



## **Systems for Stroke Patient Care: From Pre-Hospital Triage to ED Disposition**

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### **Case Presentation**

A 54 year old male has an apparent stroke while teaching a class at the local community college. 911 is called immediately, and paramedics are on the scene within 10 minutes of the onset of symptoms. A telemetry call is made to the hospital base station, and medical direction is given by one of the new Emergency Medicine attendings. As he takes the call, he wonders what he will do if the patient is transported to his facility, and also considers whether or not the patient might not be best treated via direct transfer to a tertiary center. He also wonders about stroke centers, and how they compare to the university hospital in his area as well as the capacity of his own hospital to optimally care for this patient.

Because there is no formal triage policy that directs stroke patients to specialty centers, the patient is brought via ambulance to his facility, which is the closest hospital. He begins to consider his hospital's resources, how he will expedite the care of this patient, and whether or not transfer after initial treatment will be necessary.

**How should the care of this stroke patient take place within the system of prehospital and hospital providers that includes stroke centers, specialty services, and the options for directed EMS triage and inter-hospital triage?**

## **Key Clinical Questions and Learning Points**

### **What is stroke center designation? How did it occur? Who is performing it?**

A center is certified by the JCAHO as a primary stroke center. Certification is a voluntary JCAHO program that is designed to demonstrate that a hospital is committed to providing high quality care in one specific area of medicine. Examples include certification as a primary stroke center, a center capable of lung volume reduction surgery, or a center capable of utilizing a left ventricular assist device.

This JCAHO certification came about as a result of the stroke center guidelines developed by the Brain Attack Coalition, endorsed by the American and National Stroke Associations, and implemented by the JCAHO.

It is anticipated that many hospitals will certify as primary stroke centers, given that the criteria for certification would allow most institutions to participate in providing quality stroke patient care. Although the capabilities of a comprehensive stroke center have been defined, there is no formal process for certification as such at this time.

### **What is the difference between a primary and comprehensive stroke center?**

Primary stroke centers, in general, have the capacity to provide the initial ED evaluation and treatment of stroke patients, as well as systematic hospital care and disposition. These activities include integrated emergency services, a stroke team and protocols, radiological capabilities, and organized hospital care and rehabilitation disposition.

A comprehensive stroke center takes the primary stroke center one step further, requiring specialty consultants, interventional radiology services, surgical capabilities, and research and education that support the mission of caring for the acute stroke patient. This proposed specialty designation is patterned after Level I trauma centers, which are capable of providing immediate diagnostic and surgical interventions in order to maximize trauma patient outcome.

**What triage tools exist that allow for stroke patient triage in the EMS setting?**

Many stroke scales have been developed for use in the pre-hospital setting, with the goal of adequately defining stroke severity and allowing for optimal triage and pre-hospital disposition of acutely ill stroke patients. In 2002, Tirschwell published an analysis of the use of a shortened version of the NIHSS for use in the prehospital setting. The authors demonstrated that only five of the NIHSS items need to be tested in this shortened scale, termed the sNIHSS. These five items included the assessment of leg weakness, gaze and visual field deficits, language, and level of consciousness. Although this sNIHSS has not been independently validated nor is it used extensively in clinical practice, this paper does suggest, as is true with other pre-hospital stroke scales, that it is possible for paramedics to assess stroke severity using clinically relevant and easy to assess neurological exam findings.

**Do EMS systems currently utilize triage directly to stroke centers?**

EMS systems across the country are analyzing the way in direct stroke patient triage to stroke centers can be optimized. Although only a few metropolitan EMS systems such as New York City and Birmingham, AL have direct stroke patient triage, others (Dallas, Houston) promote such a practice when it appears to be appropriate and approved by the patient and family. Because there are no publications of the outcome of these triaged stroke patients, it is not yet possible to transfer this process to other similar metropolitan areas.

**What hospital resources are available for the diagnosis and management of ED stroke patients?**

The hospital resources necessary for the management of stroke patients include:

- Comprehensive Emergency Department care
- Immediately available cranial CT and interpretation
- Consultation with a neurologist, neurosurgeon, and critical care specialist
- Interventional radiology capabilities
- Stroke protocols for the administration of thrombolytics and the management of subarachnoid and intracerebral hemorrhage
- Critical care and surgical services
- Policies that support transfer to facilities that provide services not available within the institution

**What are the indications for hospital transfer following the acute evaluation and stabilization of ED stroke patients?**

Hospital transfer to a higher level of service should be considered whenever it is determined that there are services available elsewhere that might improve stroke patient outcome. This decision making process must take into account the stroke patient's severity of illness, the availability of necessary resources, and the timing of the stroke and presentation to the ED, and the ability of another institution to provide enhanced services in a timely manner.

In general, there are three indications for the transfer of stroke patients to another hospital in order to provide a broader range of services. These include:

1. When diagnostic testing not available that might better define the stroke etiology or severity can be performed elsewhere.
2. When IA thrombolysis is the preferred treatment option because of an uncertain diagnosis or because the three hour time window for IV tPA has expired.
3. When interventions such as the Merci mechanical clot removal device are thought to provide the best chance for a good or excellent patient outcome.

**What ED diagnostic and therapeutic interventions should be provided prior to transfer to a stroke specialty center in order to improve patient outcome?**

When initially managing ED stroke patients that ultimately will be transferred to another hospital for ongoing care, it is necessary to achieve three therapeutic interventions prior to transfer:

1. Stabilize the stroke patient's airway and cardiopulmonary status.
2. Obtain an initial non-contrast cranial CT to determine the presence of CNS hemorrhage (SAH, ICH) and/or the etiology and extent of the ischemic stroke findings.
3. Provide a hard copy or electronic version of the CT for transfer.
4. Provide IV tPA when indicated utilizing the NINDS protocol if the three hour treatment time window will likely expire during patient transfer.

**What steps should be taken going forward in order to improve the system for stroke patient care in the US?**

In order to optimize the system for stroke patient care in the US, the following steps should be implemented in the coming years:

1. Maximize the number of hospitals that become primary stroke centers.
2. Include as many Emergency Medicine physicians and nurses as possible as members of primary stroke centers' stroke teams.
3. Develop methods by which timely initial radiology and neurology support and consultation can be consistently provided to the ED staff.
4. Utilize protocols that support the use of IV tPA by emergency physicians.
5. Study the effects of directed EMS triage to primary stroke centers in improving stroke patient outcome.
6. Analyze the stroke tools that direct EMS providers in the assessment of patients who are suspected of having a stroke.
7. Determine when advanced diagnostic and interventional techniques are indicated based on improved stroke patient outcome.
8. Establish commonly accepted indications for the inter-hospital transfer of stroke patients for advanced diagnostic, interventional, hospital, or rehabilitation care.
9. Support efforts to educate prehospital and ED providers of emergency care to stroke patients.
10. Conduct research that answers the clinically relevant questions that surround the EMS triage, ED management, and hospital care of stroke patients.