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Do Multiple Stroke-Related Educational Opportunities Enhance Stroke Knowledge among Students Enrolled in Communication Sciences and Disorders Programs?

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ABSTRACT

Purpose: Stroke education modules have been added to medical school curriculums to improve stroke knowledge in graduate physicians, and this has resulted in positive outcomes. These findings suggest that similar strategies may be successful in graduate programs such as Communication Sciences and Disorders (CSD). The purpose of this study was to examine the impact of multiple stroke-related education opportunities on students enrolled in CSD programs. **Methods:** Seventy-six first and second year students enrolled in a Communication Sciences and Disorders program completed a survey of stroke risk factors and early warning signs of stroke. **Results:** *Risk factor knowledge* - 97% identified smoking as a risk factor; 61% identified diabetes; 90% identified high cholesterol; 84% identified age, and 90% identified physical inactivity. Students varied in their recognition of diabetes as a stroke risk factor based on their level of instruction. *Early warning signs and first response knowledge* - 83% recognized sudden confusion or trouble speaking; 100% recognized sudden facial, arm or leg weakness; 83% recognized sudden vision loss; 76% recognized sudden trouble walking; and 75% recognized sudden headache as early warning signs of stroke. Seventy-nine percent recognized calling 9-1-1 as the appropriate first action. Students varied in their recognition of sudden trouble walking and severe headache as an early warning sign of stroke based on their level of instruction. **Conclusions:** Most students recognized individual stroke risk factors and early warning signs, but few recognized multiple risk factors and warning signs. Multiple education opportunities appear to enhance student recognition of risk factors and warning signs.

INTRODUCTION

Stroke is the leading cause of disability and the third leading cause of death in the United States.[1] Each year, approximately 700,000 individuals experience stroke; 500,000 people sustain an initial event and the remaining 200,000 people experience a reoccurrence of stroke.[1] The annual costs associated with stroke are approximately 63 billion dollars.[1] The indirect and direct costs associated with stroke-related care is expected to surpass 2.2 trillion dollars in 2050.[2]

Even though nationwide stroke education programs exist, the public's knowledge of common stroke risk factors and early warning signs remain considerably low.[3,4] Pancioli and colleagues examined knowledge of stroke risk factors and early warning signs in over 1,880 adults by telephone survey and found that only 68% could identify one stroke risk factor and even fewer

(57%) could identify one of five common early warning signs.[4] Interestingly, results from a number or studies indicate that those at highest risk for stroke are also the least likely to know stroke risk factors, recognize early warning signs or take appropriate action in the event that someone was having a stroke.[3-6] However, the factors leading to poor stroke knowledge (risk factors and early warning signs) are not entirely clear.

New approaches to stroke education are targeting students in middle schools[7,8] while others suggest that stroke education programs should target specific community based organizations such as churches and social organizations.[9] Similarly, medical schools are now offering more instructional opportunities to medical students as a means of improving their stroke knowledge.[10,11] Billings-Gagliardi and colleagues found that stroke education programs provided to first year medical students resulted in a substantial retention of stroke related information.[10] The authors concluded that educational programs early in the curriculum of health professions could enhance doctors' future stroke-related patient management.[10] In summary, stroke-related educational programs with a specific focus on primary and secondary prevention can improve the knowledge and awareness of stroke among physicians.

These findings suggest similar strategies should be considered in allied health programs such as those that train future speech-language pathologists (SLPs). The scope of practice for SLPs includes "prevention" such as strategies to prevent and control specific stroke risk factors before and after stroke.[12,13] Subsequently, SLPs are expected to have adequate knowledge of stroke risk factors and early warning signs of stroke in order to educate patients at risk for initial or recurrent stroke.

Little is known about stroke knowledge among students currently enrolled in Communication Sciences and Disorders (CSD) programs who are training to practice in the field of speech-language pathology. Therefore, the aim of this pilot project was to assess knowledge of stroke risk factors, recognition of early warning signs and recognition of the first action to seek help (activation of the 9-1-1 system) in the event that someone is having a stroke in students currently enrolled in a CSD program. A secondary aim was to determine how stroke-related educational offerings influence the stroke knowledge of students. We hypothesized that students who received at least two courses that included stroke-related information would demonstrate greater knowledge than students who had no specific coursework that included stroke-related information. We hypothesized that differences would exist in three areas: (1) knowledge of stroke risk factors, (2) knowledge of stroke early warning signs and (3) knowledge of the appropriate first action to seek treatment for stroke care.

RESEARCH DESIGN AND METHODS

Study Setting and Sample: The sample for this pilot study was composed of first and second year graduate students in a CSD program. Two first year and one second year class were included in this study. One first-year class (CSD-1) had not participated in any specific classes that included specific stroke-related information. The second first-year class (CSD-2) was enrolled in an interdisciplinary neuroscience course at the time of the study that provides first year students their first exposure to stroke-related information. The third class (CSD-3) consisted of second year students enrolled in a discipline-specific course related to "Stroke Syndromes." As a result, CSD-3 students had the benefit of exposure to the stroke-related information in the first year interdisciplinary neuroscience course as well as the "Stroke Syndromes" course. Students were invited to participate in a survey of their knowledge of stroke risk factors and early warning signs of stroke. Since it is possible that the first CSD-1 students may have had little or no knowledge of stroke, we defined stroke as either ischemic or hemorrhagic. An ischemic stroke is the result of a blockage of an artery in the brain while a hemorrhagic stroke occurs when a blood vessel breaks or ruptures in the brain. Those who agreed to participate were surveyed during their respective classes. This study was reviewed and approved by the Medical University of South Carolina Institutional Review Board (IRB).

Survey Content: The survey used in this study was developed to examine stroke risk factor knowledge and recognition of early warning signs of stroke. We collected basic demographic information including: age and year/class (CSD-1; CSD-2; CSD-3). For knowledge of stroke risk factors, the respondents were asked to identify the five most important risk factors for stroke from a list of 20 items. Hypertension was given as an example and was excluded from the survey. The five correct risk factors were obtained from the 2007 Heart Disease and Stroke Statistics - 2007 update.[1] The remaining 15 items were created for the purposes of the project by authors. For recognition of the early warning signs of stroke, respondents were asked to identify early warning signs from the Behavioral Risk Factor Surveillance System Heart Attack and Stroke module.[14] Respondents were asked to identify the top five early warning signs of stroke from a list of 20 items. Respondents were also asked, "If you thought someone was having a stroke, what would you do first?" Respondents chose from a list of actions that included: (1) take the patient to the hospital, (2) tell them to call the doctor, (3) call 9-1-1, (4) call their spouse or family member or (5) do something else.

***Data Analysis*:** SPSS 14.0 [15] was used for statistical analysis in this project. We performed three types of analyses. First, we described demographic characteristics by class (CSD-1; CSD-2; CSD-3). We calculated the total number of students and the mean age of the students enrolled in each class. Second, we compared recognition of stroke risk factors for all students and then by class. Third, we compared recognition of stroke early warning signs and appropriate first action to call 9-1-1 for all students and then by class. Comparisons between classes of recognition of stroke risk factors, early warning signs and first action to initiate treatment were completed using Chi-Square analyses to test the relationship between year and knowledge of risk factors, early warning signs and appropriate first action to call 9-1-1. The Chi-Square analysis is a non-parametric statistic that was chosen because it allows the investigator to analyze categorical data (yes or no recognition of stroke risk factors and early warning signs) to determine if there is a difference between observed and expected percentage of recognition among the three classes (CSD-1; CSD-2; CSD-3). An alpha level of $p < .05$ was used to determine statistical significance. We hypothesized that the students would recognize some risk factors and early warning signs with 100% accuracy resulting in cell frequencies of zero, thus violating this assumption of the Chi-square statistic. Therefore, we decided a priori to use the more conservative Yates continuity correction to adjust the alpha levels prior to determining statistical significance to account for this potential violation.

RESULTS

The sample included 76 students. Of this number, 28 were enrolled in CSD-1, 26 were CSD-2 and 21 were CSD-3. The mean age for CSD-1 students was 22.9, 23.4 for CSD-2 and 24.3 for CSD-3.

Recognition of Stroke Risk Factors: The majority of students recognized smoking, high cholesterol, age and physical inactivity as stroke risk factors. Ninety-eight percent of all students recognized smoking as a stroke risk factor; about 61% recognized diabetes; 90% recognized high cholesterol; 84% recognized age and 90% recognized physical inactivity. The three classes only differed in their recognition of diabetes as a stroke risk factor. Only 46% of students in CSD-1 recognized diabetes as a risk factor while 85% in CSD-2 recognized diabetes. Interestingly, only 50% of CSD-3 recognized diabetes as a stroke risk factor. On the other hand, only 41% of all students recognized all five stroke risk factors. Twenty-eight percent of CSD-1, 58% of CSD-2, and 36% of CSD-3 recognized all five stroke risk factors. Given the low recognition overall, there were no significant differences in the recognition of all five stroke risk factors between the three classes. See Table 1 for a summary of the results.

Table 1: Recognition of Stroke Risk Factors among CSD Students by Class

	All Students	CSD-1	CSD-2	CSD-3	
	%	%	%	%	p-value
Smoking	97.4	92.9	100.0	100.0	0.172
Diabetes	60.5	46.4	84.6	50.0	0.008*
High Cholesterol	89.5	89.3	84.6	95.5	0.475
Age	84.2	85.7	80.8	86.4	0.837
Physical Inactivity	89.5	82.1	96.2	90.9	0.237
All five risk factors	40.8	28.6	57.7	36.4	0.336

*Value is significant at p<.05

Recognition of Stroke Early Warning Signs and Appropriate First Action: The majority of the students recognized individual early warning signs of stroke. About 89% recognized sudden confusion, trouble speaking or understanding; 100% recognized sudden facial weakness or numbness of the arm or leg; 83% recognized sudden trouble seeing in one or both eyes; 76% recognized sudden trouble walking, dizziness or loss of balance or coordination and 75% recognized sudden headache with no known cause as early warning signs of stroke. Approximately 79% recognized calling 9-1-1 as the appropriate first action to take if someone was having a stroke. However, only 37% of students recognized all five early warning signs of stroke, and only 29% recognized all five early warning signs and would call 9-1-1 as the first action if someone was having a stroke. See Table 2 for a summary of the results.

Table 2: Recognition of Early Warning Signs of Stroke and Appropriate Action among CSD Students by Class

	All Students	CSD-1	CSD-2	CSD-3	
	%	%	%	%	p-value
Sudden confusion, trouble speaking or understanding	89.2	75.0	80.8	95.5	0.153
Sudden numbness or weakness of the face, arm or leg	100.0	100.0	100.0	100.0	NS
Sudden trouble seeing in one or both eyes	82.9	89.3	69.2	90.9	0.073
Sudden trouble walking, dizziness, loss of balance or coordination	76.3	75.0	61.5	95.5	0.022*
Sudden headache with no known cause	75.0	46.4	84.6	100.0	0.000*
Call 9-1-1 as first action	78.9	92.9	69.2	72.7	0.072
Recognized all 5 warning signs	36.8	17.9	19.2	81.8	0.000*
Recognized all 5 warning signs and appropriate action to call 9-1-1	28.9	21.4	11.5	59.1	0.011*

*p<.05
NS – No statistic computed

Recognition of Stroke Early Warning Signs and Appropriate First Action by Class: There were significant differences in recognition of individual stroke early warning signs or appropriate first action to call 9-1-1 by class for: (1) sudden trouble walking, dizziness, loss of balance or coordination (p=.02) and (2) sudden headache with no known cause (p=.00). CSD-1 students were less likely to recognize sudden trouble walking, dizziness, loss of balance or coordination (75%) compared to CSD-3 students (96%). CSD-1 students were also less likely to recognize sudden headache with no known cause (46%) compared to CSD-3 students (100%). Interestingly CSD-1 students (93%) were more likely to identify activation of 9-1-1 as a first action compared to CSD-2 students (69%) and CSD-3 students (73%). However, this value did not reach significance (p=.07). Few students recognized all five signs of stroke (37%) and even fewer (29%) recognized all five early warning signs of stroke and recognized 9-1-1 as the appropriate first action in the event that someone was having a stroke. Statistical significance was observed in comparisons of the three classes for recognition of all five early warning signs (p=.00) and recognition of all five early warning signs and activation of the 9-1-1 system in the event of a stroke (p=.01). CSD-3 students were more likely to recognize all five early warning signs (82%) compared to CSD-1 (18%) and CSD-2 (19%). Similarly, CSD-3 students were more likely to recognize all five early warning signs and activate the 9-1-1 system in the event of a stroke (59%) compared to CSD-1 (21.4%) and CSD-2 (12%) students.

DISCUSSION

This study of stroke knowledge in students enrolled in CSD programs has three important findings. First, all of the students who participated in the survey recognized smoking, high cholesterol, physical inactivity and age as important risk factors for stroke. However, their recognition of all five stroke risk factors was low among all students. Second, recognition of early warning signs of stroke was generally low among the CSD students surveyed, but recognition of three of the five early warning signs was generally higher among CSD-3 students. These findings suggest an added benefit of multiple stroke education opportunities. Third, recognition of all five early warning signs of stroke and all five early warning signs of stroke and first action to 9-1-1 in the event of a stroke was significantly low across the three classes and generally lower than recognition of individual early warning signs. We do note that the students in CSD-3 did recognize the five early warning signs of stroke and all five early warning signs of stroke and first action to 9-1-1 in the event of a stroke at a higher percentage rate than both the CSD-1 and CSD-2 students. These findings suggest that multiple education opportunities may enhance retention of stroke-related knowledge among CSD graduate students.

Our findings are very similar to findings by Travis and colleagues[6] who found that only 67% of their participants who had risk factors for stroke demonstrated good knowledge of stroke risk factors.[6] They studied 364 adults and found that 91% recognized

high blood pressure, 78% recognized high cholesterol, 77% recognized smoking and 63% recognized increased age. Our findings are also similar to at least three previous studies of stroke warning signs. Reeves and colleagues found that only 80% of their participants were able to name one risk factor.[5] Finally, Blades et al[16] and Schneider et al[17] both found that only 70% or their participants could name at least one risk factor.

Despite education regarding early warning signs of stroke, the students in this study recognized only one warning sign with greater than 90% accuracy. These findings are somewhat surprising given that the participants are engaged in allied health programs that are key components to stroke prevention and rehabilitation programs. Limited recognition of stroke early warning signs and risk factors has important implications for future patients either at risk for an initial stroke or those at risk of recurrent stroke. Speech-language pathologists are expected to provide patients with stroke-related information (risk factors and early warning signs) as part of primary and secondary prevention programs. Adequate recognition of the early warning signs of stroke are of great importance for speech-language pathologists who treat and educate patients with stroke because many patients at risk for recurrent stroke continue to have difficulty recognizing stroke-related signs primarily because they are similar to other health conditions.[18]

Of some concern in this study was the fact that CSD-1 students recognized calling 9-1-1 as the appropriate first action at a higher rate than both CSD-2 and CSD-3 students. Students with previous experiences in stroke education should consistently recognize calling 9-1-1 as a first action because all other actions can result in delays in receiving treatment. When patients fail to seek care urgently, they increase their likelihood of increased stroke related disability.[19] Patients who seek urgent treatment are also able to take advantage of the most current treatments and are more likely have better overall outcomes.[19] Our findings are in line with the difficulties of educating adults about the early warning signs of stroke. These findings suggest that stroke knowledge should be provided in CSD curriculums and on multiple occasions during the program. Such stroke-related curriculum should be designed to identify knowledge geared towards the prevention of initial and recurrent stroke. Educational modules specifically designed for students in allied health programs and practicing clinicians should be developed.

We acknowledge several limitations of our study. First, this study was completed with a very small sample of CSD students at one university. Second, high blood pressure, the most commonly recognized stroke risk factor was not included in the survey. Including high blood pressure in the survey may have improved the risk factor results. Third, we used close-ended survey questions which can influence some responses relative to more open-ended questions.[4] Despite these limitations, our findings suggested that there is improved recognition of early warning signs of stroke when multiple educational opportunities are provided to students. Additional study of CSD students is needed to accurately quantify the impact of increased stroke-related classes on student's knowledge and retention of stroke risk factors and early warning signs.

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