision and numbness in my cheek.	I was afraid it was a stroke.	I was shopping … and couldn't see the words.
	Came back in the house, as I felt foggy. Wanted to take my blood pressure, but I couldn't see the numbers [on the monitor].	I thought it was related to my blood pressure or Afib. I knew Afib could cause stroke.	I was looking at the flowers outside.
	According to her husband, she looked pale and felt cold. Her legs became weak. She was moving her left arm less.	Husband thought she had another stroke.	The patient was lying in bed when she awakened with symptoms.
	I first went to another hospital. [The physician there consulted with a neurologist and then sent her home with instructions to follow-up with her regular physician.] I then decided to come to this ED.	Stroke.	She was upset with family members, and her arm felt limp.

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Question responses	Question 1: Why did you decide to come to the Emergency Department today?	Question 2: In your own words, what did you think was wrong?	Question 3: Describe what you were doing when the symptoms started.
Late presenters: Men	Cleaning lady found me on the floor and called 911.	Didn't know what was wrong. I had no strength.	Sleeping. Woke up [at] the usual time. Fell trying to get out of bed.
	I spent 10.5 hours in the ED waiting to be seen. I couldn't raise my left hand.	Stroke.	Pouring coffee in the kitchen.
	A friend came to see me and stated that my face was droopy.	Unsure.	Just finished eating Thanksgiving dinner.
	I had fallen down and couldn't get up. I then pushed my panic button and help came.	I don't know. I was very weak.	Going to dinner, staggered to dinner. Had to use a walker to get from dinner table back to my room [assisted living]. I fell when I got back to my room.
	I had pain in my back for 3 days. I had a headache, was dizzy, and couldn't walk right.	Unsure. I just knew something wasn't right.	I was having a glass of wine. I then developed a headache. I thought it was from the wine. The next morning, I had problems walking.
	Thought I was having a stroke.	I thought that I had a stroke. I had similar symptoms a few months prior and was told I might have had a stroke at that time.	Coming out the bathroom, using a [cotton swab] to clean my ears, when my legs stopped working. I felt like I was falling, and I called for my wife. Then I fell.
	Had new seizure.	Not sure; I was weak and sleepy.	Sleeping.
	Falling for 3 days.	Didn't know.	Unsure. Have had problems with falling over the last 3 days.
	Had problems with balance and arm weakness at work yesterday.	I didn't know.	Experiencing some dizziness, right arm numbness, and some slurred speech.
	I didn't seem right.	I didn't know.	I can't remember.
	Something wasn't right.	I didn't know.	I don't remember.
	Daughter stated that I needed to go to the hospital.	I didn't know.	I was sleeping and got up in the morning to go to the bathroom and had problems walking. Daughter stated that my speech was off.
	My girlfriend stated that I was having a stroke.	My girlfriend thought I was having a stroke, and I believed her.	I kept falling down when trying to walk in the kitchen.
	My doctor sent me. I had an appointment regarding other issues. He sent me to the ED for [evaluation of] stroke symptoms.	Maybe a stroke or reaction to medication or to the flu shot.	I was spending the night at my brother's house. I got up to go to the bathroom during the night, and my balance was off. Balance was off for the next several days.
	I couldn't get off the ground after I fell getting out of bed.	I didn't know. I was sick with the flu and thought it was associated with the flu.	It was the middle of the night, and I had been sleeping.
	My wife told me to go.	I didn't know. My wife thought it was stroke.	I was sleeping and felt tingling in my thumb at 3 a.m. when I awoke. I then went back to sleep. At 8-9 am when I woke up, I couldn't move my left side of my body.
	Urgent care transferred me to the ED. I was feeling unsteady. y balance and walking were off.	Recently stopped taking a new blood pressure medication. I thought it was a side effect of stopping the medicine.	The symptoms [were] present when I woke up but got worse as the day went on.
	I don't know. I waited too long to come to the hospital.	I was in denial that anything was wrong.	Routine stuff.
	A friend brought me.	I didn't know.	I was eating.
	I didn't feel good. I went to my primary care physician first.	I didn't know. Symptoms came on slowly.	I was watching TV and had some problems with my speech.
	Fell to the floor a day before recognizing any symptoms.	Stroke.	Sat to drink coffee.
	Someone else called 911.	I don't remember anything.	I was walking in a restaurant and was going to sit down after ordering.
	I knew I was having a stroke.	When I couldn't roll over in bed, I knew I was having a stroke.	I was lying on my stomach and wanted to go to the bathroom, but I couldn't move.

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Question responses	Question 1: Why did you decide to come to the Emergency Department today?	Question 2: In your own words, what did you think was wrong?	Question 3: Describe what you were doing when the symptoms started.
Late presenters: Women	I didn't feel good.	I knew my body wasn't good.	I saw my friend dead on the floor.
	Symptoms mild. I was out of town at my sister-in-law's house and was under a lot of stress. I was sitting in a chair trying to put papers together, and my hand wasn't working. Then it got bad: Numbness from the top of my arm to my fingers. I drove home [approximately 3 hrs]. I didn't initially do anything. I went to bed and called the advice nurse the next day to get a physician appointment.	Suspicious of small stroke.	Sitting in chair settling papers [death in family].
	Ear infection (swimmer's ear).	Unsure.	Unsure.
	Babysitting some dogs for several days. On Day 1, felt dizzy and lightheaded in the evening. The next day, I fell 3 times. The next day, I called my daughter.	I thought I was having a stroke. Maybe problems with diabetes. I've also had cancer.	Fell getting up from the couch to get the mail.
	No choice; my boss called 911.	I thought I had heartburn.	The day prior I felt like I was punched in the chest. My handwriting was funny. Went to bed at 2 am. Got up to go to the bathroom and fell. Got up again at 4 am and fell again. I ignored it. Spouse and son were home when I got up for work. Had problems doing hair but went to work anyway. I was apparently having problems doing my work, and my boss called 911 at 7:15 am.
	Daughter decided to call EMS after I slid off the toilet and fell on the floor. I couldn't get up.	My arms were too weak to use my walker. I had the walker because my ankle is broken.	Using toilet. Was on floor for 8-10 hrs until daughter came over.
	My boyfriend thought that I was having another stroke.	I didn't know. I didn't recognize anything wrong or different.	Watching TV. We had gotten a motel room, as we were living in our truck. It is very stressful. My boyfriend recognized that I couldn't grip or stand up on my left side and that my words were slurred.
	I couldn't use my hand or arm. I knew I wasn't feeling right.	Stroke—family member is a neurologist. I called him. He stated that I should go to the ED.	I just woke up. I was cold and couldn't get my arm in my sweater.
	Felt bad and couldn't walk. My eyes were dark. I can usually see good [sic].	I had a prior TIA. Thought it was a stroke based on past TIA.	I got up in the morning and didn't feel good. I laid down on the couch at 8:30 am I tried to get up at 10 am and was unable.
	Family noticed that something wasn't right.	Didn't know; only knew something wasn't right.	At home alone during the day. Fine when family left for work in the morning but was unable to communicate when they returned in the afternoon.
	I felt hot … and my left eye hurt.	I was very hot.	I was sleeping. When I woke up, I had pain to my left eye and felt very hot.
	I didn't know what went wrong.	Bronchitis.	Husband was sick. Praying for husband when my voice changed. My speech became slurred.
	My roommate and father thought I needed to go to the ED because of my symptoms.	Migraine.	Symptoms started 3 days ago while driving. For 2 days … had arm numbness in class. Went to health clinic at the university. [The health clinic stated she had a migraine and sent her home. She had no history of migraines or headaches.]
	Walked from bedroom to TV room and fell to ground.	I didn't know.	Walking from one room to another.
	I was drooling in my sleep. I got up and did my morning activities. I then went shopping and out to lunch with my daughter, where I had problems with eating and drinking.	Maybe that I had a little stroke.	Eating at a restaurant.
	My son thought I should go.	I didn't know anything was wrong.	Sleeping.
	I was visiting children at the hospital.	I don't know.	I was visiting kids.
	My sister noticed I had slurred speech.	I'm not sure. I slipped, fell, and banged my head.	Fell on slippery floor in bathroom.
	Feeling numb, especially my arm, and my hand was cold. I waited all day before doing anything.	I was thinking it could be a stroke. A friend had a stroke in January.	I went to bed healthy. Had a weird dream and woke up in the morning. Arm felt funny, [and I] couldn't talk right. Symptoms got worse during the day.
	On Sunday, I felt hot and dizzy while working. Monday, I got up at 1 am to go to the bathroom. At that time my knees buckled, and I had a hard time feeling on the left side. I went back to sleep. I had to use my cane when I got up … I knew something wasn't right but went back to bed. [When she woke up again, her left hand was weak. Later that morning, one of her sons called her on the telephone, and she told him about her symptoms and that she thought she was having a stroke. Her son who was home stated that her speech was slurred and her face was droopy.]	I thought it was a knee problem initially.	I was getting up to go the bathroom.

Afib = atrial fibrillation; ED = Emergency Department; EMS = Emergency Medical Services; TIA = transient ischemic attack.

onset starting at home. Even when symptoms started outside the home, women were more likely to return home and confer with others before making the decision to seek help. Early- and late-presenting men reported being more involved in the decision-making process to seek emergency care. Early-presenting men more frequently arrived by ambulance (71.4%) and more frequently received alteplase or endovascular treatment of their stroke (85.7%) compared with women (50% and 40%, respectively; Table 2).

DISCUSSION

This study suggests that women with acute stroke report nonfocal symptoms (eg, generalized weakness, chest pain, shortness of breath, problems with concentration, problems with memory, feeling anxious, and word-finding difficulty) more frequently than do men. These findings are more apparent in late presenters compared with those who present to the hospital or ED within 4.5 hours. Regardless of sex, patients with stroke appear to perceive and explain their symptoms differently from how they are described by health care practitioners. Patients were more likely to describe tasks they could not perform and overall feelings compared with focal signs noted by health professionals. These findings have an impact on the functionality from the perspective of mnemonic acronyms such as FAST, which emphasize loss of function in terms of face, arm, or leg weakness. Although their symptoms were potentially life altering, patients did not tend to dwell on the onset of symptoms and underestimated their severity. There was a gap between the perception of symptoms and the appreciation of the meaning and seriousness of the symptoms and then to decision or actions in seeking help. Despite having at least 1 focal deficit, both late and early presenters were uncertain that they were having a stroke, with most patients being unsure of the cause of their symptoms. These findings correlate with previous reports acknowledging that most individuals do not attribute stroke symptoms to a stroke. This may be in part because of the vagueness of the symptoms and the self-interpretation of their meaning, including the lack of attributing symptoms to a major problem. Some patients lacked the somatic awareness of a change in their physiologic status. Exploring alternative stroke symptom messaging may help patients and other individuals better recognize stroke.

Including the location and cause of the stroke may help to further explain differences in presentation. For example, elderly women are more likely to have atrial fibrillation, although not found in this study, placing them at higher risk of a cardioembolic stroke. Cardioembolic strokes are more likely to occur in larger cerebral vessels causing higher severity strokes that may include cortical findings, such as language loss and anosognosia (a failure to recognize the symptoms of one's own illness), as reported in previous studies.

Bystander and lay consultation appear to be important in decision making and timely presentation to the ED. For women, the burden of decision making was more often shifted to a nonspousal family member, such as a son or daughter, or friend who helped to determine the seriousness of the event and the action that should be taken. This may be because elderly women are more likely to live on their own compared with elderly men. Interestingly, when women first experienced stroke symptoms outside the home, they returned home before reporting symptoms to others. Men were less likely to shift and/or report the shifting of decision making to others, reporting taking an active role in the decision to seek emergent care; however, the EMS or 911 telephone calls were most often made by a bystander, most commonly the patient's spouse when the stroke occurred at home. Most of the recurrent strokes in this study occurred in women. Even with recurrent stroke, women were slow to seek care, most often relying on others for decision making. This emphasizes the importance of educating family members, caretakers, close friends, and others close to those at risk of stroke about the signs and symptoms of stroke as well as the need to obtain emergency care.

Our study had a number of limitations. This was a small convenience sample from a single hospital. Most strokes were minor to moderate in severity, because patients had to have the ability to consent and comply with study questioning. Responses by patients with more debilitating strokes may differ from those in this study. Stroke cause and location may confound the differences between sexes and was not accounted for. The small sample size limited the analyses that could be performed, and most findings were insignificant owing to low power.

CONCLUSION

Lack of timely recognition of stroke symptoms by persons with stroke continues to be a problem in acute stroke care. Although women are more likely to report nonfocal stroke symptoms, both men and women often do not recognize or correctly attribute signs and symptoms of stroke as such and thus delay seeking emergency care. Bystander roles and the patient's location at the time of the stroke, as well as social roles and relationships, influence care-seeking behaviors in both sexes, with women being more likely to defer treatment decisions until conferring with others. This pilot study supports conducting a larger study to confirm these findings, to better understand how patients perceive stroke symptoms, and to further understand how they evaluate and to respond to changes in their health status. This type of research may help improve the community health messages on stroke symptoms, stroke recognition, and the need to obtain emergency care. ❖

Disclosure Statement

The author(s) have no conflicts of interest to disclose.

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