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Evaluation of Pre-hospital Stroke Diagnosis Agreement with Emergency Diagnosis

Masoumeh Poureskandari[1], Alireza Ala[1], Elyar Sadeghi-Hokmabadi[1,2], Farzad Rahmani[1], Mina Amin[1], Samad Shams Vahdati[1]

[1]Tabriz University of Medical Sciences, Emergency and Trauma Care Research Center, Tabriz, Iran
[2]Tabriz University of Medical Sciences, Neuroscience Research Center, Tabriz, Iran

Abstract

Aim: Many acute disorders, such as hypoglycemia, migraine, seizures, and others, can mirror stroke symptoms and are referred to as stroke mimics. The goal of this study was to determine the number of patients brought to the emergency department by the pre-hospital system with a possible stroke, as well as the accuracy of diagnosis and placement in the SAMA code to determine the genuine diagnosis of stroke and its separation.

Materials and Methods: In this cross-sectional observational study, 150 patients who were referred to the emergency department for a period of 1 year with a complaint of acute stroke by the pre-hospital emergency department were examined for the accuracy of diagnosis and placement in the SAMA code.

Results: There was a weak correlation between thrombolytic administration and diagnosis when looking at the probable correlation between the data. The major complaint of the patient and the final diagnosis at the emergency department have a considerable relationship; however, it is a weak relationship. kappa is equivalent to 0.043 when assessing the coefficient of agreement between the patient's history and the final diagnosis given in the emergency department.

Conclusion: Pre-hospital emergency staff have a terrible track record when it comes to assess patients who are at risk of a stroke. This team is not very excellent at identifying people who require thrombolytic therapy. Personnel changes have little bearing on personnel decisions or diagnosis, which are affected by disease. Patients with thrombolytics are evaluated, diagnosed, and treated regardless of their age or gender.

Keywords: Emergency department, stroke, stroke mimics, SAMA code

Introduction

After heart disease and cancer, cerebrovascular disease is the third greatest cause of death in the United States. It is also the most common cause of disease and death among neurological disorders (1,2).

The term "cerebrovascular disease" refers to any abnormality of the brain induced by blood artery injury, which can be caused by a variety of reasons, the three most common of which are: 1. Thrombotic blood vessel obstruction 2. Blood vessel occlusion due to embolism 3. Arterial rupture (3,4).

Several evidence-based interventions can help people with acute ischemic stroke live longer and perform better. These include venous thrombolysis with Alteplase, either alone or in combination with endovascular therapy, stroke unit therapy, malignant infarction decompression hemicraniectomy, and early antiplatelet therapy (5-11).

Because these therapies are time-sensitive, accurate prehospital diagnosis and hospitalization at the most appropriate facility are critical, but this might be difficult for nonspecialist physicians or emergency medical professionals (12).

In Iran, prehospital notification for stroke is defined as SAMA code (the name of thrombolytic administration team activation code in Iran stroke protocol), which is equivalent to code 724 (which means every seven days of the week and 24 hours a day) in other countries; it is intended to reduce the delay in the

Corresponding Author: Samad Shams Vahdati MD, Tabriz University of Medical Sciences, Emergency and Trauma Care Research Center, Tabriz, Iran
Phone: +984133352078 **E-mail:** sshamsv@gmail.com **ORCID ID:** orcid.org/0000-0002-4831-6691

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treatment of patients suspected to have stroke who have signs and symptoms in the face, arm, and speech tests. By announcing the SAMA code, these patients are quickly transported to the nearest stroke centers where a well-equipped team is ready to treat these patients immediately (13).

The goal of this study was to determine the number of patients brought to the emergency department via the pre-hospital system with a possible stroke as well as the accuracy of diagnosis and SAMA code placement.

Materials and Methods

This was a cross-sectional observational-analytical study. During the year 2020, about 970 patients were admitted to the stroke center, of which 150 patients were referred by Emergency Medical Service with the activation of the SAMA code The Cincinnati Prehospital Stroke Scale was used to assess these patients.

Patients who left the hospital before the completion of the study or if their neurological examination was inaccurate owing to a decreased level of conscience were excluded. It was also noted if the patient was from a category where the SAMA code was activated and thrombolytics were prescribed.

The number of patients referred to the prehospital emergency department with a possible stroke, whether the SAMA code was activated, was counted.

The chief compline of the patients in emergency department presentation as well as the patient's demographics, were recorded first, followed by an examination of the patient's examination process, and finally, the final diagnosis to which the patient was assigned and discharged from the emergency department (discharge or hospitalization). A definitive diagnosis of stroke was made by an emergency medicine specialist with the advice of a neurologist. It was also noted if the patient was from a category where the SAMA code was activated and thrombolytics were prescribed.

Data were gathered from the Emergency Medical Service documentation center and Hospital Information System.

Statistical Analysis

The data will be entered into statistical analysis software, and statistical analysis will be performed. Statistical Package for the Social Sciences version 20 statistical analysis software was used to examine the collected data. To explore the association between normal quantitative variables from Pearson correlation and for non-normal variables, Spearman's correlation tests were used. Also, data were given as descriptive statistics (frequency and percentage) and mean standard deviation with a significance threshold of $p<0.05$. The agreement between the data was examined using the kappa coefficient.

Results

Age did not obey the normal distribution. Also, the distribution of patients deviated to the right skewed. The mean age of patients (57.23±71.95, confidence interval 95%) was 67.50 19 19.30 years, the mean age was 73 years, and the population was between 60 and 80 years old in the mid-quarter period.

There were 88 male patients (58.7%) and 62 female patients (41.3%) among these patients. It displays the largest number of missions in July, November and January and the lowest number of missions in April, October and March, based on the number of pre-hospital emergency personnel missions and the risk of stroke in the patient (Figure 1).

Only 14 patients (9.3%) were treated with thrombolytics out of 150 who were taken to Imam Reza Hospital with a diagnosis of stroke and activation of code.

67.3% of the 150 patients with suspected stroke who were referred to the pre-hospital emergency department had ischemic stroke, 14% had hemorrhagic stroke, and the rest had non-stroke reasons (Table 1).

There is a weak correlation between thrombolytic administration and diagnosis (Pv=0.035, correlation coefficient=0.173), which is likely due to the fact that not all patients with ischemic stroke are eligible for thrombolytic treatment.

The major complaint of the patient and the final diagnosis at the emergency department have a significant relationship; however, it is moderate (Pv=0.002, correlation coefficient=0.255).

Other factors such as the main complaint, ultimate diagnosis, and thrombolytic therapy had no correlation with age or sex.

There was no relationship between shift hours and the ultimate diagnosis or treatment with thrombolytics.

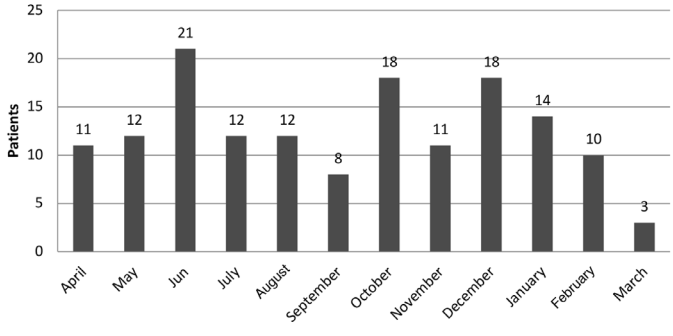

Figure 1. Frequency of pre-hospital emergency missions with the possibility of stroke

kappa is equivalent to 0.043 in a study of the coefficient of agreement between the patient's history and the final diagnosis given in the emergency department, based on which the hospital emergency personnel chose to transport the patient to the emergency department by activating the code. When the code is activated and thrombolytic treatment is administered in an emergency, the kappa agreement coefficient is 0.007, which is an extremely low value. The data and resulting kappa values are summarized in Table 2 and 3.

The weak relationship between the activated prehospital SAMA code and the definitive diagnosis of patients with acute ischemic stroke who received thrombolytic therapy could be related to the fact that the prehospital personnel have a poor performance in selecting Tpa candidates, which shows the need for continuous education about stroke and its symptoms.

Discussion

According to current research, the risk of stroke increases with age, with around two-thirds of all strokes occurring in persons over 65 years of age. Stroke is more prevalent in males than in women, and in black people than whites (1).

Table 1. Frequency of final diagnosis of patients transferred by pre-hospital emergency in the emergency department

Diagnosis	n	%
Ischemic stroke	101	67.3
Hemorrhagic stroke	21	14.0
TIA	1	0.7
Hypoglycemia	2	1.3
Generalized weakness	15	10.0
COPD	2	1.3
Hypertension	1	0.7
Multiple sclerosis	1	0.7
Severe headache	1	0.7
Coma with unknown cause	3	2.0
SAH	1	0.7
Pneumonia	1	0.7

TIA: Transient ischemic attack, COPD: Chronic obstructive pulmonary disease, SAH: Subarachnoid hemorrhage

Table 2. Kappa and Pv between age and other factors

Age	Kappa	Pv
Chief complaint	0.006	0.012
Shift	0.000	0.733
Tpa	0.000	0.897
Diagnosis	0.000	0.001
Month	0.000	0.840

Many acute disorders, such as hypoglycemia, migraine, seizures, and others, can mirror stroke symptoms and are referred to as stroke mimics (SMs), In the receiving hospital, almost 20% of prospective stroke patients were recognized as SMs (14). Magnetic resonance imaging is presently the most significant diagnostic technique in the diagnosis of ischemic stroke from SMs in situations of diagnostic ambiguity (15).

In Bray's study, there were flaws in the agreement between paramedics and physicians on all stroke patients (16). For starters, the ultimate diagnosis of transient ischemic attack (TIA) was based on the TIA diagnosis at discharge, and not all patients with genuine TIA were identified correctly at release. Second, the disease occurrence has an impact on the positive and negative predictive value These numbers may not reflect the real amount of stroke transmitted by ambulance because only 23% of patients diagnosed with stroke or TIA have Melbourne Ambulance Stroke Score (MASS) documentation for stroke. Finally, it is conceivable that MASS was only recorded in individuals who were strongly suspected of suffering a stroke, exaggerating MASS specificity by removing false positives (17,18). The improvement in stroke diagnosis by paramedics is another finding that contradicts recent published studies in this field (17,18). This disparity might be explained by variations in the samples Janet looked at for all MASS-documented stroke patients (16).

In our study, 67.3% of the 150 patients referred to the pre-hospital emergency department with a stroke risk had ischemic stroke, 14% had hemorrhagic stroke, and the rest had non-stroke reasons.

Poor usage (37.5%) of the Cincinnati stroke criteria by paramedics was found in stroke patients despite staff training that did not modify the personnel procedure, according to a recent study by Frendl et al. (18). In the Bray research, however, MASS was widely used. The majority of stroke patients in the MASS database experienced neurological issues and inexplicable falls, according to an examination of their records (16).

Previous research has demonstrated that paramedics diagnose strokes more rapidly in hospitals (19) and that with improved paramedic diagnosis, the rate of thrombolytic treatment has increased by 21% (20). In our study, out of 150 patients who were brought to the emergency department with a diagnosis of stroke

Table 3. Kappa and Pv between gender and other factors

Gender	Kappa	Pv
Chief complaint	-0.002	0.903
Shift	-0.019	0.250
Tpa	0.042	0.312
Diagnosis	-0.011	0.702
Month	-0.009	0.384

and activation of code, only 14 patients (9.3%) were treated with thrombolytics.

In a study by Dewey et al. (21), excellent agreement was observed between physicians and nurses in assessing motor and speech symptoms in 31 stroke patients trained by a group of stroke nurses and assessed by two neurologists. The Cincinnati group's study is only that explicitly evaluates tracker agreement between paramedics and stroke neurologists/specialists (22). The most consistent sign is arm weakness, followed by speech impairment and face weakness, according to this study (22). Only seven patients were referred in the current study, out of 150 patients who were brought to the emergency department with complaints of weakness and numbness of a part of the body or limb. Three patients complained of dizziness and falling, and four patients complained of a decreased level of consciousness.

Although only one of the prior research included paramedics, the findings of Noor evaluators for neurological symptoms after an acute stroke (22-24). Arm weakness is an indication of the highest agreement among assessors, according to earlier results by experienced physicians and nurses. In Padmanabhan et al. (25) study, they stated that Siriraj Stroke Score showed high sensitivity and specificity, and the results were satisfactory compared with computed tomography (CT) imaging in differentiating stroke subtypes. Thus, it could be used for bedside diagnosis in the lack of CT scan facilities and can help physicians so they can treat patients sooner with faster diagnosis.

Regarding our sample size, it should be considered that our study was conducted during the Coronavirus disease-2019 (COVID-19) pandemic and this issue can affect the sample size. As stated in the study by Ekmekyapar et al. (26) although the number of stroke cases increased during the pandemic, the presentation rate of patients with acute ischemic stroke decreased. This reduction rate, which may have been due to the patient's fear of contracting the COVID-19, caused some of them to lose the possibility of quick intervention and treatment.

Study Limitations

It can be evaluated the possible change in the process of patient management by prehospital while the sample size is calculated in continually years.

In this study, only prehospital cases were examined. In the other study, it is recommended that non- and prehospital patients be compared in terms of time to referral and amount of thrombolytics received.

Some findings or diagnoses, such as TIA, include some people, and by increasing the sample size, the error in kappa calculation can be minimized.

Conclusion

There is a correlation between thrombolytic administration and stroke diagnosis when the data is examined, although it is weak, most likely because not all patients with ischemic stroke are eligible for thrombolytic administration. The main complaint of the patient and the final diagnosis at the emergency department have a significant relationship; however, it is a weak relationship. The coefficient of agreement between the patient's history on the basis of which the emergency service personnel chose to transport the patient to the emergency department by activating the code.

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Ethics

Ethics Committee Approval: This study was approved by the regional ethic committee of Tabriz University of Medical Sciences with no.: IR.TBZMED.REC.1400.041, date: 29.06.2021.

Informed Consent: Consent form was filled out by all participants.

Peer-review: Externally and internally peer-reviewed.

Authorship Contributions

Concept: M.P., Design: A.A., Data Collection or Processing: M.A., Analysis or Interpretation: E.S-H., S.S.V., Literature Search: F.R., Writing: M.P.

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