International Journal of Community Medicine and Public Health
Tippayanate N et al. Int J Community Med Public Health. 2021 Aug;8(8):3818-3822
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20213008

Original Research Article

Stroke recognition efficiency by emergency medical dispatchers

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Received: 07 July 2021
Revised: 21 July 2021
Accepted: 22 July 2021

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ABSTRACT

Background: Delaying treatment for an acute stroke can typically lead to further severity and disastrous consequences. The majority of patients, however, did not arrive at the hospital in time to get thrombolysis. While the accuracy of stroke diagnosis by emergency medical dispatchers (EMDs) remains uncertain. The focus of this research was to assess the accuracy of the stroke detection (face-arm-speech-time tool) (FAST) utilized by EMDs for the management of acute stroke was as well as how it affected patients' time from door to CT and door-to-needle time.
Methods: From 1 January 2020 to 31 December 2020, this research was performed retrospectively. We included all patients over the age of 18 who had an acute stroke identified by incident dispatch code 18. Data was gathered using pre-hospital forms and hospital records. The CT scan findings were used to predict the overall diagnosis.
Results: Overall 244 patients, only 143 likely cases (62.4%) were identified by EMDs out of 181 final stroke diagnosis. Conversely, the specificity was 44.4 percent and the sensitivity was 63.5 percent. Only 19 patients (10.5%) obtained a CT scan within 60 minutes, per the data from acute stroke patients, whereas only 40 patients with acute ischemic stroke acquired r-TPA (22.1%).
Conclusions: It remains undecided if the failure to use FAST, the inability to recognize positive FAST indicators, or the failure to report FAST findings involves issues with EMDs assessments.

Keywords: Stroke recognition accuracy, EMD, Door-to-needle time, Door to CT, Command control center

INTRODUCTION

Among working age adults, stroke is a leading source of death and disability.[1] Unfortunately, few people obtain care in a timely manner, owing to delays in getting to a hospital.[2] In this context, emergency medical services can play a critical role by promptly assessing those who are still within the defining moment of recanalization treatment and transporting them to a hospital with appropriate resources for diagnostic and therapeutic treatment.[3] The first specialists to deal with an acute stroke victim are generally EMS workers. A parallel processing consequence can be created by any delay in the sequential chain of information including the neurologist, hospital transport service, radiographer/CT technician and on-duty radiologist.[4]

One of the most important variables for enhanced efficiency is the patient screening tool utilized by EMS. Since the introduction of particular pre-hospital scales such as the Cincinnati pre-hospital stroke scale (CPSS), FAST and Los Angeles pre-hospital stroke screen (LAPSS), stroke identification in the pre-hospital phase has improved significantly.[5,6] Despite these limitations, FAST is one of the most effective methods for pre-hospital screening of individuals identified as having an acute stroke.[7]

The IDC 18 system (which uses the FAST screening tool to provide enhanced detection for acute stroke when a request is made to the command control center) has been deployed in pre-hospital centers in Thailand. Its goal is to quickly identify and screen patients described as having an acute stroke as well as to improve coordination between the pre-hospital system and acute stroke clinics to ensure that stroke patients are sent to centers with thrombolytic treatment capabilities as quickly as possible. After implementing FAST for acute stroke screening in Thailand, no extensive investigation on the efficacy of this instrument in a real-world setting has been undertaken.

METHODS

Study design

This registry-based research of diagnostic accuracy was done retrospectively. Patients' data were gathered for this study during one year from January 2020 to December 2020.

Definition

Following contact to 1669, EMDs conduct focused interviews with the caller using the current algorithm and FAST tool, following which the closest confirmed center was notified. Following the identification of positive FAST indications, the emergency medical service team of one paramedic and two emergency medical technicians promptly triggered the stroke FAST pathway. The required vital signs were obtained and the patient's transfer to the designated hospital was communicated via the dispatch center. Patients with stable hemodynamics are referred to the computed tomography (CT) scan unit, while those with unstable values are referred to the emergency department (ED), where treatment was resumed.

Study population

We included all patients over the age of 18 who had a clinically evident stroke based on the first assessment provided by EMDs, reinforced by the paramedic team, using census sampling. The patients chosen had no history of trauma and had been transported to the hospital by EMS staff. Patients were excluded if their medical records were inadequate or if they died before EMS arrived. According to a recent study, the FAST test has 70% sensitivity in identifying acute stroke.[8,9] The minimal sample size required for this investigation was 220 cases, based on a recurrence of 52 percent of stroke suspected patients, accuracy of 95 percent and a 5% error in sensitivity estimation.

Statistical analysis

For categorical data, we utilized frequency and percentage to characterize the sampling. For continuous data, the mean and standard deviation were provided as well as the median (interquartile range). We used the Chi-square test or Fisher's exact test to compare variables between stroke and non-stroke patients. Sensitivity, specificity, negative predictive value (NPV) and positive predictive value (PPV) were used to quantify the diagnostic test. R software version 4.1.0 was used to carry out all calculations.

RESULTS

The study comprised a total of 244 participants with a mean age of 60.2±15.2 years. There were 143 males (58.6%) and 101 females (41.4%) in the group. The average age of stroke victims was 62.8±14.3 years, compared to 52.8±15.3 years for non-stroke patients ($p<0.05$). Stroke was verified in 181 (73.8 percent) of the patients. Table 1 summarizes the fundamental data collected from participants. As a result, EMDs identified only 143 likely instances of stroke (62.4 percent, $p<0.05$), whereas paramedics at the scene detected 186 (76.2 percent, $p<0.05$) reported incidences of stroke. Weakness (62.4 percent), altered awareness (26.2 percent), dyspnea (57 percent) and seizure (5.7 percent) were the symptoms documented by paramedics, in that order ($p<0.05$). In terms of when the EMS system received notification, 133 (54.5%) instances were reported during the day shift, from 8 am to 4 pm, which was the most prevalent timeframe. In terms of callers, 208 (85.6%) instances were registered by passersby or parents, with just 27 (11.1%) incidents reported by the patients directly. When patients diagnosed with stroke were compared to instances diagnosed with other illnesses, the overall reaction time was substantially lower (7.5 versus 8 minutes, $p<0.05$). In instances of stroke, however, 109 (60.2%) patients had a delayed reaction time of more than 10 minutes.

Based on standard diagnoses, a cross-tabulation of EMD and paramedic evaluations of stroke is illustrated in Table 2 (acute stroke detection at a hospital). Consequently, the sensitivity and specificity of the test were 65.3 and 44.4 percent, respectively. Sensitivity and specificity were 88.4 percent and 58.7%, respectively for the paramedic group. The PPV and NPV for EMD diagnosis were 76.2 percent and 32.6 percent, respectively, whereas the PPV and NPV for paramedic diagnosis were 58.7% and 86 percent, respectively (Table 2).

The variances in CT scan processing time and results between stroke patients and those with other illnesses are shown in Table 3. The stroke group had a considerably shorter time from door to CT scan (13.5 minutes versus 26.5 minutes, $p<0.05$) than the non-stroke group. As can be seen, the number of stroke patients eligible for intravenous t-PA was 40 (22.1 percent, p.05), with a door-to-needle time of 59.5 minutes. The majority of instances, however, required more than 60 minutes ($p<0.05$).

Table 1: Characterization of groups validated by EMD diagnoses among stroke patients who were later diagnosed in the ED.

Variables	Total (%)	Non-stroke	Stroke	P value
Age (mean, SD)	60.23(15.176)	52.8 (15.257)	62.8 (14.292)	0.014**
Gender	244 (100)			
Male	143 (58.6)	42	101	0.132
Female	101 (41.4)	21	80	
Shift	244 (100)			
8-16	133 (54.5)	34	99	0.084
16-24	69 (28.3)	23	46	
24-8	42 (17.2)	6	36	
Callers	243 (100)			
Patients	27 (11.1)	7	20	0.998
Parents/bystanders	208 (85.6)	53	155	
Health providers	8 (3.3)	2	6	
Exhibiting indications	229 (100)			
Dyspnea	13 (5.7)	6	7	0.001**
Alteration of cons	60 (26.2)	13	47	
Seizure	13 (5.7)	9	4	
Weakness	143 (62.4)	34	109	
EMD's preliminary finding of stroke	229 (100)			
Yes	143 (62.4)	34	109	0.001**
No	86 (37.6)	28	58	
Response time (median, IQR) (in mins)	244 (100)	8.0 (5, 11)	7.5 (6, 12)	0.041**
Delay >10	88 (36.1)	16	72	
Within 10	156 (63.9)	47	109	
Preliminary identification of stroke by EMS personnel	244 (100)			
Yes	186 (76.2)	26	160	0.000**
No	5 (23.8)	37	21	

Table 2: Incidence of correct and wrong initial assessments made by EMDs and paramedics as well as their accuracy and predictive value, depending on the definitive diagnosis made at the hospital.

EMS staff	FAST	Stroke		Sensitivity	Specificity	PPV	NPV
		Rule in	Rule out				
EMDs	Positive	109	34	65.3	44.4	76.2	32.6
	Negative	58	28				
Paramedics	Positive	160	26	88.4	58.7	86	63.8
	Negative	21	37				

Table 3: Divergence in time parameters and clinical outcomes between stroke patients and those with other diseases.

Variables	N (%)	Non-stroke	Stroke	P value
Door to CT (min), median (IQR)	244 (100)	26.5 (1, 89)	13.5 (6.8, 22)	0.000**
>20	173 (95.6)	57	116	
≤20	71 (4.4)	6	65	
r-TPA	181 (100)			
Yes	40 (22.1)	0	40	
No	141 (77.9)	0	141	
Door to needle time(min), median (IQR)	181 (100)		59.5 (51, 73)	
≤60	19 (10.5)	0	19	
>60	16 2(89.5)	0	162	
ED LOS (mins), median(IQR)	244 (100)	80.5 (14, 670)	63 (51, 100)	
<60	75 (30.7)	17	58	0.000**
>60	169 (69.3)	46	123	

DISCUSSION

A comprehensive solution to clinical evaluation and reporting can help EMS teams better identify stroke and as a result, improve patient outcomes.[10] A number of pre-hospital stroke triage tools have been created to help identify patients who are most able to benefit from acute stroke treatment.[11] Most patients were transferred on a high-priority basis, with the majority of patients being taken to a hospital via an acute stroke care service. This treatment was in line with the recommendations in the stroke guidelines.[12] Several limitations were apparent in this study. It was a reflective analysis of probable data. The drawbacks of utilizing the emergency department discharge diagnosis as comparison are recognized, as in prior studies, but accessibility to the hospital discharge diagnostic was restricted.[13] However, discharge from the emergency department was frequently contingent on diagnostic tests that are not accessible in the pre-hospital environment. The perception of sensitivity and specificity may also be impacted by emulated data on FAST.

FAST demonstrated suitable sensitivity for stroke detection but its specificity was relatively low, particularly when utilized by EMDs, as per the findings of this study. However, when the tool was used by the EMS team on the scene, this problem was partly remedied. Furthermore, the findings revealed that using EMDs to identify stroke had little effect on reducing travel time to the hospital. Stroke identification by the EMS unit, on the other hand, was linked to a shortened transfer time.

We discovered that the EMS team's responsiveness was stronger than that of EMDs, at 88.4% and 65.3 percent, respectively. Furthermore, the specificity of EMDs in detecting acute cerebral stroke was greater (58.7 percent versus 44.4 percent). The test specificity was raised by the EMS team in accordance with the provisions of this stage in order to deter healthy people from joining the health care cycle. This ensured that healthy individuals did not join the treatment process.

Zhao et al reported that, when using FAST for the diagnosis of acute stroke in a hospital emergency, the EMS team's responsiveness, precision and PPV were 85 percent, 93.5 percent and 80 percent, respectively, when comparing the FAST validity features to previous study findings.[14] As a result, their research discovered higher sensitivity and specificity compared to this study.

Patients identified with stroke by EMDs were sent to the hospital substantially faster than those who were not evaluated as having a stroke by EMDs, according to Caceres et al.[15] We also anticipated that the timeliness of a patient's transfer to a hospital would vary depending on the diagnosis of acute stroke, causing the EMS team to mobilize faster and the patient to be taken to a hospital quicker in this study. As a result, when the EMS team recognized a stroke, patient transport time was dramatically shortened.

CONCLUSION

It is unknown if failing to apply FAST, failing to recognize positive FAST indicators or failing to document FAST findings causes EMD assessment issues. Thorough stroke screening and identification is expected to enhance reporting, which could translate to better management of stroke patients.

Funding: NIEM, Thailand
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Tippayanate N, Chaleepad S, Intarut N. Stroke recognition efficiency by emergency medical dispatchers. Int J Community Med Public Health 2021;8:3818-22.