



ORIGINAL ARTICLE

## The Code Stroke: Medical evaluation by a pre-hospital attention service



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### KEYWORDS

Prehospital care;  
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### Abstract

**Introduction:** In 1996, the NINDS (National Institute of Neurological Disorders and Treatment of Acute Stroke) published targets for the management of patients with acute cerebrovascular events, setting a time of 3 h or less for administration of thrombolytics, creating the Code Stroke.

**Objective:** Evaluate the time between onset of symptoms and arrival at the emergency department of a hospital as prognostic factors in patients with cerebrovascular events attended by the prehospital emergency medical service in the metropolitan area of Monterrey, Nuevo Leon.

**Materials and methods:** Calls received in the ED (EMME) between January and December 2012 were included in a retrospective cross-sectional study, with symptoms showing within the first 8 h or with an unknown onset. The Mann–Whitney test and Fisher’s exact test were used.

**Results:** Thirty-six patients were included in the study. In 21, the final diagnosis was cerebral infarction, 5 patients were treated with thrombolysis (23.8%). They were divided into two groups: group 1 died or were left with severe neurological sequelae ( $n=9$ ) and Group 2 survived without sequelae or mild neurological sequelae ( $n=12$ ). The door hospital arrival time was 67 (29–116) min (Group 1) versus 54 (24–86) min (Group 2) ( $p=0.110$ ). The neurological status at the start of the event affected prognosis and mortality ( $p=0.018$ ).

**Conclusions:** There are few studies analyzing the time between the inception of the symptomatology and the arrival to the emergency room. In our study 23.8% of this series were thrombolized, which puts us in the range of international statistics, compared to the series published by Geffner-Sclarsky et al. The population of this study is small so it is not able to show statistical differences, but the few studies that evaluate the Code Stroke in Mexico open the doors to future work with a larger population in Latin American society.

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## Introduction

Cerebrovascular events are the leading cause of disability and the second cause of dementia among adults.<sup>1</sup> Stroke refers to the interruption of blood supply to the brain. If not treated in a timely manner it may cause permanent brain damage, having an impact on the patient's quality of life as well as his/her family. Cerebral ischemia is the most common cause of stroke, the most effective management treatment to define, and even revert, the damage is thrombolysis. In 1996, the National Institute of Neurological Disorders and Treatment of Acute Stroke published the goals for the management of an acute cerebrovascular event, establishing a time lapse of 3 h or less for the administration of thrombolytic treatment.<sup>2</sup> At this point, an early recognition and a rapid transportation of the patient to a specialized health care facility is vital; under 60 min is the recommended time lapse. The shorter the transportation time is, the greater the possibility of recovery.<sup>3,4</sup>

From the emergence of the NINDS recommendations, several studies have been conducted trying to assess the compliance with timetables, finding a delay of 10–15 min. Among these, we were able to find studies by Katzan, et al. in Cuyahoga County, 2003; Boode, et al. in 2007; Haraf, et al. in a multi-centered study in 2002; Schroeder, et al. in 2000; Salisbury, et al. in Oxford, 1998, and Lannehoa, et al. in 3 French emergency rooms in 1999.<sup>5–11</sup> Thrombolytic treatment was only administered to less than 5% of the patients, becoming the main cause of pre-hospital/hospital delay,<sup>12</sup> the main factors are the lack of recognition of symptoms by the patient and the lack of suspicion of a stroke victim by the medical personnel and the paramedics. The use of emergency medical services and the transportation of patients by them are associated with an earlier hospital admission and thus a better survival rate with fewer consequences for the patient.<sup>13–15</sup> With the purpose of having a greater number of patients benefit from thrombolytic treatment, the European Cooperative Acute Stroke Study ECASS-3 was conducted using rtPA with a widened window of 3–4.5 h,<sup>16</sup> with positive results.

Acknowledging the importance of the first 3 h for the proper management of a stroke, the "The Code Stroke" was created. This code has been adopted in several countries worldwide. It is an organizational tool used to coordinate pre-hospital and hospital structures. Its main objective is to identify potential candidates for thrombolytic treatment and shorten transportation time as well as pre-hospital and hospital diagnoses.<sup>17</sup> The activation of emergency medical services (EMS) and transportation is associated with early admission and better opportunities for the patient. The percentage of thrombolysis from activated the Code Strokes vary in different series between 12.9% and 26%, resulting in a better chance of a proper management for patients and the possibility to limit the sequelae, thus reinstating them into a normal and productive life.<sup>18</sup>

Studies have been published evaluating the time of arrival to the hospital and neurological attention in patients with acute stroke as shown in the study of EPICES. For example, The EBRICUS study, which states that the implementation of a Code Stroke improves its attention

in the whole territory, giving importance to pre-hospital attention.<sup>19–22</sup>

The Code Stroke has been installed in Nuevo León, Mexico. However, we do not have studies which evaluate its impact on timely attention for the population or in the prognosis, as proven in United States and European countries. For this reason, this study was conducted with the objective of evaluating the time elapsed between the onset of symptoms and arrival at the hospital ER, and its impact on the patient's final prognosis, to evaluate whether or not the background of chronic pathologies affects the patient's prognosis, and lastly, to determine the percentage of patients who reach thrombolytic treatment, as a means of evaluating the Code Stroke in our region.

## Materials and methods

Medical Emergencies (EMME by its Spanish acronym) is an organization of mobile intensive therapy units (MITU) driven by a crew including a physician, a paramedic and a nurse, certified in Advance Cardiac Life Support (ACLS), for the service of patients in the metropolitan area of Monterrey, Nuevo Leon, Mexico.

The time between the onset of symptoms and the arrival at emergency services at a hospital were evaluated as factors of prognosis in patients with a cerebrovascular event, attended by pre-hospital medical emergency services in the metropolitan area of Monterrey, Nuevo Leon.

We used a retrospective, analytic, transversal, observational study, including all the calls received in our call center at EMME with patients who presented suspicious neurological symptomatology of cerebral ischemia within the first 8 h between January and December 2012.

Inclusion criteria: patients who presented neurological alterations with data of lateralization at the moment of diagnosis (sudden weakness or paralysis, difficulty speaking, loss of vision, difficulty walking, loss of balance or coordination) between 18 and 80 years of age.

Exclusion criteria: patients who presented an evolution of symptoms of more than 8 h, dependent patients (incapable of walking, cleaning or dressing themselves), patients who were asymptomatic at the time of the arrival of the ambulance, those with either terminal diseases, seizures at the onset of the stroke, or who presented any sign or symptom which made us think of a hemorrhage, patients who presented a medical background of digestive hemorrhage, intracranial hemorrhage and/or major surgery in the last three months.

Patients who, during their transportation to the hospital, showed any type of exclusion, or patients who refused to be transported to the hospital were excluded from the study.

All patients were evaluated at their address, using the Cincinnati Scale, by our mobile intensive therapy unit. Data was gathered from the service request reports registered at the company's call center, in addition to the patients' clinical history and a survey performed via telephone to the patient or a relative.

We evaluated the association of time between the onset of symptoms and the arrival at emergency services at the hospital, with survival rate and the development of neurological damage, measuring the odd ratio with a 95%

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