



Disparities in Awareness of the Warning Signs and Symptoms of a Heart Attack and Stroke among Rhode Island Adults

Deborah N. Pearlman, PhD, Patricia Affleck, MS, and Dona Goldman, RN, MPH

Early treatment after a heart attack or a stroke is critical to lowering the risk of disability and death. The survival benefit is greatest when **thrombolytic** agents are administered within one to three hours after symptom onset.^{1,2}

Median delay time from symptom onset to hospital arrival in U.S. studies ranges from 1.5 to 6.0 hours.³ Treatment-seeking delays include the time intervals 1) from symptom recognition to the decision to seek medical care; 2) from the decision to seek medical care to first contact with the healthcare system; and 3) from first contact with the healthcare system to treatment.³ Once patients arrive in a hospital for care, the delay in getting treatment is small. The longest delay continues to be the time from symptom recognition to the decision to get medical attention.³ Thus, assessing the public's knowledge of heart attack and stroke warning signs and symptoms is an important first step for designing interventions that may decrease time to treatment and improve patient outcomes.^{4, 5, 6, 7}

In 2009, the **Rhode Island Department of Health (HEALTH)** included a module on awareness of heart attack and stroke warning signs and symptoms as part of the **Behavioral Risk Factor Surveillance System (BRFSS)** survey, followed by two public awareness campaigns.⁸ This study reports baseline findings from the BRFSS survey. It also presents findings on length of stay and associated costs when myocardial infarction or stroke was the primary reason for a hospital discharge in 2008 and 2009. Rhode Island's Hospital Discharge Data will be analyzed again in 2012 after the two public awareness campaigns have ended.

METHODS

The BRFSS is a random-digit-dial telephone survey of adults age 18 years or older. The **Centers for Disease Control and Prevention (CDC)** provides national oversight to participating states. This report uses information from the 2,580 respondents age 40 and older who received the 2009 Rhode Island BRFSS module on heart attack and stroke signs and symptoms.

Respondents were asked to identify the major warning signs and symptoms of a heart attack and stroke in a series of close-ended questions that included two incorrect signs (sudden trouble seeing in one or both eyes for heart attacks and chest pain for strokes). Response options for all questions were "yes," "no," and "don't know/not sure."

We computed one heart attack and one stroke knowledge score for each respondent. Respondents received 1 point for each correct answer, with an additional point if they would call 9-1-1 as their first action if they thought someone was having a heart attack or stroke. Other options included taking the person to a hospital, advising the person to call a doctor, calling a spouse

or family member, or doing something else. Each score ranged from 0 to 6. Data were weighted to the 2009 state population estimates. Statistically significant differences between groups were determined by non-overlapping 95% confidence intervals.

Data on inpatient admissions came from the 2008-2009 Rhode Island Hospital Discharge Data files. Our analyses focused on admissions to one of 11 acute care general hospitals where acute myocardial infarction (ICD-9-CM 410) or a stroke (ICD-9-CM 430-438) was listed as the principal diagnosis for persons age 40 and older. We calculated length of stay and costs separately for non-Hispanic whites, non-Hispanic blacks, and Hispanics. Because hospital charges do not represent the cost of an inpatient admission, the charges were multiplied by a cost factor ratio specific to each hospital. The unit of analysis was the admission, not the individual patient. We used SAS software version 9 for all analyses.

FINDINGS

In 2009, nearly all Rhode Island adults age 40 and older (96.4%) knew that chest pain or discomfort was a heart attack warning sign. Only 38.6% of respondents knew all five warning signs and symptoms. The average score for correctly recognizing all five heart attack warning signs and the importance of first calling 9-1-1 was 4.8 with a range of 0 to 6 (Table 1).

The two most commonly recognized stroke warning signs were sudden numbness or weakness of the face, arm, or leg (98.2%) and sudden confusion, trouble speaking, or understanding (97.2%). Awareness of all five signs and symptoms was low (44.5%). The average score for correctly recognizing that someone might be having a stroke and the importance of first calling 9-1-1 was 4.9 with a range of 0 to 6 (Table 1).

Non-Hispanic whites generally had a higher awareness of individual heart attack or stroke warning signs and symptoms than racial/ethnic minorities. Twenty-five percent of racial/ethnic minorities and 40.1% of non-Hispanic whites correctly identified all five heart attack warning signs and symptoms. In addition, 32.5% of racial/ethnic minorities and 45.8% of non-Hispanic whites were aware of all five major stroke signs. However, the minority groups had wide (and thus less precise) 95% confidence intervals due to small sample sizes (Table 1).

Among patients age 40 and older, non-Hispanic whites had a significantly longer average length of stay for myocardial infarction than Hispanics. Non-Hispanic blacks and Hispanics had longer lengths of stay and higher costs, on average, for stroke than non-Hispanic whites, although the smaller sample sizes for Hispanic and, non-Hispanic black patients resulted in larger standard errors and wider confidence intervals (Table 2).

Table 1. Percentage of Rhode Island adults aged 40 and older recognizing correct and incorrect heart attack and stroke warning signs and action taken if a heart attack or stroke occurs by race/ethnicity.

BRFSS Survey Questions	Total (n = 2580) % Yes (95% CI) ¹	Minorities ² (n = 266) % Yes (95% CI)	White, non-Hispanic (n = 2280) % Yes (95% CI)
Heart Attack Signs & Symptoms			
Chest pain or discomfort	96.4 (95.7 – 97.2)	88.4 (83.7 – 93.1)	97.2 (96.6 – 97.9)
Pain in arm or shoulder	93.6 (92.4 – 94.7)	83.7 (77.6 – 89.7)	94.7 (93.7 – 95.8)
Shortness of breath	90.1 (88.7 – 91.5)	85.3 (80.0 – 90.6)	90.6 (89.2 – 92.1)
Pain or discomfort in the jaw, neck, or back	70.5 (67.9 – 73.0)	55.5 (45.8 – 65.1)	71.9 (69.4 – 74.6)
Feeling weak, lightheaded, or faint	67.0 (64.4 – 69.5)	58.5 (48.8 – 68.2)	67.9 (65.3 – 70.5)
Sudden trouble seeing in one or both eyes (<i>Incorrect</i>)	35.6 (32.9 – 38.3)	48.6 (38.8 – 58.4)	34.1 (31.3 – 36.9)
Aware of all (correct) five signs	38.6 (36.1 – 41.0)	25.0 (17.1 – 32.9)	40.1 (37.5 – 42.7)
Stroke Signs & Symptoms			
Sudden numbness/weakness of face, arm, leg	98.3 (97.7 – 98.8)	93.0 (88.9 – 97.0)	98.9 (98.4 – 99.2)
Sudden confusion or trouble speaking	97.2 (96.5 – 97.9)	90.1 (85.4 – 94.8)	98.0 (97.4 – 98.5)
Sudden trouble walking, dizziness, loss of balance	92.7 (91.3 – 94.1)	84.7 (77.4 – 91.9)	93.6 (92.3 – 95.0)
Sudden trouble seeing in one or both eyes	86.0 (84.0 – 87.9)	70.6 (61.5 – 79.7)	87.5 (85.6 – 89.4)
Sudden severe headache no known cause	73.1 (70.5 – 75.7)	74.3 (65.1 – 83.4)	72.9 (70.1 – 75.6)
Sudden chest pain (<i>Incorrect</i>)	39.8 (37.0 – 42.7)	59.6 (49.8 – 69.3)	37.6 (34.7 – 40.6)
Aware of all (correct) five signs	44.5 (42.0 – 47.0)	32.5 (25.0 – 40.0)	45.8 (43.1 – 48.4)
First Action Taken			
Would call 9-1-1 if someone was having a heart attack or stroke	94.5 (93.4 – 95.5)	93.7 (90.3 – 97.1)	94.5 (93.4 – 95.6)
Knowledge Score			
	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
Knows all 5 heart attack warning signs and would first call 9-1-1	4.83 (4.77 – 4.89)	4.10 (3.84 – 4.36)	4.91 (4.85 – 4.97)
Knows all 5 stroke warning signs and would first call 9-1-1	4.94 (4.89 – 5.00)	4.35 (4.12 – 4.58)	5.00 (4.94 – 5.06)

Notes

¹ CI = confidence interval. The 95% CI indicate the range around the point estimate.

² Racial/ethnic minorities include Hispanics, Blacks non-Hispanic, other minority groups (Asians, Native Americans) and persons identifying as multi-racial who were not Hispanic.

Data source: 2009 Rhode Island Behavioral Risk Factor Surveillance System weighted data, Rhode Island Department of Health, Center for Health Data and Analysis.

Table 2. Mean length of stay and for myocardial infarction and stroke hospitalizations by race/ethnicity among Rhode Island adults ages 40+.

Characteristics	Number of hospital discharges (95% CI)	Average length of stay in days (95% CI)	Average costs (95% CI)
Myocardial Infarction			
Total patients (Aged 40+)	4570	4.9 (4.7, 5.1)	\$16976 (16514, 17438)
Race/ethnicity¹			
Hispanic	136	4.1 (3.5, 4.7)	\$18147 (15738, 20555)
Non-Hispanic Black	113	4.8 (3.8, 5.8)	\$16803 (13654, 19952)
Non-Hispanic White	4096	5.0 (4.8, 5.2)	\$16773 (16283, 17264)
Stroke			
Total patients (Aged 40+)	5898	5.0 (4.8, 5.2)	\$9901 (9518, 10284)
Race/ethnicity			
Hispanic	265	6.0 (5.0, 7.0)	\$11922 (9468, 14376)
Non-Hispanic Black	242	9.0 (6.2, 11.8)	\$15075 (11938, 18212)
Non-Hispanic White	5201	4.7 (4.5, 4.8)	\$ 9447 (9068, 9826)

¹ Other racial/ethnic groups are not shown.

Data source: 2008-2009 Rhode Island Hospital Discharge Data, Rhode Island Department of Health, Center for Health Data and Analysis.

CONCLUSION

The disparities observed in this report suggest that Rhode Island should improve public awareness of heart attack and stroke warning signs and symptoms, especially among adults least likely to recognize them. Our findings add to the growing body of knowledge that improved awareness is particularly critical for racial/ethnic minority populations.^{4-7, 9,10,11,12,13,14, 15,16,17,18}

The disparities observed in this report by race/ethnicity, however, likely reflect differences in educational level. In the 2009 Rhode Island BRFSS, the proportion of persons ages 40 and older recognizing all five major warning signs of a heart attack ranged from 21% for those who had not completed high school to 46% of those with 12 or more years of education. A significantly higher proportion of racial/ethnic minorities age 40 and older had not completed high school than non-Hispanic whites in this age group (21% vs. 5%). No differences were found in the proportion of respondents that would first call 9-1-1 if they thought someone was having a heart attack or stroke by race/ethnicity or level of education.

Delays in seeking help when someone is having a heart attack or a stroke play a major role in overall care delays.¹⁹ Our study found longer lengths of stay and costs, on average, for non-Hispanic black and Hispanic patients age 40 and older hospitalized for a stroke as compared with their non-Hispanic white peers. Additional analyses indicated that non-Hispanic blacks and Hispanics were hospitalized for stroke at significantly younger ages, on average, than their non-Hispanic white peers. These findings suggest that Rhode Island should target public health information about stroke warning signs and symptoms to minority groups well before age 50. Of course, recognizing warning signs of a heart attack or stroke is only the first in a sequence of steps required for early and effective intervention. To maximize the benefits of thrombolytic therapy, patients must also receive rapid transport and treatment.

Two limitations of this study should be noted. First, the 2009 Rhode Island BRFSS data cannot be linked to

Rhode Island's Hospital Discharge Data, preventing assumptions that persons with low knowledge of warning signs in 2009 were hospitalized for a heart attack or a stroke during the study period. Second, neither the BRFSS nor the Hospital Discharge Data provide information on how quickly a person experiencing a heart attack or a stroke was transported to a hospital and started treatment; two factors that have been shown to influence patient outcomes.

In conclusion, the results of this study underscore the importance of public education campaigns to increase awareness of heart attack and stroke signs and symptoms. Rhode Island's Hospital Discharge Data provide a unique opportunity to see if public education campaigns decrease racial/ethnic disparities in length of stay and costs for Rhode Islanders hospitalized with a heart attack or stroke.

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Deborah N. Pearlman, PhD, is Research Faculty in the Warren Alpert Medical School of Brown University, Program in Public Health and Senior Epidemiologist for the Heart Disease and Stroke Prevention Program at the Rhode Island Department of Health.

Patricia Affleck, MS, is Program Manager for the Heart Disease and Stroke Prevention Program at the Rhode Island Department of Health.

Dona Goldman, RN, MPH, is Team Lead for the Chronic Care and Disease Team at the Rhode Island Department of Health.

Disclosure of Financial Interest

The authors and/or their spouses/significant others have no financial interests to disclose.

CORRESPONDENCE

Patricia Affleck
phone: (401) 222-3667
e-mail: patricia.affleck@health.ri.gov