Acute Ischemic Stroke: When Every Second Counts
EMS and Solitaire™ FR Revascularization Device
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What is Ischemic Stroke?

An Ischemic Stroke occurs when a blood clot blocks the blood and oxygen flow to the brain. This blockage causes vital brain cells to die resulting in severe neurological damage.

The Facts about Ischemic Stroke

- Every year about 795,000 Americans suffer from a new or recurrent stroke with 87% of these cases being classified as acute ischemic stroke.*
- Stroke is the fourth leading cause of death in the US and the leading cause of long term disability.*
- Early recognition of stroke symptoms, rapid transport to stroke centers, and innovative new technology to treat stroke are all factors that can help reduce the number of stroke victims each year.*
- It is important for EMS teams to understand the symptoms of stroke, available routing options to stroke centers and treatment options for patients.*

Time is brain in these situations and delays in treatment means loss of brain function and long term disability. The EMS team must be able to recognize a stroke patient and get them the care they need in order to save patients.

Stroke Centers and Available Treatment Options

When patients are admitted into the hospital for a potential stroke, the emergency department begins a detailed assessment. The assessment includes a neurological examination, physical examination, imaging evaluation, medical history of patient and determination of stroke symptom onset. Currently there are two methods that exist for treating acute ischemic stroke: Medical Management and Clot Removal Devices (Mechanical Thrombectomy). Only certain centers are equipped to perform mechanical thrombectomy in interventional angiography suites. These centers are also equipped with some of the latest technology in imaging and have detailed stroke protocols in place. As an EMS professional, knowledge of your area’s nearest interventional treatment centers can help impact the care and treatment of stroke patients.
The treatment options available are highly dependent on clinical success, time from symptom onset to treatment and what the patient is eligible to receive. The table below outlines the options available and the time in which they can be performed.

This table helps to give a visual description of how important time is in these situations. As an EMS team the major goals when it comes to stroke care is fast recognition of stroke symptoms and proper routing to a hospital with the resources to treat stroke patients.
The Importance of Early Recognition and Proper Routing to Stroke Centers

Every Minute there is a delay in treatment of an acute ischemic stroke patient, 1.9 million brain cells are lost (Maggiore, 2012). Fast symptom recognition, routing to stroke centers and communication with incoming hospitals is knowledge every EMS team should be equipped with. A clinical review found that for every 30 minutes there is a delay in reperfusion, the probability of a good clinical outcome decreases by 12% (Gupta, et al., 2012). EMS teams can help drive effective stroke care by focusing on the importance of time and transport.

EMS Response Components

1. Fast Recognition of Stroke Symptoms:
The goal of stroke care is to minimize brain injury and maximize the patient’s recovery. The EMS team must be able to quickly identify the presence of a stroke and decide the best way to get the patient to proper care.

2. Proper use of Evaluation Tools:
There are several tools that can be used in the field to help identify the symptoms of stroke. The Cincinnati Prehospital Stroke Scale, Los Angeles Prehospital Stroke Scale and Miami Emergency Neurological Deficit Scale are a few of the popular tools used by EMS personnel to assess stroke patients. Some of these popular tools are shown below.


3. **Transportation protocols and communication with hospital:**

EMS pre-notification systems have been associated with improved evaluation and timelier stroke treatment (Lin, et al., 2012). Effective communication with the incoming hospital can help ensure timely stroke diagnosis in the emergency room.

4. **Transportation to stroke centers when available:**

Transportation to the most comprehensive stroke center is highly recommended. These stroke centers contain some of the latest technology for the treatment of stroke patients. High volume stroke centers with endovascular capabilities have lower procedural times, higher reperfusion rates and better clinical outcomes (Gupta, et al., 2012). Transportation to the right hospital may be the key in saving a patient from long term disability and death.

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**Los Angeles Pre-Hospital Stroke Screen**

<table>
<thead>
<tr>
<th>Screening Criteria</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Age over 45 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. No prior history of seizure disorder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. New onset of neurological symptoms in just 24 hours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Patient was ambulatory at baseline (prior to event)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Blood glucose between 60 and 400</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Exam: Look for obvious**

<table>
<thead>
<tr>
<th></th>
<th>Normal</th>
<th>Right</th>
<th>Left</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facial smile/</td>
<td>🌼</td>
<td>🌼 🌼</td>
<td>🌼 🌼</td>
</tr>
<tr>
<td>grimace</td>
<td></td>
<td>Droop</td>
<td>Droop</td>
</tr>
<tr>
<td>Grip</td>
<td>🌼</td>
<td>🌼 🌼</td>
<td>🌼 🌼</td>
</tr>
<tr>
<td>Arm weakness</td>
<td>🌼</td>
<td>🌼 🌼</td>
<td>🌼 🌼</td>
</tr>
</tbody>
</table>

**Cincinnati Prehospital Stroke Scale**

<table>
<thead>
<tr>
<th></th>
<th>Normal</th>
<th>Abnormal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facial Droop</td>
<td>Left and Right side of face move equally</td>
<td>One side of face does not move at all</td>
</tr>
<tr>
<td>Arm Drift</td>
<td>Both left and right arm move together or not at all</td>
<td>One arm does not move equally with the other</td>
</tr>
<tr>
<td>Speech</td>
<td>Patient uses correct words with no slurring</td>
<td>Patient has slurred speech, uses inappropriate words or cannot speak</td>
</tr>
</tbody>
</table>

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How is Stroke Treated?

Initial treatment consists of a complete patient evaluation. The emergency stroke unit team will document a full medical history, including physical and clinical neurological exams, as well as imaging evaluation.

Currently two methods exist for treating acute ischemic stroke patients

**Medical Management:**
Within 3 hours of stroke onset a drug can be given through a vein to help dissolve the clot. Some patients cannot receive this drug because of other medical conditions or medicines they are taking. Other patients may not arrive to the hospital in less than 3 hours from their first symptoms.

**Mechanical Thrombectomy:**
A procedure that uses a tiny device to remove clot from an artery in the brain, restoring blood flow. This procedure is an option for some patients who cannot receive drug therapy or who have failed drug therapy.

Clinical data has shown that patients who have blood flow restored to the brain are more likely to survive an acute ischemic stroke. The time between the onset of symptoms to the time of treatment may also be a key component in determining the degree of injury to a patient’s brain, and therefore, the long term outcome.

** McDougall C et al. 2008 International Stroke Conference
The Limitations of IV-rtPA:

Currently the only FDA approved treatment for the management of acute ischemic stroke is the Intravenous Recombinant Tissue Plasminogen Activator, also known as IV-rtPA. This drug is administered through a vein and is intended to dissolve blood clots in ischemic stroke. The drug has a time window of 0-3 hours from symptom onset to treatment which limits its use in longer time to reperfusion cases. A study that aimed to review the acute recanalization rates after IV-rtPA in proximal vessel occlusions, gave insight into the effectiveness of IV-rtPA. The study reviewed the Calgary Stroke Program from 2002-2009, looking at all patients with proximal vessel occlusions receiving IV-rtPA. The patients were assessed for recanalization using transcranial Doppler and angiograms. The key results from this study are as follows:

- 388 patients with proximal occlusions were identified
- 216 patients received IV-rtPA; 127 patients underwent further imaging to look at recanalization
- Among the 127 patients assessed for recanalization, only 27 (21.25%) had acute recanalization
- Recanalization was the strongest predictor of good outcome in this study

According to this study, the acute recanalization rates in proximal vessel occlusions are low. This delay in recanalization can decrease the chances of a good clinical outcome for stroke patients. Time is brain and this study helps to highlight the importance of alternate flow restoration options such as mechanical thrombectomy. If the patient is out of the time window, not a candidate for treatment or failed IV-rtPA therapy they may be considered a candidate for mechanical thrombectomy. Transferring patients to stroke centers with interventional capabilities, when appropriate, may help patients achieve better clinical outcomes.

The Importance of Revascularization and Time for Stroke Patients

Revascularization is the restoration of blood flow to an area that has been blocked. In ischemic stroke that blockage is a blood clot in a vessel, stopping fundamental oxygenated blood flow to the brain.

A clinical study further explored the importance of revascularization in areas of stroke recovery. The study also aimed to understand the relationship between timing of angiographic reperfusion and clinical outcomes.

The study tested IV/IA therapy for moderate to severe ischemic stroke within 3 hours from symptom onset. The results observed were as follows:

- Among 54 cases, only time to angiographic reperfusion and age independently predicted good clinical outcomes after angiographic reperfusion alone.
- The probability of good clinical outcomes decreased as time to angiographic reperfusion increased.

This study helped to provide evidence that good clinical outcomes are dependent on time to successful reperfusion. For EMS personnel, this study helps to further emphasize the importance of timely transport to a stroke center.

If your medical team has suggested using the Solitaire™ FR device as a treatment option, the images on this page can help you understand the treatment procedure involved.

Step 1: Access
The blood clot or occluded vessel is accessed
The doctor will insert large type of IV catheter into the groin area and then pass a catheter into the blocked vessel in the brain.

Step 2: Positioning
The Solitaire™ FR device is positioned
The Solitaire™ FR device is navigated within the micro catheter and positioned through the blood clot.

Step 3: Deployment
The Solitaire™ FR device is deployed
Once deployed, the clot is now embedded within the Solitaire™ FR device

Step 4: Retrieval
The clot is removed
Once entrapped within the Solitaire™ FR device the clot can now be safely removed from the body

Solitaire™ FR revascularization device procedural steps taken from IFU. For complete instructions for use please see IFU. All images are the property of Covidien.
Indications for Solitaire™ FR Revascularization Device:
The Solitaire™ FR revascularization device is intended to restore blood flow by removing thrombus from a large intracranial vessel in patients experiencing ischemic stroke within 8 hours of symptom onset. Patients who are ineligible for intravenous tissue plasminogen activator (IV-tPA) or who fail IV-tPA therapy are candidates for treatment.

Contraindications for Solitaire™ FR Revascularization Device:
Use of the Solitaire™ FR revascularization device is contraindicated under these circumstances:
- Patients with known hypersensitivity to nickel-titanium
- Patients with stenosis proximal to the thrombus site that may preclude safe recovery of the Solitaire™ FR revascularization device
- Patients with angiographic evidence of carotid dissection