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Phrases and Keywords Used by Patients with Stroke Contacting Dispatcher's Nurses at the Emergency Medical Communications Center

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Abstract

Stroke is the second leading cause of death and a significant cause of long-term disability and morbidity in the world. Improving the accuracy of stroke diagnosis by dispatcher nurses is essential. This study aimed to investigate the words, phrases, and keywords used by callers when contacting the Emergency Communication Center regarding patients with stroke. This retrospective mixed-methods study was conducted at the Mashhad Emergency Communications Center and affiliated hospitals receiving patients via prehospital emergency services. Nurses performed telephone triage following dispatch guidelines. Patients with a final stroke diagnosis, identified by ICD-10 codes, were selected. Audio files from calls related to stroke and non-stroke cases were extracted and analyzed to identify common phrases and keywords used by callers. Among 246 suspected stroke cases, 106 were confirmed stroke diagnoses. The mean age of patients with stroke was 70.0 ± 11.4 years. Analysis of calls revealed that 38% of callers mentioned “body and limb numbness.” Nearly 90% of callers reported motor symptoms. Motor symptoms are key indicators for stroke identification during emergency calls. Dispatch guidelines should prioritize these symptoms. Commonly used phrases by callers included “body and limb numbness,” “stroke,” “speech impairment,” “crooked mouth,” “facial numbness,” and “inability to walk.” Public education is essential to encourage timely contact with emergency services, ensuring faster access to acute stroke care.

Keywords: Stroke, Dispatcher's Nurse, Emergency, Medical Communications Center

Introduction

Stroke ranks among the leading causes of mortality and is a significant contributor to long-term disability and morbidity worldwide, including the United States (1). After age 55, the risk of stroke doubles every 10 years (2). The economic costs of stroke including emergency care, inpatient and outpatient care, prescribing drugs, absenteeism, and home care, are significant across countries (3). Approximately 87% of strokes are ischemic, and only 13% are hemorrhagic (4). Ischemic stroke is a medical emergency, similar to myocardial infarction, in which rapid treatment with thrombolytic agents within 3–4.5 hours can reduce symptoms and disability (5). The only significant reason for not receiving recombinant tissue plasminogen activator (rtPA) patients with stroke is the delay in getting to the hospital (6-9). The second part of the stroke care chain is the dispatch center, or the contact point for the prehospital emergency medical communication center, and the dispatch of an ambulance by dispatcher nurses (10). More than 70% of all patients with stroke establish their first medical call with the Emergency Medical Communications Center (EMCC) (11). The American Heart Association recommends that the first step in observing suspicious stroke symptoms is to contact the Prehospital EMCC and request an ambulance (12). However, few patients with stroke are transported by prehospital emergency services within the critical three-hour window (13), although some studies report higher prehospital transfer rates (14).

Despite the existence of telephone triage instructions, previous studies showed that dispatchers correctly diagnosed only 31-52% of stroke calls (15-17). Emergency medical dispatcher instructions may lack words and phrases commonly used by callers, which may prevent the dispatcher from detecting the stroke (18-19). Therefore, the accuracy of the dispatcher nurses' stroke diagnosis should be improved (20). This study aimed to investigate the words, phrases, and keywords used during calls involving patients with stroke at the EMCC. Additionally, it aimed to determine whether using these terms could improve the identification of probable patients with stroke in the prehospital emergency setting.

Methods

This retrospective study employed a mixed-methods design. The study population consisted of patients suspected of stroke who contacted the EMCC in Mashhad and its surrounding areas. The study was conducted at the EMCC of Mashhad and affiliated hospitals where prehospital emergency services transported patients.

For over one year, the “724 country plan” has been implemented to provide continuous care and treatment for patients with stroke at the reference hospital, operating 24 hours a day, and 7 days a week. In major Iranian cities such as Tehran, Mashhad, Isfahan, and Shiraz, bachelor’s degree nurses are responsible for answering calls at the EMCC and conducting telephone triage. These nurses perform telephone triage following established dispatch guidelines and protocols. Call prioritization was based on the instructor's questions, the nurse's assessment of patient status, and the national automation software at two levels. Dispatcher nurses receive information from callers via a computer that records details such as the patient's address, telephone number, age and sex, emergency number, patient's admission hospital, and patient history. Electronic files of patients suspected of stroke were examined. In Mashhad, three hospitals (Ghaem, 22 Bahman, and Taleghani) have neurological departments that admit patients with stroke. Due to the prehospital emergency department's transfer of these patients to other hospitals in the city, the researcher visited all hospitals admitting patients to determine their final diagnoses. Then, according to the ICD-10 codes, patients with the final diagnosis of stroke were identified. Then, by examining the prehospital emergency database, audio files were recovered from patients who had a diagnosis of stroke and other patients who had a non-stroke diagnosis. These audio files were listened to by two researchers (a nurse and a general practitioner), and the conversations were then transcribed

into paper files. Then, it extracts the phrases and keywords that callers used to describe patients with stroke. The Kappa agreement coefficient was used to calculate the agreement rate for two researchers for each phrase and keyword. Patients under 18 years who were transferred from the prehospital emergency department were excluded from the study. Due to the study's urgent nature, consent forms were not obtained from patients. The final diagnosis of stroke in patients' records is considered the gold standard of the study. The sample size was calculated using a pilot study and the following formula.

$$n=\frac{Z2\cdot p(1-p)}{d2}=\frac{(1.96)2\times 0.25}{(0.063)2}=\frac{0.9604}{0.003969}\approx 242$$

Descriptive statistics, including mean and standard deviation, as well as absolute and relative frequencies, were used to summarize data in tables and charts. For analytical comparisons between the two groups regarding diagnostic accuracy, the Chi-Square and Fisher's tests were applied to evaluate stroke diagnosis during telephone triage. In the statistical tests, the confidence level was set at 95%. SPSS No. 22 was used to analyze the data. The study design code is 911144, and this research is part of a master's thesis.

Result

The mean age of the patients with the final diagnosis of stroke was 70.0 ± 11.4 years, ranging from 32 to 97 years old. The highest age group was 60-69 (30.2%). Most callers to the EMCC had a first-degree relative (81.2%) who was a patient, such as a daughter, son, or spouse. Also, 14.2% had a second-degree relative. The mean total time of telephone triage in all investigated contacts was 1.7 ± 0.2 Minutes. Among 246 suspected stroke cases, 106 were confirmed as stroke (true positives), and 140 had other diagnoses, including brain tumor, seizure, stress, blood glucose abnormalities, or infection (false positives).

Patients' audio files with a stroke diagnosis by the dispatcher revealed that in 38%, the callers expressed the phrase body and limb numbness. In 16% of the contacts with the final diagnosis of stroke, the word "stroke" was used. In 16% of the cases, callers used the keyword ' speech problem'; in 5.45% of the cases, 'crooked mouth'; and in 5.45% of the cases, 'unable to walk'. In general, in 89% of cases, callers reported motor symptoms.

Chi-square and Fisher's exact tests showed significant differences between stroke and non-stroke patients for the phrases and keywords: body and limb numbness, stroke, speech impairment, crooked mouth, facial numbness, and inability to walk (P < 0.001; Table 1).

Table 1. Frequency distribution of expressions expressed by the caller in stroke contacts

Reported Problems	Stroke diagnosis by a dispatch nurse		Non-stroke diagnosis by the dispatch nurse	
	Cases	Percent	Cases	Percent
Body& limb numbness	21	38	3	5.88
stroke	9	16	2	3.92
Speech problem	9	16	4	7.84
crooked mouth	3	5.45	2	3.92
Inability to walk	3	5.45	6	11.76
Stroke& Numbness	2	3.63	2	3.92
Speech problem and numbness	2	3.63	3	5.88
Speech problem& crooked mouth	1	1.81	0	0
Inability& numbness	1	1.81	3	5.88
Other Expression	4	7.27	26	51
Total	55	100	51	100
P value<001				

Discussion

This study showed that nearly 90% of callers report symptoms and motor problems when they contact the EMCC. Moreover, focusing on these motor symptoms will identify most patients with stroke. Therefore, dispatch tools, questions, and guidelines should emphasize motor symptoms to improve stroke identification. In this study, nurses correctly identified about 43% of patients with stroke, which is consistent with most studies in this area. The phrases and keywords of body and limb numbness, stroke, speech impairment, crooked mouth, facial numbness, and inability to walk were the most commonly used phrases by the callers. In the study of Rosamond et al., the rate of stroke expression in contact with the final diagnosis of stroke was 45% (21). Also, 40.4% of contacts with a final stroke diagnosis used stroke keywords. That could be indicative of the low awareness of stroke signs and symptoms and the need for public education in this case. The stroke diagnosis rate in this study was higher than that reported by Rosamond (31%).

Deakin and colleagues found that 80% of stroke patients used at least one of four stroke-related phrases—facial dysfunction, weakness/dyspnea, or communication disturbance—which aligns with our findings. Unlike Jones et al., who reported that only 25% of stroke calls included the keyword “stroke,” our study found that 68% of calls containing the word “stroke” corresponded to a final stroke diagnosis. However, in Jones’s study, when callers used “stroke,” 89% of patients were diagnosed with stroke.

Unlike our study and Jones' study, the usual warning signs of stroke (facial weakness, hand weakness, and verbal disorders) were rarely reported as the first problem. Also, our results differ from those of the Australian study (22), which found that verbal problems were the most commonly reported symptom among witnesses. Our study results are not consistent with those of Buck et al. (23). In this study, despite callers' explicit use of the word' stroke,' senders considered only one-third of the calls to be strokes. In our study, dispatcher nurses identified 74.2% of calls mentioning “stroke” as stroke cases. However, the rest of the cases were recognized mistakenly as a disturbance of consciousness, weakness and anomalies, headaches, and hypertension.

These findings highlight the need for community education to improve public recognition of stroke symptoms and enhance communication with dispatcher nurses. Educating the public to promptly contact EMCC when stroke symptoms occur is critical, as emergency medical services (EMS) provide the fastest access to acute stroke care (23).

Conclusion

This study found that most of the keywords and phrases used by EMS callers are related to physical symptoms, such as numbness. Identifying stroke keywords and phrases specific to a culture and environment significantly impacts EMS stroke recognition. The study found that callers to EMCC use various keywords and phrases to describe stroke signs and symptoms. By recognizing these keywords, emergency medical dispatch center nurses can better recognize stroke patients. Also, communication between the nurse and the caller improves, and the time for telephone triage and ambulance dispatch is shortened. Given the standard time limit for thrombolytic injection within 3 hours (from the time of stroke occurrence to injection), rapid identification and immediate transport by ambulance to the hospital are crucial in the treatment of these patients.

Based on the results of this study, medical education policymakers can educate students about the importance of focusing on the indigenous culture of different regions of the country. The Ministry of Health's treatment center can also use the findings of this study to more quickly identify stroke patients and promote the integration of care and treatment between pre-hospital and hospital emergency departments.

Limitations

This study had some limitations. Some patient records suspected of containing stroke could not be retrieved from the medical records

section. In some cases, the patient's final diagnosis was not known because it was not documented by the doctor. Due to the high number of calls to the EMCC, it was not possible to review all the calls with suspected stroke.

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Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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