

POSITION PAPER

NATIONAL ASSOCIATION OF EMS PHYSICIANS

ACUTE STROKE:

IMPLICATIONS FOR PREHOSPITAL CARE

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POSITION

The National Association of EMS Physicians believes that:

- Emergency medical services (EMS) providers should be trained in early recognition of stroke symptoms and early hospital notification.
- EMS medical directors should be aware of available local stroke treatment options, including experimental treatments.
- Local EMS medical directors should work with physicians who care for acute stroke patients to ensure that EMS protocols and training are consistent with local practice.
- EMS medical directors should work with the local medical community to determine the most appropriate destinations for EMS stroke patients.
- EMS medical directors should include the pathophysiology,

evaluation, and recognition of acute stroke symptoms in continuing education and protocols.

- EMS treatment of stroke patients should be a part of a continuum of treatment of stroke patients in the community.

INTRODUCTION

Acute ischemic stroke (AIS) continues to be a major cause of disability and mortality in the United States. The American Heart Association noted in its 1999 annual report that there are approximately 600,000 strokes, leading to 160,000 deaths per year.¹ Traditionally, management of acute stroke patients has been supportive with few options for therapeutic intervention, both in the emergency department and in the out-of-hospital environment. In 1995, the National Institute of Neurological Disorders and Stroke (NINDS) published a study in which tissue plasminogen activator (TPA) given within three hours of symptom onset improved outcome for AIS patients.² As a direct result of this single study, TPA was granted Food and Drug Administration (FDA) approval for treatment of acute stroke. Although this regimen remains controversial, the management of AIS is now considered an acute emergency, with time-dependent treatment available in some settings.

Even though some hospitals

have become more aggressive about their AIS care, very few AIS patients are eligible for thrombolytic therapy. This is due to the strict indications for usage of this treatment.³⁻⁷ It is been shown that roughly 50-60% of all stroke patients are brought in by ambulance and that relatively more of them are eligible for thrombolytic therapy than walk-in patients.^{4,6,7} This means that EMS systems across the country interact with roughly 300,000 stroke victims per year. Therefore, EMS can have a profound impact on outcome of stroke victims. Early recognition of stroke symptoms by family members and EMS personnel is of prime importance.

ACUTE THERAPY FOR ISCHEMIC STROKE

The main impetus for rethinking this process has been the FDA approval of TPA for treatment of acute thrombotic stroke. The first major trial that suggested a positive effect of TPA was the European Cooperative Acute Stroke Study (ECASS).⁸ This large multicenter trial was a randomized, prospective, double-blind, placebo-controlled trial. In this study, patients from 18 to 80 years of age, without any computed tomography (CT) signs of acute stroke, were enrolled if they could be treated within six hours of onset of symptoms. A total of 620 were

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Approved by the NAEMSP Board of Directors January 24, 2000. Received February 9, 2000; accepted for publication February 9, 2000.

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enrolled and randomized into either a TPA group or a placebo group. In the analysis of the entire group, there was no statistical difference noted in 30-day mortality rates or neurologic outcomes (measured using a modified Rankin Scale) at three months. There was, however, a significant increase in parenchymal hematoma in the TPA group, and there were, unfortunately, 109 protocol violations. The most common violation was that CT signs of stroke were missed. When this population is excluded, there was still no statistical difference between the groups in mortality, but there was a statistically different improvement in neurological outcome.⁸ In addition, a subgroup analysis revealed that the group treated within three hours had statistically significant improvement.⁹ The ECASS study was repeated and described as the ECASS II trial. This study showed no significant difference between placebo and TPA groups but demonstrated a trend toward improvement. In this study, like ECASS I, the TPA group had more significant intracerebral hemorrhages.¹⁰

Although the study was far from conclusive, the ECASS trial was the first large-scale study that suggested an improvement in neurological outcome. The NINDS trial provided more compelling evidence. In this trial, patients were treated within three hours of onset. This trial was done in two parts. The first part looked at 24-hour outcome and evaluated three-month neurological recovery as a secondary outcome. The first part found no change in neurological recovery at 24 hours but did find a significant improvement at three months. The second portion of the study was performed to prospectively validate the findings of part one. This also found an improvement in neurological outcome after three months. Neurological outcome was measured by four different outcome scales: 1) the National

Institutes of Health Stroke Scale (NIHSS), 2) the Barthel Index, 3) the modified Rankin Scale, and 4) the Glasgow Outcome Scale. The study found an absolute increase of 11% in the number of patients with no or minimal disability in the TPA group.² Although this study has been the only one finding positive results, it served as the basis of FDA approval of thrombolytic therapy. A recent study has further demonstrated the lack of benefit of thrombolytics in patients who are more than three hours from their initial event.¹¹

Although thrombolytic use has been the impetus for this change in thinking, there are potentially other time-dependent treatments. The study of neuroprotective agents is currently a very large and growing area. These agents, through various mechanisms, are thought to move to the ischemic area known as the penumbra and provide protection to the ischemic cells still obtaining some blood flow. There are multiple classes of agents being studied, with various effects. Although there are no clinical trials that demonstrate the benefit of neuroprotective agents, benefit has been shown in animal models. These agents can significantly affect the size of the ischemic area, and many human trials are under way.¹² The ideal neuroprotective agent will have a minimal side effect profile and may be amenable to prehospital administration.¹³⁻¹⁵ Some academic centers are additionally experimenting with invasive techniques of restoring blood flow to an ischemic area of the brain, including selective angioplasty and intraarterial thrombolysis.^{12,16,17}

Finally, there may be benefit to patients who receive a full continuum of care, including early mobilization and rehabilitation at a center that is specialized in taking care of AIS patients. The placebo patients in the NINDS study had better neurological outcome than previous historical controls.¹⁵ In

addition, the outcome of patients in ECASS II was even better.¹⁰ This implies that there may be benefit when the patient's final destination is a specialized stroke treatment center.^{15,18}

IMPLICATIONS FOR EMS

Most studies show that there are two areas that take up the longest period of time before treatment can begin. The longest delay is time from onset of symptoms to patient presentation, either to an EMS system or to a hospital. The second area of delay is the time period from hospital presentation to CT scan performance and reading. The time period of EMS interaction is very small. In most urban systems, that interaction may account for no more than 20 or 30 minutes. In some rural systems, it may be longer.^{3-7,14,15,18,19}

This implies a paradigm similar to that of acute myocardial infarction. The time from initial onset of symptoms to treatment can likely be improved with early EMS notification. Approximately 50% of all stroke patients initially access the health care system through EMS.⁴ One study noted that time to physician evaluation was cut in half by advanced notification and time to CT scan was cut to 47 minutes from 67 minutes. This study noted that 72% of patients who were identified by paramedics or emergency medical technicians as having an acute stroke had a discharge diagnosis of acute stroke.¹³ The same group found factors of facial palsy, best language ability, and best motor ability to be independently predictive of an end diagnosis of stroke (100% sensitivity, 90.5% specificity). This study was performed in an emergency department setting.²⁰ It appears that paramedics are able to accurately recognize signs and symptoms of acute stroke, which will affect the time to final treatment of these patients. In addition, the possibility does exist that neuroprotective

five agents could be administered in the out-of-hospital environment. It is incumbent on EMS medical directors to integrate training in these signs and symptoms into regular continuing education and protocol updates. Early identification of these patients by EMS providers will serve as a key trigger to facilitate early evaluation of AIS patients who may qualify for possible treatment or experimental protocols.

NINDS NATIONAL CONFERENCE

In August 1997, the NINDS convened a consensus conference on the rapid identification and treatment of stroke. This conference included leaders in EMS, emergency medicine, and neurology. A portion of the conference was dedicated to a Prehospital Medical Systems Panel. This panel was charged to determine recommendations involved in system design, EMS dispatch, and potential identification and treatment. A key recommendation was the initiation of the concept of "chain of recovery."^{15,18} This concept, modeled after the AHA "chain of survival" for cardiac arrest, proposes a system for identification and treatment of AIS. The recommendations of the panel are based on this concept and aimed at improving the EMS response to AIS. The biggest place in which EMS plays a role is in early identification and early notification.^{14,15,21}

CONCLUSION

The care of patients with AIS has undergone a paradigm shift. Although few patients qualify and

treatment remains controversial, the approval of TPA for acute stroke has caused hospital systems to become more aggressive in their evaluation and treatment of these patients. It has also served to stimulate research in other possible therapies—such as invasive therapies and usage of neuroprotective agents. These advances only increase the importance of the EMS role for the early recognition and treatment of this common disease.

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