

# Acute stroke management: models of pre-hospital organisation

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## Introduction

Stroke is a disease which has a devastating impact on the patient's quality of life, as well as on the economy of a society. Pre-hospital acute stroke recognition improves onset-to-thrombolysis time, as well as the rates of recombinant tissue plasminogen activator (rtPA) delivery, therefore improving clinical outcomes.

## Role of dispatch centres

We expect dispatchers to detect strokes using triage scales (Cincinnati Stroke Scale or similar). When suspected, depending on the local emergency medical system (EMS) or the geography, either an ambulance with or without an emergency physician or a helicopter will be dispatched to the site. Until now, studies conducted on medical dispatchers' performance in the diagnosis of stroke were disappointing with, at best, a sensitivity of 60% and a positive predictive value of 50%.

## Role of paramedics and/or emergency physicians on-site

We expect EMS personnel on-site to recognise strokes and activate in-hospital fast tracks for stroke victims. Studies have been conducted to evaluate this task by paramedics, and until now, these results are deceiving, regardless of the scale used (Cincinnati Stroke Scale, Face Arm Speech Time, Ontario Pre-hospital Stroke Scale, Los Angeles Pre-hospital stroke screen), showing a modest sensitivity (70%) and specificity (50%). Some even conclude that pre-hospital scales perform no better than the odds of a "coin toss". To improve specificity, some EMS use emergency physicians to perform clinical examinations on-site, or they ask paramedics to call a senior emergency physician or neurologist in the hospital to perform the triage. There is, however, no published data on those medical triage systems and therefore, we do not know if it is more accurate than the paramedics' triage alone.

Once the fast track stroke system is activated, EMS personnel have to decide what transport vehicle is the most appropriate, which is dependent on the destination (ambulance? helicopter?). They also have to ensure that all of the details from family or witnesses are documented (onset of symptoms, past medical history, usual medication). When possible, they should bring one of the family members or witnesses along, as their information will be of crucial importance for in-hospital physicians. During transport to the hospital, EMS personnel are expected to set an IV line and control blood pressure when necessary, ideally with labetalol, but most paramedics do not have the authority to use it.

## Reasons EMS performance is so poor in diagnosing strokes

A stroke is a clinical and radiological diagnosis. Clinical description on the phone and findings on-site may be very unspecific (unconsciousness, dizziness, "not feeling well"), and therefore, strokes have many "chameleons".

In comparison, cardiac arrest is a simple clinical diagnosis that can be suspected on the phone. Dispatch centres can then provide pre-arrival instructions (bystander's CPR). Once on-site, paramedics quickly confirm cardiac arrest, pursue CPR and defibrillate when appropriate. Those measures improve the patients' outcomes.

## EMS future on stroke

### At the dispatch level

- Taking into account the word "stroke" when mentioned by the caller could improve the dispatch triage's sensitivity [1]. Today, this information is not part of dispatch protocols.
- When all of our calls are videophone calls, it will probably improve sensitivity and specificity of the dispatch triage, as dispatchers will be able to see the patient [2].

- While waiting for those improvements, the dispatch centres can improve their efficiency if they add a question regarding the onset of symptoms into their protocol. Today, responding to the adage “time is brain”, most dispatch centres use a priority dispatch with lights and sirens (L&S) for all potential stroke victims without addressing the specific issue of delay. There is, however, an abundant literature regarding L&S, including the low level of benefit it may offer to the victim and the high potential for harm that it may cause to the general public, EMS workers and patients. As only acute strokes (<6 hours) may benefit from thrombolysis, L&S could be denied to non-acute strokes if no other criteria of instability is suspected (unconsciousness, dyspnoea).

#### At the paramedics' level

- In the near future, paramedics may be equipped with cameras (GoPro™, Google glasses™) that will enable in-hospital physicians to better evaluate the patient and improve triage's specificity from the field, therefore, sparing stroke centres from non-stroke patients [3].
- Finally, one team published its results on “pre-hospital thrombolysis”, having a CT-scan in the ambulance, [4] but this may not be a solution for most EMS due to logistic problems and costs.

## Conclusion

Today, dispatch centres and paramedics' abilities in detecting cases of acute stroke are poor. The evolution of communication technology may improve those results, but as stroke remains a clinical and radiological diagnosis, we can suppose the improvement will not be stunning.

The biggest improvement may come from general public information campaigns, as we know that only 50% to 70% of strokes do benefit from a dispatch triage [5], leaving all other patients going to the hospital by their own means, sometimes arriving too late to benefit from thrombolysis.

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