



## REVIEW ARTICLE

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# Approach of ACLS for stroke patients

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### Abstract

Stroke has become one of the leading causes of serious, long-term neurologic impairment and functional disability and is the cause of mortality. However, first aid providers should be trained to utilize a simple stroke assessment tool such as the Face, Arm, Speech, Time scale (FAST) or the Cincinnati Prehospital Stroke Scale (CPSS) to identify individuals with suspected acute stroke. Initial assessment and evaluate the suspected stroke patient's presentation to recognize potentially life-threatening conditions and to convey life-saving treatment. It is collection of all possible available data about the Stroke patients' therapy in the Emergency department. By many research questions to achieve these aims so a midline literature search was performed with the keywords "critical care", "emergency medicine", "principals of ACLS therapy in stroke", "ACLS and stroke". All studies introduced that the initial stroke therapy is a serious condition that face patients of the emergency and critical care departments. Literature search included an overview of recent definition, causes and recent therapeutic strategies. Practitioner's experts should be known approach stroke from the ACLS aspect. It is important to always remember, "Brain is time", and whenever we intervene fast, there is a higher chance that we salvage the brain of the patient and preserve his functional and neurological abilities.

**Keywords:** ACLS, critical, stroke, management

### Introduction

Stroke is a clinical syndrome of focal neurological dysfunction that occurs when blood supply to the brain is interrupted. It can happen to anyone regardless of their age, gender, or race. There are two types of stroke; they are triggered by either ischemia (lack of blood flow) or blockage (thrombosis, arterial embolism) or a hemorrhage. Ischemic stroke and hemorrhagic stroke account for 87% and 13% of the total incidents, respectively [1].

Estimates from the Global Burden of Diseases, Injuries, and Risk Factors Study (GBD 2010) ranked stroke as the second most common cause of death and the third most common cause of disability-adjusted life-years (DALYs) worldwide in 2010. Also, 10% of the deaths and about 4% of DALYs were due to stroke. The risk of strokes in adults aged 20-64 years is lower than that in older adults, but the societal impact is high due to the greater number of years of life lost and the resulting loss in functional activity. Stroke was used to be thought of as an elderly disease, but data show that the proportion of stroke burden is greater overall in individuals younger than 75 years than in those who are older, especially in low-income and middle-income regions [2].

A previous systematic review of population-based studies of stroke incidence from 28 countries showed that incidence is increasing in low-income and middle-income countries, by contrast with high-income countries where a 42% decrease in incidence has taken place in the past four decades [3].

In Saudi Arabia, the incidence and prevalence of strokes were low as compared with those recorded in the western countries, which could be because of the predominance of the younger age groups in this region. Thus far, no nationwide, if any, research has been conducted recently on the incidence and prevalence of strokes in Saudi Arabia. However, over the past decade there was one study which reported that the crude incidence rate for first-ever incidence of stroke in Saudi Arabia was 29.8/100,000/year. They also reported that ischemic strokes (69%) predominated and Sub-Arachnoid Hemorrhage (SAH) was extremely rare (1.4%). It is important to mention that there is definite lack of published researches on stroke. Thus, such research is vitally essential to plan for appropriate management programs to be set up, effective implementation of primary prevention strategies and proper allocation of health resources in this area [4].

In the United States of America, stroke kills about 140,000 Americans each year. That is one out of every 20 deaths. This means that someone in the United States has a stroke every 40 seconds. Every 4 minutes, someone dies of stroke. Every year, more than 795,000 people in the United States have a stroke.

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About 610,000 of these are first or new strokes. About 185,000 strokes nearly 1 of 4 are in people who have had a previous stroke. About 87% of all strokes are ischemic strokes, in which blood flow to the brain is blocked. Stroke costs the United States an estimated \$34 billion each year. This total includes the cost of health care services, medicines to treat stroke, and missed days of work [2].

In African countries, the situation is even worse because of the population growth, unchecked industrialization and increased consumption of western diets, leading to a rise in many modifiable vascular disease risk factors, and invariably resulting in increased prevalence of hypertension, diabetes and obesity. Three African countries (Angola, Liberia and Sierra Leone) recorded the highest stroke mortalities and DALYs worldwide. Even with this increasing burden, the public health response, accesses to health services and treatment options in many African countries have been poor. Specifically, the lack of functional stroke units, neurologists, health workers, cranial computed tomography (CT) scans, magnetic resonance imaging (MRI) machines and echodoppler machines, among many others, has negatively affected stroke outcomes [5].

Stroke has become one of the leading causes of serious, long-term neurologic impairment and functional disability and is the cause of mortality. However, there are no known drug therapies to improve recovery after stroke. Depending on the severity and type, stroke can leave an individual with a residual damage of physical, psychological, social and cognitive functions. Several modifiable risk factors for stroke have been identified including hypertension, hypercholesterolemia, carotid stenosis, atrial fibrillation, diabetes mellitus, and smoking. On the other hand, modifiable ones include age, gender, and race/ethnicity. Antiphospholipid antibodies have also been shown to be an independent contributor to stroke, with evidence suggesting it may be a more important mechanism in young adult stroke than in the older stroke population [6].

We aimed from this research to improve the skill, approach and the outcome of the stroke patients.

### **Rational for choosing this topic**

Stroke is a leading cause of serious long-term disability. Stroke reduces mobility in more than half of stroke survivors age 65 and over. Every year, 15 million people worldwide suffer a stroke, nearly six million die and another five million are left permanently disabled. Stroke is the second leading cause of death above the age of 60 years and the second leading cause of disability (loss of vision, speech or partial or complete paralysis). However, knowing the warning signs and symptoms of stroke so that you can act fast if you or someone you know might be having a stroke. The chances of survival are greater when emergency treatment begins quickly [3].

As a results, early admission to a stroke center and early treatment greatly improves stroke outcome and highlights the need for first aid providers to quickly recognize stroke symptoms. The stroke management goal is to administer definitive treatment early in the course of the stroke and to benefit from the best therapies, e.g. receiving clot-busting treatment within the first hours of the onset of stroke symptoms or in the case of intra-cerebral hemorrhage, a surgical intervention. So, the key note here is that brain is time, and

whenever the intervention is given faster, the chances of the patient to live with less disabilities would be more. Remember that every minute counts. Given the importance of time for stroke patients as “brain is time”, it is important that all people including the general population and specialized first aid providers are acquainted with how to approach stroke advanced cardiac life support (ACLS) [5].

### **Material and Methods**

Collection of all possible available data about the Stroke patients’ therapy in the Emergency department. By many research questions to achieve these aims so a midline literature search was performed with the keywords “critical care”, “emergency medicine”, “principals of ACLS therapy in stroke”, “ACLS and stroke”. All studies introduced that the initial stroke therapy is a serious condition that face patients of the emergency and critical care departments. Literature search included an overview of recent definition, causes and recent therapeutic strategies.

Aim and outcome of the study: initial assessment and evaluate the suspected stroke patient’s presentation to recognize potentially life-threatening conditions and to convey life-saving treatment so the key note here is that brain is time,

### **Discussion on ACLS approach to stroke patients:**

First, it is important to describe the symptoms of stroke:

1. Weakness in the arm and leg or face
2. Vision problems
3. Confusion
4. Nausea or vomiting
5. Trouble speaking or forming the correct words
6. Problems walking or moving
7. Severe headache (hemorrhagic)

First aid providers should be trained to utilize a simple stroke assessment tool such as the Face, Arm, Speech, Test scale (FAST) or the Cincinnati Prehospital Stroke Scale (CPSS) to identify individuals with suspected acute stroke [6].

In the later tool, the first aid provider would evaluate if the patient is having an abnormal presentation of:

-Facial Droop. This is evaluated by asking the patient to smile or shown teen and then observe if one side of face does not move as well as the other side.

-Arm Drift. This is evaluated by asking the patient to close eyes and extend both arms straight out, with palms up for 10 seconds. A positive finding would be if one arm does not move or one arm drifts down compared with the other.

-Abnormal Speech. This is evaluated by asking the patient to say “you can’t teach an old dog new tricks”. A positive finding would be if the patient slurs words, uses the wrong words, or is unable to speak [7].

If any one of these three signs is abnormal, the probability of a stroke is 72%.

If all three findings are present, the probability of an acute stroke is more than 85%.

Steps to approach stroke patients before reaching the hospital –in the ambulance–:

- Support ABCs: Give Oxygen if indicated
- Perform pre hospital stroke assessment
- Check glucose
- Establish time of symptom onset (last normal)
- Triage to stroke center. If onset >3 hours consider triage to hospital with interventional capabilities for stroke.
- Alert hospital and activate stroke team

In the hospital, an immediate general assessment and stabilization would be performed and this includes:

- Assess airway, breathing, circulation (ABC), and vital signs.
- Provide oxygen if O<sub>2</sub> saturation <94%.
- Obtain IV access and perform laboratory assessments
- Check glucose; treat if indicated
- Obtain 12-lead ECG
- Perform neurologic screening assessment
- Order emergent CT without contrast

After that, an immediate neurologic assessment by stroke team or designee will be performed and this includes:

- Reviewing patient history
- Establishing time of symptom onset or last known normal
- Performing neurologic examination (NIH Stroke Scale or Canadian Neurological Scale) [8].

Based on the CT scan, stroke can be classified to either:

1-) Ischemic stroke.

-If no hemorrhage is shown in CT scan, then it is acute ischemic stroke; consider fibrinolytic therapy by giving e.g. tissue plasminogen activator (tPA) up to 4.5 hours after symptom onset. Under certain circumstances, intra-arterial tPA is possible up to six hours after symptom onset.

-It is important to check fibrinolytic inclusion and exclusion criteria as detailed in Figure 1.

-Repeat neurologic exam: are deficits rapidly improving to normal? As the patient might be suffering from a transient ischemic attack (TIA), and this needs to be excluded before giving fibrinolytic therapy [9].

-For patients who may be candidates for mechanical thrombectomy, an urgent CT angiogram or magnetic resonance (MR) angiogram (to look for large vessel occlusion) is recommended, but this study should

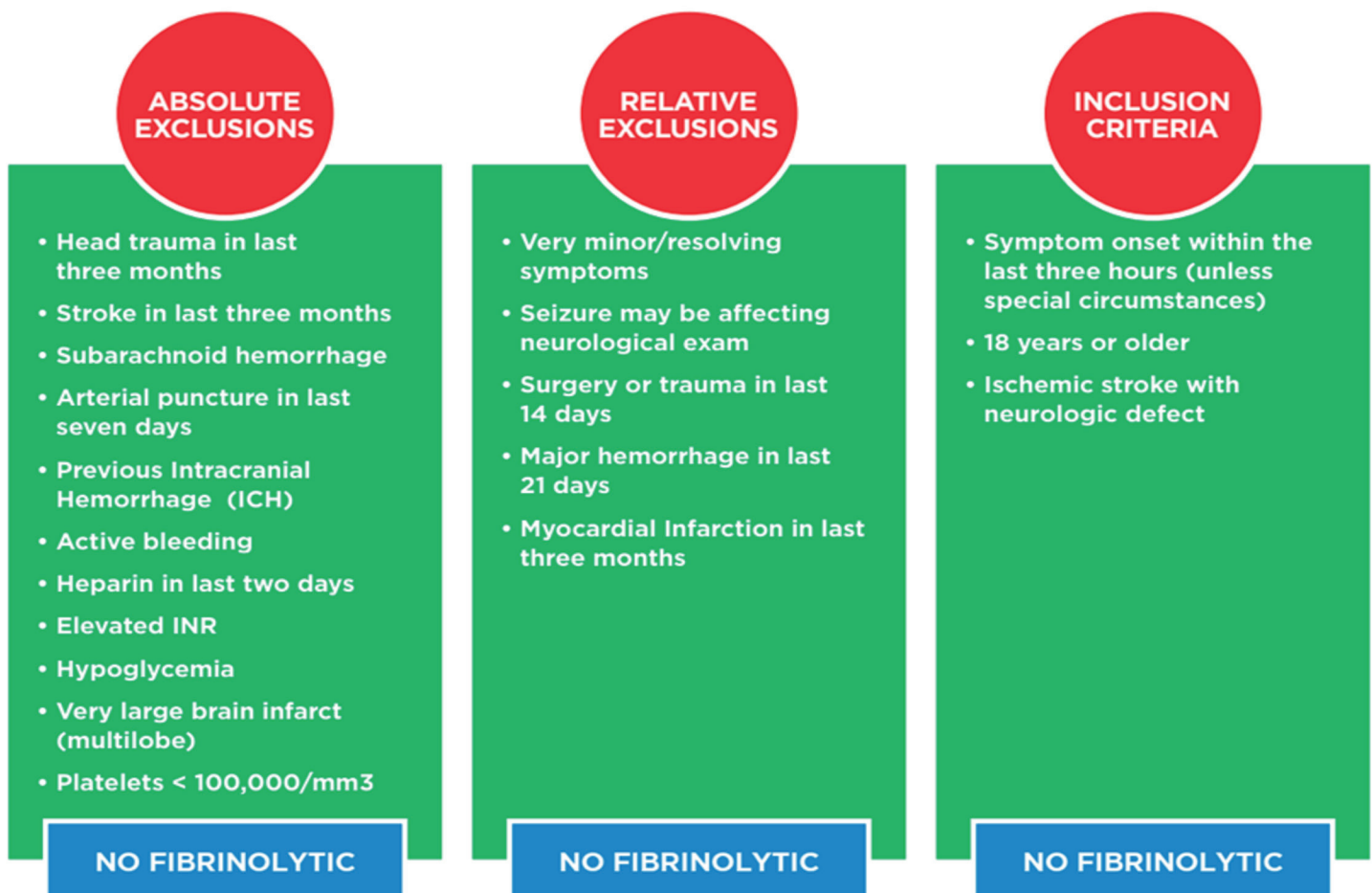


Figure 1. Eligibility criteria for fibrinolytic therapy

not delay treatment with fibrinolytic therapy.

- Give fibrinolytic therapy.
- No anticoagulants or antiplatelet treatment for 24 hours
- Begin post-fibrinolytic therapy stroke pathway.
- Aggressively monitor: blood pressure per protocol, for neurologic deterioration.
- Emergent admission to stroke unit or intensive care unit [8].

2-) Hemorrhagic stroke.

Consult neurologist or neurosurgeon; consider transfer if not available.

- Begin stroke or hemorrhage pathway.

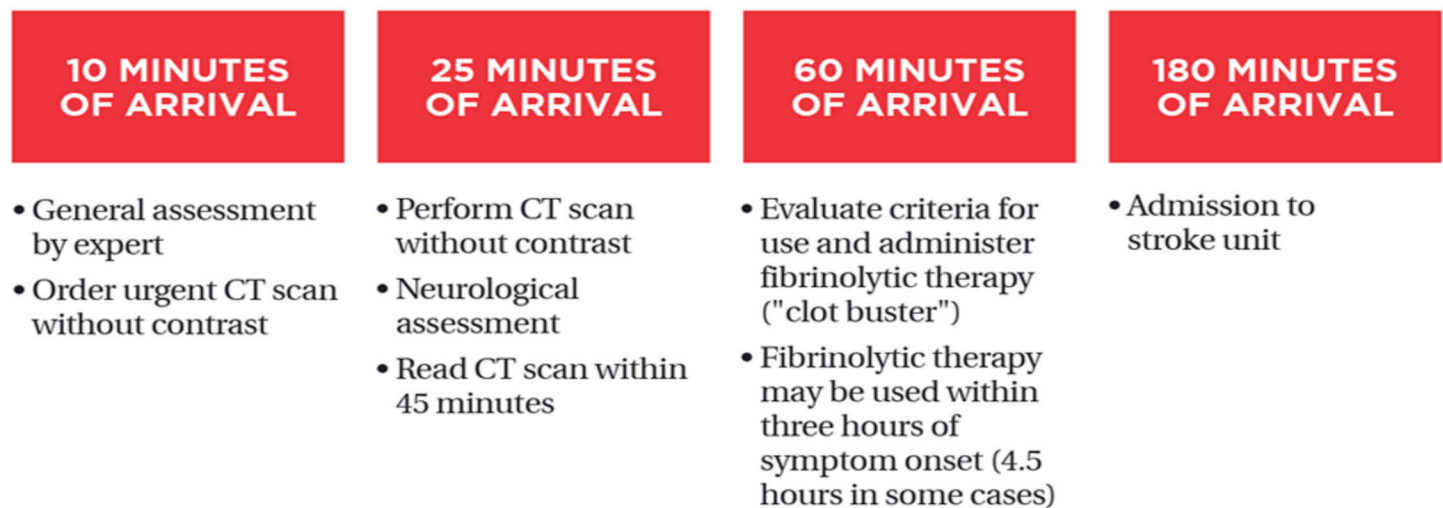
-Admit to stroke unit or intensive care unit.

-As we mentioned earlier: "brain is time". So, as health providers, we need to strive to complete all steps in following timeline as described in Figure 2.

Some of the important notes that have been highlighted by the ACLS guidelines:

Before giving anything (medication or food) by mouth, you must perform a bedside swallow screening. All acute stroke individuals are considered NPO on admission.

The goal of the stroke team, emergency physician, or other experts should be to assess the individual with suspected stroke within 10 minutes of arrival in the emergency department (ED).



**Figure 2.** Timeline steps of emergency management of stroke patients

The CT scan should be completed within 25 minutes of the individual's arrival in the ED and should be read within 45 minutes [4].

**Hypertensive Urgency:** - defined as an elevation of the diastolic blood pressure to greater than 115 mm Hg without evidence of acute end-organ damage. History: Noncompliance with medication is usually the precipitating event. Symptoms: non-specific and non-directional, headache is however the most common symptom. Evaluation: ECG, serum electrolyte panel, BUN and creatinine. levels, and urinalysis to evaluate and exclude signs of acute end-organ damage. The goal of therapy is to reduce the patient's blood pressure within 24 to 48 hours. Clonidine is the most commonly used oral agent. 0.2 mg, given orally, with additional doses of 0.1 mg added every hour until the desired response is achieved or the maximum dose of 0.7 mg is reached. Angiotensin-converting enzyme inhibitors, blockers and diuretics. Disposition: Patients must be referred to their primary physician for reevaluation and should be discharged with a prescription for an antihypertensive medication [11].

Hypertensive emergency an uncommon complication of hypertension and is defined as decompensation of brain, heart, or kidney function in the face of severe hypertension. Occurs when the diastolic pressure exceeds 115 to 130 mm Hg. Reveals noncompliance with antihypertensive medications. Again, the use of illicit substances, especially cocaine, must be considered. Headache, nausea, vomiting,

visual complaints, or any change in mental status should be taken as evidence of encephalopathy. Cardiac symptoms (e.g., ischemic chest pain, dyspnea due to CHF) may be present. Evaluation by an ECG and CXR useful for assessing the degree of cardiac ischemia or the presence of CHF. Computed tomography (CT). A CT scan of the head to look for intracranial bleeding is appropriate. Laboratory studies. Serum electrolyte panel, CBC, BUN and creatinine levels. Goal of therapy: decrease the blood pressure so that the mean arterial pressure is lowered by 20% to 25%. Nicardipine, Nitroglycerin, Labetalol or Sodium nitroprusside. Disposition: Patients require admission to the ICU for further observation and treatment.

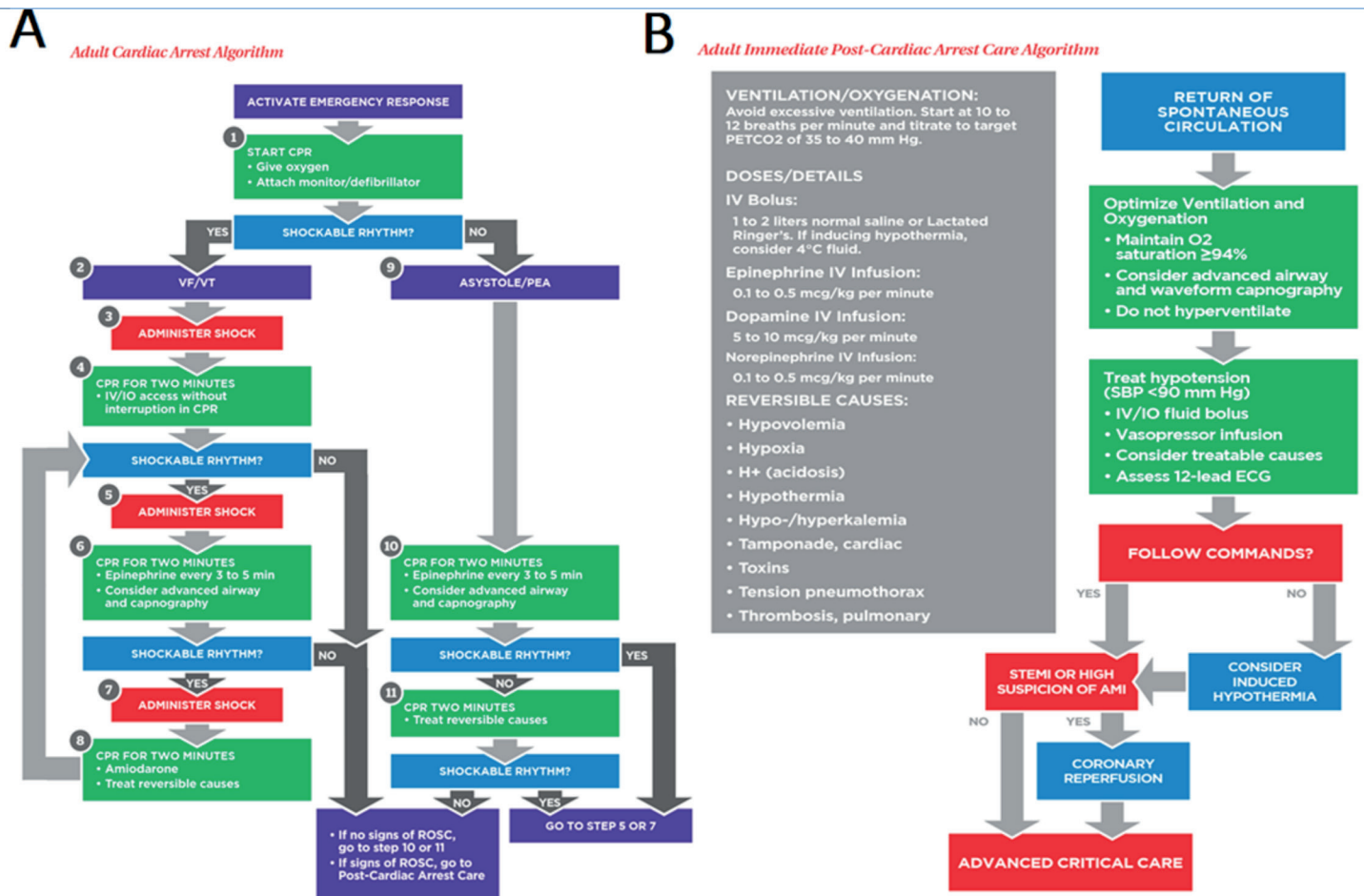
What if the patient presents with cardiac arrest and stroke?

We would follow the ACLS approach for cardiac arrest, and once the patients gets ROSC (Figure 3A), will start post-cardiac arrest care (Figure 3B) along with the treatment of stroke algorithm [10].

### Conclusion and Recommendations

Stroke is a leading cause of mortality worldwide. It severely affects the functional mobility in more than half of stroke survivors. In this research paper, we concluded that: the risk of stroke and approach to patients suspected from the ACLS aspect is important for decrease morbidity and mortality rate and physicians should always remember





**Figure 3.** Adult cardiac and post-cardiac arrest care algorithms

that “brain is time”, and whenever we intervene fast, there is a higher chance that we salvage the brain of the patient and preserve his functional and neurological abilities. Evidence based protocols for management of ischemic stroke should be developed for every aspect of care, from pre-hospital health education to post hospital discharge of ischemic stroke patients. Emergency physicians should participate at all levels of planning for ischemic stroke care and management.

#### Conflict of interests

The authors declare that they have no competing interest

#### Financial Disclosure

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