STROKE KNOWLEDGE: HOW IS IT IMPACTED BY RURAL LOCATION, AGE, AND GENDER?

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ABSTRACT

Background and Research Objective Stroke, the third-leading cause of Americans' deaths, is often not recognized causing fatal or disabling delays in receiving effective, time-sensitive treatment. To understand the delay in seeking treatment, a sample of rural and non-rural adult residents were surveyed using the Stroke Recognition Questionnaire (SRQ) to assess their level of knowledge of stroke symptoms and risk factors.
Sample and Method Five hundred and sixty-six individual (283 rural and 283 non-rural) from six East Central Illinois counties responded to the self-administered SRQ mail survey. The five-element design method for mail surveys guided this survey implementation procedure.
Results Rural and younger (20-64 years) respondents had significantly higher stroke symptom knowledge scores (M = 9.32) compared to non-rural and older (> 65 years) respondents (M = 9.0; t =2.181, p <.03). Confusion was the most frequently recognized stroke symptom by rural and women respondents. Stroke risk factor knowledge scores revealed no significant differences by residence location, age, and gender. Younger respondents were more likely than older respondents to identify high blood pressure, smoking, and diabetes as stroke risk factors.
Conclusions Rural respondents were more knowledgeable about stroke symptoms than has been found in other earlier studies. Results indicate that stroke educational efforts should target the elderly (> 65 years), who have the greatest stroke risk but who appear to be least informed. Educational interventions are needed in both rural and urban settings which improve the general public's stroke symptom recognition and response, and help the public sort out which symptoms are associated with stroke versus myocardial infarction.

INTRODUCTION

Despite the fact that from 1996 to 2006, the stroke death rate fell 33.5% and the actual number of stroke deaths declined 18.4%, stroke continues to be the third-leading cause of death in the United States, making stroke knowledge an important public health concern (Lloyd-Jones et al., 2010). Regardless of rural or non-rural residence someone in the United States suffers a stroke every 40 seconds, and on average, dies of one every 4 minutes, accounting for 610,000 new and 185,000 recurrent strokes (National Institutes of Neurological Disorders and Stroke [NINDS], 2009). The 2010 estimated direct and indirect cost of serious, long-term stroke disability is $73.7 billion (Lloyd-Jones et al., 2010). Increasing the awareness of stroke warning signs and risk factors among the general population and those at highest risk is essential to stroke prevention and treatment.

Most Americans do not recognize the symptoms of a stroke, causing disabling or even fatal delays in receiving effective, time-sensitive treatment (Lloyd-Jones et al., 2010). Because stroke injures the brain, stroke victims may the have an impaired ability to communicate or to recognize the symptoms they are experiencing as a stroke. The burden for quick, efficient action therefore shifts to an alert bystander (e.g., family, friends, neighbors, coworkers) who must recognize symptoms associated with a stroke (NINDS, 2009).

Rural Location

The decreased availability and accessibility of health care providers to the 25% of Americans who live in rural areas may impact both the dissemination of stroke information and the timely treatment of stroke (United States Department of Health and Human Services [USDHHS], 2000). Rural populations for this study were defined as those residents living outside an urban area of 2,500 or more people (United States Census Bureau, 2001). Individuals living in rural areas are typically older and earn less than their non-rural counterparts, compounding the issues surrounding stroke recognition, detection, and treatment (Redford & Cook, 2001). Rural residents are less likely to use preventive health services, and when in need of health care, rural elders are more likely to depend on local rural health systems because of the logistics and cost of travel to urban areas for care (Redford & Cook, 2001). Timely access to emergency services and availability of specialty medical care are additional issues of concern for those in rural areas (Pierce, 2007). These facts increase the likelihood that rural residents will have less knowledge of stroke symptoms, be less likely to identify symptoms of an impending stroke, and be hindered from receiving timely care or treatment for stroke symptoms.

Stroke Knowledge

Table 1 shows results of previous stroke knowledge studies. Pancioli et al. (1998) reported that, of 1,880 phone interviews, 27% could not name a single stroke symptom and 14% could not identify a single stroke risk factor. Similarly, Yoon, Heller, Levi, Wiggers, and Fitzgerald (2001) reported that 50% of their (n = 822) community-based interviewees were unable to name one stroke symptom and 24% could not list one stroke risk factor. Hux, Rogers, and Mongar (2000) interviewed participants (n = 190) at a regional shopping mall and found that 34% could not name a single stroke symptom and 10% could not identify a single stroke risk factor. Goldstein, Silberberg, McMiller, and Yaggy (2009) interviewed 76 Latino clients of a community-based health program and noted that 29% could not correctly name a single stroke risk factor and 57% could not identify a single stroke symptom. This lack of knowledge of stroke, especially in those most at risk, such as the elderly, could contribute to the delay in seeking health care services. The results of these few studies support the conclusion that the general public's knowledge of stroke symptoms and risk factors is inadequate.

None of these studies addressed variations in the general public's knowledge of stroke when comparing rural and non-rural residence location. The purpose of this study was to determine a rural Midwest sample's knowledge of stroke symptoms and risk factors using the Stroke Recognition Questionnaire (SRQ).

Table 1. Results of Previous Stroke Knowledge Studies

Study	Sample	% unable to identify any stroke symptom	% unable to identify any stroke risk factor
Pancioli et al. (1998)	1,880 phone interviews	27%	14%
Yoon et al. (2001)	822 community-based interviews	50%	24%
Hux et al. (2000)	190 interviews at a regional shopping mall	34%	10%
Goldstein et al. (2009)	76 interviews in a community health program	57%	29%

CONCEPTUAL MODEL

This research is rooted in the work of Leventhal, Nerenz, and Steele (1984) who developed a Common-Sense Model (CSM) of illness recognition based on the notion that different types of information are needed to influence a person's attitudes and actions to a perceived health threat. The key component of the CSM is the idea that a lay person wants to make sense of their illness symptoms by labeling them as a specific illness. Their reaction to illness symptoms may be by asking themselves questions such as: What do these symptoms mean? How do I feel about them? Am I in danger? Is there anything I can do about them? How do I make myself feel better? Leventhal and colleagues (1984) argue that how a person labels their illness symptoms regulates how they cognitively, emotionally, and behaviorally act in response to the personal experience of these symptoms. Thus, the cognitive process of correctly labeling experienced warning symptoms as a stroke and seeking appropriate and timely health care is increased with stroke knowledge, the focus of this research.

DESIGN AND METHOD

This descriptive study of stroke knowledge had a non-experimental, quantitative design. The mailed self-administered Stroke Recognition Questionnaire (SRQ) was used to assess knowledge of stroke symptoms and risk factors. Demographic data were also obtained.

Design

We used the tailored design method for mail surveys (Dillman, 2000), a general method of survey implementation outlining a set of procedures for conducting successful self-administered mailed surveys that produces both high-quality information and higher response rates. It consists of five elements that complement each other. These elements include: (1) a respondent-friendly questionnaire (visually appealing, clear and simple instructions, easy response format), (2) up to five contacts with the questionnaire recipient (lead postcard notice, letters, postcard reminder), (3) inclusion of stamped return envelopes, (4) personalized correspondence, and (5) a token financial incentive (a one dollar bill paper clipped to first letter) sent with the survey request.

Setting and Participants

The researchers selected six East Central Illinois counties. The U.S. Census Bureau's 2000 Geographic Comparison Table for Illinois was used to identify rural (population < 2,500) and non-rural communities in the six selected counties. Telephone directories for the communities within these six counties provided a frame for the random selection of resident names and addresses (Dillman, 2000). The random selection of survey recipients continued until the researchers had identified 400 rural and 400 non-rural community residents.

Instruments

The principal investigator developed the Stroke Recognition Questionnaire (SRQ) to identify a respondent's knowledge of stroke symptoms and risk factors. Prior to development of this questionnaire, no tool structured for self-administration existed that specifically measured knowledge of stroke symptoms and risk factors. The SRQ provides lists of 10 stroke and 10 non-stroke symptoms and 10 stroke and 10 non-stroke risk factors taken from the American Heart Association (AHA, 2001; Golstein et al., 2001). Respondents were instructed to check "yes" or "no" regarding the likelihood of an item being evident in a person experiencing a stroke or putting a person at risk for stroke. Respondents were not given any suggestion as to how many of the symptoms or risk factors listed on their survey were "correct."

Eight nationally recognized physician and nurse experts specializing in research and care of stroke patients reviewed the SRQ for content validity. Content validity was determined by using the content validity index (CVI) (Waltz, Strickland & Lenz, 1991). The SRQ was found to have good content validity for both the symptom item list (CVI = .90) and the risk factor item list (CVI = 1.00). The entire questionnaire scored a CVI of .95.

The SRQ's reliability was initially assessed by administering the SRQ to a convenience sample of 34 members of the lay public two weeks apart. The test-retest correlations for the subscales of the SRQ were stroke symptom r = .80, non-stroke symptom r = .75, stroke risk factor r = .44 and non-stroke risk factor r = .44.

Internal consistency reliability was computed for the SRQ for stroke symptoms and stroke risk factors in this data set (n = 566) using the Kuder-Richardson Formula 20 (KR20). The stroke risk factor subscale and stroke symptom subscale alphas were .70 and .81, respectively. The KR20 was not calculated for the non-stroke symptom and non-stroke risk factor subscales because these were comprised of distractor items that did not have meaningful connections with each other.

Procedure

The SRQ was structured for self-administration. A completed returned questionnaire was the respondent's consent to participate in this research study. Response rate for this mail survey was 566 (70.5%) completed questionnaires returned. The initial questionnaire mailing resulted in 517 (64.4%) returned completed questionnaires. The second and third follow-up questionnaire mailings yielded 41 (5.1%) and 8 (1.0%) completed questionnaires returned, respectively.

Analysis

Data were entered into an SPSS version 11.5 software database. Knowledge scores for stroke symptoms and stroke risk factors were obtained by assigning one point for every correct answer, and zero for every incorrect or missing answer. The non-stroke symptoms and non-stroke risk factors were recoded to reflect one point for those correctly identified and zero points for those incorrectly identified.

Every individual stroke symptom item and individual stroke risk factor item had missing data ranging from 1 (0.2%) to 18 (3.2%) respondents. Nineteen (3.4%) respondents did not disclose annual household income. Considering the small percentages of missing data, the researchers assumed no overall effect on the stroke knowledge scores obtained in this large data set (Tabachnick & Fidell, 2001).

RESULTS

Demographic Characteristics

The rural and non-rural mix of respondents was equal at 283 (50%) each. The final pool of 566 respondents consisted of 328 males (58%) and 236 females (42%). Respondents' ages were grouped into two categories: 20 to 64 years of age (77.6%) and over 65 years of age (22.4%), for comparison with results from other published stroke knowledge studies. Table 2 provides demographic data on the subjects.

Stroke Symptom Knowledge

The SRQ has two ten-item subscales for stroke symptoms and two ten-item subscales for stroke risk factors. The subscale score for the ten stroke symptoms had a possible range of 0 to 10 points (M = 9.2, SD = 1.67). The majority of respondents (93.4%) had a score of 7 or above; 18 (3.3%) had a score of 0 to 4. Respondents in rural settings had significantly higher stroke symptom knowledge (M = 9.32, SD = 1.34) than did respondents in non-rural locations (M = 9.01, SD = 1.93; t = 2.18, $p < .03$). In addition, respondents aged 20 to 64 had significantly higher stroke symptom knowledge (M = 9.29, SD = 1.51) than did respondents 65 years and older (M = 8.84, SD = 1.85; t = 2.67, $p < .01$). There were no differences in stroke scores between men and women.

Respondents' knowledge of individual stroke symptom items was examined (Table 3). Significantly more rural respondents (96%) recognized confusion as a stroke symptom (non-rural = 89%; X^2 = 11.00, $p < .01$). Women were more likely to recognize confusion (women = 96%, men = 91%; X^2 = 4.44, $p < .03$) and double vision (women = 88%, men = 81%; X^2 = 5.35, $p < .02$). Respondents aged 20 years to 64 years were significantly more likely to recognize trouble walking (20 to 64 years = 94%, over 65 years = 88%; X^2 = 6.30, $p < .01$), confusion (20 to 64 years = 94%, over 65 years = 89%; X^2 = 5.16, $p < .02$), loss of balance (20 to 64 years = 94%, over 65 years = 86%; X^2 = 9.33, $p < .01$), and double vision (20 to 64 years = 87%, over 65 years = 73%; X^2 = 13.04, $p < .01$).

Table 2. Demographic Characteristics by Residence Location

Variable	Categories	Residence Location: Rural n=283	(%)	Non-rural n=283	(%)	X^2	*p*
Gender	Male	170	(60%)	158	(56%)	.856	.355
	Female	113	(40%)	123	(44%)		
Age	20-64 years	217	(76%)	219	(78%)	.266	.606
	65-97 years	66	(24%)	60	(22%)		
Marital Status	Married	197	(70%)	167	(59%)	12.865	.012
	Never Married	22	(8%)	49	(17%)		
	Divorced/Separated	33	(11%)	35	(12%)		
	Widowed	30	(11%)	32	(12%)		
Employment Status	Working	172	(62%)	183	(65%)	4.034	.401
	Retired	78	(28%)	69	(25%)		
	Homemaker	19	(7%)	14	(5%)		
	Unemployed/Student	10	(3%)	15	(5%)		
Highest Education Level	Less than High School	14	(5%)	10	(3%)	30.483	.000
	High School/Technical School	205	(73%)	151	(54%)		
	Four-year Degree	38	(13%)	55	(19%)		
	Graduate Degree	25	(9%)	66	(24%)		
Household Annual Income	< $20,000	37	(14%)	48	(17%)	2.433	.488
	$20,001-$39,999	79	(29%)	71	(26%)		
	$40,000-$59,999	70	(26%)	64	(23%)		
	> $60,000	85	(31%)	93	(34%)		
Race	White	280	(99%)	250	(89%)	33.698	.000
	Black	0	(0%)	15	(5%)		
	Asian	0	(0%)	10	(4%)		
	Hispanic	0	(0%)	6	(2%)		
	Other	1	(1%)	0	(0%)		

The subscale scores for correct identification of the ten non-stroke symptoms had a possible range of 0 to 10 points (M = 7.05, SD = 2.10). The majority (64.6% or 444) of the respondents correctly identified 7 or more symptoms as non-stroke symptoms, while 22.8% or 122 of the respondents had a score of 4 or less. Examination of the non-stroke symptom score variations by rural/non-rural location, gender, and age group revealed no significant differences. The four most frequently misidentified non-stroke symptoms were: difficulty breathing, sudden pain in one arm, extreme tiredness, and chest pain (Table 4). Extreme tiredness was incorrectly identified as a stroke symptom by more rural respondents (30.3%) than non-rural respondents (24.6%) (X^2 = 7.031, p < .01). Heartburn was more often misidentified as a stroke symptom

Table 3. Stroke Symptom and Stroke Risk Factor Knowledge by Residence Location

Stroke Symptom	Residence Location					
	Rural n=283	(%)	Non-Rural n=283	(%)	χ^2	*p*
Slurred or garbled speech	273	(99%)	264	(96%)	3.41	.065
Numbness on one side of face	273	(97%)	267	(95%)	1.57	.211
Confusion	272	(96%)	249	(89%)	11.00	.001
Weakness on one side of body	269	(95%)	269	(96%)	0.04	.845
Trouble with coordination	262	(95%)	254	(92%)	1.45	.229
Trouble walking	266	(94%)	257	(91%)	2.13	.144
Sudden unexplained dizziness	259	(94%)	248	(90%)	3.51	.061
Loss of balance	262	(93%)	257	(91%)	0.39	.530
Double vision	244	(86%)	227	(81%)	3.39	.065
Sudden severe headache	228	(83%)	218	(79%)	1.35	.245
Stroke Risk Factor						
High blood pressure	269	(97%)	263	(95%)	1.26	.262
High blood cholesterol	240	(87%)	231	(84%)	0.77	.380
Smoking cigarettes	243	(86%)	233	(83%)	1.37	.241
More than 20 pounds overweight	227	(82%)	218	(79%)	0.77	.379
History of neck vein disease	225	(80%)	220	(79%)	0.13	.721
Lack of physical activity	198	(72%)	207	(75%)	0.75	.386
Diabetes	193	(70%)	187	(68%)	0.24	.625
History of having a heart attack	190	(68%)	195	(70%)	0.27	.603
Irregular heartbeat	164	(59%)	155	(56%)	0.60	.438
Alcohol use (> 2 drinks per day)	127	(46%)	124	(45%)	0.03	.858

by younger respondents (15.4%) than older respondents (2.5%; $X^2 = 4.450$, $p < .03$). In addition, swollen ankles was identified as a stroke symptom by more rural residents (21% than non-rural residents (14%; $X^2 = 4.01$, $p < .045$).

Table 4. Non-stroke Symptoms and Non-stroke Risk Factors Misidentified as Stroke Symptoms and Risk Factors by Residence Location

Non-stroke Symptoms	Residence Location					
	Rural n=283	(%)	Non-Rural n=283	(%)	χ^2	*p*
Difficulty breathing	176	(62%)	165	(58%)	0.79	.371
Extreme tiredness	167	(60%)	136	(49%)	7.03	.008
Sudden pain in one arm	161	(58%)	154	(56%)	0.30	.581
Chest Pain	113	(40%)	112	(40%)	0.00	.986
Leg cramps	83	(30%)	72	(26%)	1.09	.297
Swollen ankles	58	(21%)	40	(14%)	4.01	.045
Heartburn	50	(18%)	51	(18%)	0.02	.897
Fever	28	(10%)	26	(9%)	0.09	.764
Cough	21	(8%)	20	(7%)	0.02	.890
Diarrhea	16	(6%)	14	(5%)	0.12	.730
Non-stroke Risk Factor						
Hypoglycemia	102	(36%)	92	(33%)	0.74	.391
Trouble sleeping	83	(30%)	75	(27%)	0.61	.435
Varicose veins	81	(29%)	94	(34%)	1.47	.225
Iron deficiency	51	(19%)	39	(14%)	1.91	.166
Low levels of calcium in diet	49	(18%)	35	(13%)	3.00	.083
Alzheimer's Disease	39	(14%)	31	(11%)	1.05	.306
Lyme Disease	32	(12%)	23	(8%)	1.64	.201
Exposure to too much sunlight	28	(10%)	21	(7%)	1.10	.295
Living close to a power plant	14	(5%)	14	(5%)	0.00	1.00
Travel to foreign countries	11	(4%)	6	(2%)	1.54	.215

Double vision (83.7%) and sudden severe headaches (80.7%) were the stroke symptoms least often identified. However, in previous studies (Kothari et al., 1997; Pancioli et al., 1998; Yoon et al., 2001), double vision and sudden severe headaches were included as the most commonly identified stroke symptoms. Women had minimally higher stroke symptom knowledge scores (M = 9.28) compared to men (M = 9.11), which is consistent with past studies (Pancioli et al., 1998; Yoon et al., 2001).

Stroke Risk Factor Knowledge

The subscale score for the ten stroke risk factors had a possible range of 0 to 10 points (M = 7.43, SD = 2.16). While the majority of respondents (87.4%) had a score of 7 or above, 19 (3.6%) respondents had a score of 4 or less. Examination of stroke risk factor score variations by rural/non-rural location, gender, and age group revealed no significant differences.

The items that respondents were least likely to identify as stroke risk factors were: alcohol use, irregular heartbeat, diabetes, and history of having a heart attack. There were no significant differences in recognition of risk factors by rural/non-rural location and gender. Younger respondents (aged 20 to 64) were significantly more likely than older respondents (aged > 65) to recognize as risk factors for stroke: high blood pressure (younger = 97%, older = 93%; X^2 = 4.10, $p < .04$), smoking (younger = 88%, older = 74%; X^2 = 13.97, $p < .01$), diabetes (younger = 73%, older = 56%; X^2 = 13.07, $p < .01$), and alcohol use (younger = 49%, older = 32%; X^2 = 11.46, $p < .01$).

The subscale score for the ten non-stroke risk factors had a possible range of 0 to 10 points (M = 8.34, SD = 1.66). The majority (71.8%) of respondents correctly identified 7 or more non-stroke risk factors correctly, while 59 (11.0%) had a score of 4 or less. Higher knowledge of non-stroke risk factors was noted in respondents aged 20 to 64 (M = 7.61, SD = 2.09) compared to respondents aged 65 and older (M = 6.83, SD = 2.23; t = 3.47, $p < .01$).

The three non-stroke risk factors most often misidentified by respondents as stroke risk factors were hypoglycemia, varicose veins, and trouble sleeping. There were no significant differences in recognition of non-stroke risk factors by location or gender. Younger subjects were significantly more likely to incorrectly identify as risk factors for stroke: varicose veins (younger = 34%, older = 23%; X^2 = 4.77, $p < .03$), iron deficiency (younger = 18%, older = 10%; X^2 = 4.02, $p < .04$), and Lyme disease (younger = 12%, older = 2%; X^2 = 9.42, $p < .01$).

DISCUSSION

Rural and non-rural respondents' level of knowledge of stroke symptoms in this community-based sample is much better than that of the few published reports from other studies, while the knowledge level of stroke risk factors is somewhat better or comparable to the findings in those same studies (Kothari et al., 1997; Pancioli et al., 1998; Yoon et al., 2001). In a hospital-based report from 1997 of 163 stroke patient interviews, Kothari and colleagues (1997) reported that 40% of interviewees could not name a single stroke symptom or risk factor. In a 1998 report of a Greater Cincinnati Area general public telephone interview of 1,880 persons, Pancioli and colleagues (1998) reported that only 8% of participants could list at least three stroke symptoms and only 4% could list at least three stroke risk factors. Yoon and colleagues (2001) in a general public telephone interview of 822 persons, reported that 49.8% of subjects identified one stroke symptom and 76% identified one stroke risk factor. Compared with these earlier recall surveys, the recognition knowledge of stroke symptoms of the SRQ respondents was clearly higher, with 93.4% identifying 7 or more of the 10 most common stroke symptoms and 87.4% able to identify 7 or more of the 10 most common stroke risk factors.

In completing the SRQ, respondents were asked to "recognize" stroke symptoms or stroke risk factors from 20-item lists for each. Other studies that examined a sample's stroke knowledge used an interview format, either phone or in-person, and had respondents "recall" stroke symptoms or risk factors in response to open-ended questions (Hux et al., 2000; Kothari et

al., 1997; Pancioli et al., 1998; Samsa et al., 1997; Yoon et al., 2001). The use of a recognition methodology may have contributed to the higher stroke knowledge scores in this study. A similar explanation was offered in a study by Zerwic (1998) of a general public sample's knowledge of acute myocardial infarction (AMI) symptoms.

The overall greater knowledge level rural and non-rural respondents of stroke symptoms and risk factors in this study compared with previous surveys may also be related to the characteristics of the respondent population or to methodological differences. In contrast to previous studies (Hux et al., 2000; Kothari et al., 1997; Pancioli et al., 1998; Samsa et al., 1997; Yoon et al., 2001), this study's population was mostly white, young (< 65 years), and well-educated. Differences in stroke knowledge between a general public sample and a sample of stroke patients may be related to cognitive deficits of the acute brain insult in the latter population.

Rural respondents (M = 9.32, SD = 1.32) had slightly (but not significantly) higher stroke symptom knowledge than their non-rural counterparts (M = 9.01, SD = 1.93). This was surprising, as the literature leads us to believe that rural residents who are older, less educated, and poorer than the general public would be less knowledgeable (Coward, Bull, Kukulka, & Galliher, 2004; Racher, 2002). This finding raises questions about reported differences between rural and non-rural residents. Perhaps the definition of a rural community as those residents living outside an urban area of 2,500 or more people is not sufficient. There may be a need to expand the definition of a rural community to include a specified number of miles from the nearest metropolitan community. For example, perhaps the rural areas surveyed in this study were actually bedroom communities to non-rural cities where respondents worked, influencing rural respondents' access to health information.

Younger (20 to 64 years) respondents had significantly higher stroke symptom knowledge (M = 9.29, SD = 1.93) than did respondents aged 65 and older (M = 8.84, SD = 1.85). The pattern of age-group differences in knowledge of stroke symptoms was somewhat surprising. Stroke being a health problem in older adults, older respondents were expected to be more knowledgeable than younger respondents. The basis for this finding is not obvious, but may include differences in education and access to information about health issues such as stroke.

In this study, the four non-stroke symptoms most often misidentified as stroke symptoms were difficulty breathing (60.4%), extreme tiredness (54.9%), sudden pain in one arm (57.0%), and chest pain (40%). These symptoms are in fact symptoms that are reported by individuals experiencing an acute myocardial infarction (AMI). Some individuals in this study appear to have trouble distinguishing between the symptoms of stroke and AMI. Interestingly, in an earlier study by Zerwic (1998) that focused on the knowledge of a community sample about AMI symptoms, the sample confused stroke symptoms with AMI symptoms. Zerwic (1998) concluded that individuals at risk for AMI may need education about the symptoms that are not associated with AMI as well as those symptoms that are associated with AMI. A similar approach may need to be considered with stroke. Individuals who have multiple risk factors for stroke are also at risk for AMI. Education may be needed to help these individuals sort out which symptoms are associated with one health problem versus the other.

The most frequently correctly identified stroke risk factors by rural and non-rural respondents were high blood pressure (96.2%), high blood cholesterol (85.3%), smoking cigarettes (84.7%), and being more than 20 pounds overweight (80.5%), and this is comparable

to findings in previous studies where respondents identified high blood pressure, stress, smoking, and diet (Kothari et al., 1997; Pancioli et al., 1998; Yoon et al., 2001).

Four stroke risk factors were not recognized by a substantial number of all respondents: alcohol use (53%), irregular heartbeat (42.2%), diabetes (31%), and history of having had a heart attack (31%). This is evidence that there is a need to educate the general public more specifically regarding stroke's risk factors.

Implications for Nursing Practice

The forecast of a rising toll of stroke-related deaths and disability with aging of the baby-boom generation has brought new urgency to prevention, earlier recognition, and timely treatment of stroke. Nurses are in a unique position to provide education for the general public addressing stroke risk factors. Stroke screening programs and education in rural as well as urban settings, such as churches, markets, and work sites, are needed; stroke-awareness programs could make a difference in faster stroke treatment (Zerwic, Ennen, & DeVon, 2002).

Although it is important for the public to be aware of stroke's symptoms and life-saving benefits of immediate treatments, the key to improved public health is prevention. Nurses can help individuals understand stroke risk factors related to their lifestyle. Community-based screening programs that are accessible to rural populations that address risk-laden lifestyle behaviors and the symptoms of stroke are one way to increase the public's stroke knowledge and begin to decrease stroke incidence and its devastating consequences.

Strengths and Limitations of the Study

A strength of this study was the use of the tailored mail survey design method. This method was successful in obtaining a greater than 70% response rate (566 respondents) and an equitable representation of rural and non-rural residents. The opportunity to complete the SRQ without the influence of an interviewer is a strength of self-administered surveys. The specific assessment of rural residents' stroke knowledge was an important strength of this study.

Limitations of the study include possibility that the characteristics and knowledge level of stroke symptoms and stroke risk factors in those individuals who did not return a questionnaire and who were not selected to participate were different than the sample respondents. The sample, though large, was quite homogenous, as they were mostly white, young, and educated. The use of telephone directories to select a sample may have resulted in the underrepresentation of certain populations.

The SRQ was a new measure using specified lists of stroke symptoms and stroke risk factors requiring recognition versus open-ended questions requiring recall. Pilot testing showed that risk factor recognition scores were not as stable across time as the symptom recognition scores. This suggests that study subjects may have been guessing on some of the items in the risk factor assessment affecting stability.

CONCLUSIONS

Education programs in both rural and urban settings must focus on stroke risk factor modification and actions to take if stroke symptoms occur. Data indicate that stroke educational efforts should target the elderly, who have the greatest stroke risk, but who appear to be the least

informed regarding stroke symptoms and stroke risk factors (Appel, Harrell, & Deng, 2002; Fontanarosa & Winkler, 1998; Stephenson, 1998). However, stroke education will not be effective if directed only towards those at greatest risk for stroke. Individuals with acute stroke often have impaired ability to communicate or are unable to recognize their symptoms. Therefore, people of all ages, whether rural or urban residents, must be able to recognize (label) the symptoms of stroke to facilitate rapid stroke identification and transport of the symptomatic individual to the hospital.

Public education in rural and urban communities promoting stroke knowledge and modification of risk factors, actions to take when stroke symptoms occur, and differentiating stroke symptoms from those of an acute myocardial infarction seems to be the most needed interventions. As Leventhal Nerenz, and Steele (1984) described, the correct labeling of signs and symptoms as a stroke should translate into changes in behavior. The translation of enhanced knowledge about stroke symptoms can result in the rapid seeking of health care, increasing the number and percentage of individuals with stroke symptoms who receive effective interventions and reducing the disability and mortality currently associated with stroke.

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