



EMS Triage, Stroke Patient Transfer, and Matching Patients to Best Therapy: Strategies to Optimize the Diagnosis and Treatment of Ischemic Stroke Patients

J. Stephen Huff, MD, FACEP

**Associate Professor
Department of Emergency Medicine and Neurology
University of Virginia Health System
Charlottesville, Virginia**

Case Presentation

Case one:

A 42 year-old male is brought to the emergency department by EMS with abrupt onset of headache, difficulty speaking, and right-sided weakness. The patient was at his construction job site and suddenly complained of not feeling well. A moment later he was unable to speak. EMS was called and the patient was transported to the community hospital. CT scan was performed and neurologic consultation was requested. The CT scan showed no acute abnormality. The neurologist on call responded to the ED and suggested transfer to the university hospital 80 miles distant.

Case two:

A 52 year-old attorney had the onset of headache, vomiting, and left hemiparesis that evolved over moments while arguing a case in court. He was taken to the closest community hospital. The physician on duty contacted the stroke team at a referral center. He was advised not to obtain a CT and immediately transport the patient. Blood pressure was noted to be elevated at 220/120. Weather delayed flight time. The patient was intubated by the flight crew for declining mental status with RSI technique with further neuromuscular paralysis. He arrived at the stroke center paralyzed, intubated, and hypertensive.

Key Clinical Questions and Learning Points

What EMS triage protocols exist for prehospital stroke patients?

EMS approach to the stroke patient has evolved over the last decade. High-level priority dispatch, minimal scene time that includes obtaining key historical information, a focused neurologic examination, and pre-arrival notification of the emergency department are key elements of EMS response. Pre-hospital assessment scales for stroke- the Cincinnati stroke scale, the LA pre-hospital stroke screen – have been successful in identifying patients for possible interventions.

What patients are selected for selective triage, and to where are they transferred?

There is wide variation in different systems and in geographic locations for the stroke patient. Currently there are no widely accepted indications for transfer other than recommendations of treating physicians. While some localities have mandated transfer of stroke patients to designated stroke centers, many others still allow patient preference or closest-facility factors to dictate destinations.

What is the outcome enhancement of these triage protocols?

Rigorous outcomes research is lacking at this time. Ideally there is an improved match of patients and resources.

Should EMS direct triage to stroke specialty centers be done because of advanced stroke care capabilities at specialty centers?

The challenge of the medical community is to direct appropriate patients to appropriate care. Current systems are dull-edged, that is all patients might be diverted to a specialized center with the hope of capturing the few for specific interventions. Selective triage and transfer systems are needed.

Which stroke patients should be transferred from one hospital ED to another hospital for advanced stroke therapies that are not universally available?

At this time there are no widely accepted guidelines that identify patients likely to benefit from advanced therapies. Despite lack of trials, there is evolving impression that patients with basilar artery occlusion might benefit from interventions. Identification involves CT and an angiographic procedure. Other patients that fail that fail thrombolytic therapy or who are outside time-windows for intravenous lytic therapy might benefit, but practice patterns vary widely.

Annotated References

Lost Chances for Survival, Before and After Stroke **New York Times, Medicine and Health, May 28, 2007**

Indictment of emergency care system for stroke care. "...a stroke is a litany of missed opportunities." "Many patients with stroke symptoms are examined by emergency room doctors who are uncomfortable deciding whether the patient is really having a stroke....reluctant to give the only drug shown to make a real difference...." Perhaps overstates issues but instructs patients and families to expect certain diagnostic strategies and therapies.

Protocol Violations in Community-Based tPA Stroke Treatment are Associated with Intracerebral Hemorrhage **Lopez-Yunez AM, et al. 2001 Stroke 32:12-16.**

One of a number of studies that found high numbers of protocol violations in community hospitals attempting to implement tPA therapy. In this study it was found that protocol violations were associated with intracerebral hemorrhage. Hypertension, recent stroke, and prolonged coagulation studies were common factors that should have excluded patients. This study might be an argument for education, for a comprehensive stroke quality assurance program, or for early transfer to a stroke center.

Temporal Profile of Recanalization after Intravenous Tissue Plasminogen Activator **Ribo M, et al. 2006 Stroke 37: 1000-1004.**

Transcranial Doppler monitoring was used to determine reperfusion. Majority of reperfusion occurred within one hour. Authors recommended considering reperfusion techniques if improvement by sonography is not observed one hour after administration of t-PA.

Site of Arterial Occlusion identified by Transcranial Doppler predicts the response to Intravenous Thrombolysis for Stroke.
Saqgur M, et al. 2007 Stroke. 38: 948-954.

Patients with proximal middle cerebral artery fared worse than patients with distal middle cerebral occlusions as determined by Transcranial Doppler. Authors argue that within patients with MCA occlusion, response intravenous thrombolysis depends on occlusion site. Extrapolation is that certain patients may be candidates for interventional radiology techniques.

Admission Facility is Associated with Outcome of Basilar Artery Occlusion.
Muller R, et al. 2007 Stroke. 38: 1-4.

Argument that community hospital transfers delayed angiography and therapy for this subset of stroke patients. Argument for transfer of this stroke type to interventional facility.

Technology Insight: recanalization with drugs and devices during acute ischemic stroke.
Smith WS. 2007 Nature Clinical Practice Neurology. 3: 46-53

This is a good summary and review on interventional recanalization therapies

Case Outcomes

Case one:

CT was performed and a neurologic opinion was requested at the community hospital. Four hours after onset of symptoms, transfer was requested to the stroke center. Logistical issues further delayed transport. The patient arrived six hours after symptom onset with a dense hemiparesis. He was transferred to a rehabilitation center four days after admission with little change in hemiparesis and aphasia.

Case two:

The stroke team was waiting at the patient's arrival to the ED. CT scan was immediately obtained and showed a large intracerebral hemorrhage. The stroke team disbanded and the patient was admitted to a neurosurgical intensive care unit. He was eventually extubated and discharged with significant hemiparesis to a rehab facility.

Both of these illustrative cases are based on patients who presented to a community hospital and were transferred to the stroke center. Both illustrate problems common in existing systems and suggest opportunities for system improvements.

Preplanned action pathways are key and ideally should include advanced buy-in from all stake-holders – emergency physicians, radiologists, neurologists, and primary care physicians – to appropriately match patients and resources.