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Stroke Destination Decisions: A Time Sensitive Matter

Information Paper

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As more and more hospitals seek Primary Stroke Care (PSC) designation the concept of last known well (LKW) or last seen normal (LSN) is of particular importance as we educate and train our prehospital health professionals to take accurate histories, use modified stroke scales, and recognize potential large vessel occlusions (LVOs) that may benefit from Comprehensive Stroke Centers (CSCs) and access to immediate interventional therapy. (9, 11, 12, 15)

While the vast majority of evidence for the benefit of interventional thrombectomy have come from studies involving patients who first received thrombolysis (tPA) (1, 2, 3, 4, 5, 6, 7, 8) followed by intervention, recent literature suggests that when a patient presenting with symptoms consistent with an emergent large vessel occlusion (ELVO) endovascular therapy (ET) was associated with higher three month functional outcome in both those treated with or without IVT (ET)(1) This new research leaves the clinician asking if destination protocols routing this subset of patients directly to a CSC may improve outcomes as ischemic time to the brain may be reduced and those who fail to meet IVT guidelines or who fail to respond may have expedited access to the lab.

The risk to the patient of primary routing to an equidistant CSC is low and the benefit of early evaluation for EVLO and endovascular treatment including thrombectomy, or site directed thrombolysis with or without IVT (IV treatment) is substantial. (5, 7) The risk for the hospital is simply over triaging and an increased number of potential stroke patient presentations to the emergency department. The community must decide if the risk of bypassing a PSC given a tight, well, overseen and quality controlled protocol is in the best interest of the patient in the face of clear and convincing evidence of an LVO.

For consideration, is the overuse of finite resources in a specialty center being mindful of the appropriate use of such resources? The risk of under triage to a CSC for a patient who may potentially benefit from early neurointerventional therapy is an increase in morbidity and mortality associated with the time sensitivity involved in clot retrieval. (5, 6, 7) ACEP believes most of us would not tolerate the risk of missing the time window or delaying endovascular treatment for our families or ourselves. Politics and healthcare dollars aside, following a strict “triage criteria” for LVO being routed to a CSC must be considered. With this consideration, there needs to be strict criteria and a comprehensive stroke system QA/QI program involving all stakeholders associated with this time sensitive illness much like the American College of Surgeons (ACS) required prehospital component of for Level 1 trauma designation.

As the science changes and evolves so does the clinical window for tPA administration with the AHA/ASA recommending 3- 4.5 hours as the upper limit. (4) Additionally the window for neurointerventional therapy studied ranged between 6 and 12 hours with or without IVT and a small infarct core. However most patients received embolectomy within 6 hours which is the current accepted practice and extending this time will be studied in future trials. ACEP will continue to follow the ever evolving science. (3, 4, 5, 6, 7)

High-performing EMS systems have successfully utilized a modified stroke scale as well as a protocol that identifies potential LVOs and continue to make strong destination decisions (1). While earlier developed Prehospital Stroke Scales (PSS) lack specificity (11, 12) and in some studies sensitivity as well (12), the Rapid Arterial occlusion Evaluation scale (RACE) seems to be promising for identifying not only acute ischemic stroke but also LVOs in a pre-hospital setting. (9) Any position statement must take into account geography, maturity and sophistication of both the prehospital and hospital system serving an area and access to air medical assets. With the

advent of telemedicine both in the emergency department and in some ambulances, these decisions can be made in concert with neurologic consultation making these decisions a true multidisciplinary effort. (16, 17, 18)

Additionally, the AHA/ASA's focus for prehospital care is largely assuring response time intervals, scene time intervals and destination decisions.

Prehospital Stroke Management

- The Implementation Strategies for Emergency Medical Services within Stroke Systems of Care policy statement outlines specific parameters to measure the quality of EMSS including:
 - Stroke patients are dispatched at the highest level of care available in the shortest time possible.
 - – EMSS response time is < 8 minutes (time lapsed from the time of the call by the dispatch entity to the arrival on the scene of a properly equipped ambulance and staffed ambulance)
 - – Dispatch time is < 1 minute
 - – Turnout time (from the call is received to the unit in route) is < 1 minute)
 - – The on-scene time is < 15 minutes (barring extenuating circumstances such as extrication difficulties)
- Travel time is equivalent to trauma or myocardial infarction calls.
 - The time between the receipt of the call and the dispatch of the response team is less than 90 seconds. (21)

With the advent of telemedicine and in particular Mobile Stroke Units (MSUs), decreasing the door-to-treatment time will inevitably continue to evolve. A number of recent studies suggest that mobile CTs and MSUs are not only economically feasible but are also changing the way we design stroke systems. Most hopeful is the impact they have on early recognition and treatment, thereby improving identification of patients who are eligible for thrombolysis and interventional treatment. (13, 16, 17)

ACEP cannot emphasize enough the need for robust education around the pathophysiology of acute cerebral vascular accident both hemorrhagic and ischemic as well as the identification of the signs and symptoms of this time-sensitive illness. EMS, both urban, and rural are tasked with taking accurate histories, including the ever elusive “last seen normal” which has proven to be often difficult to identify preliminarily (15), performing detailed and thorough physical exams and weighing confounding factors as they identify acute stroke in the pre-hospital environment. (10) This can often be difficult and result in over or under triage creating barriers to accurate identification of acute stroke. (10) An evaluation tool, which is sensitive and specific, must be utilized (9) and the pre-hospital clinician must be proficient at performing an accurate neurologic exam in often-austere environments with histories and historians that are not always accurate. Early recognition by both the public and by extension the EMS clinical professional is essential. Understanding the risk of transient ischemic attacks (TIAs) and their relationship to future acute strokes is also an area of education that must evolve. (20) The ongoing need for immediate

feedback to our pre-hospital clinicians and the perceived lack of feedback is one of the barriers our clinicians involved in our stroke systems have identified. (10)

Currently “drip and ship” from a hospital with the ability to administer tPA in the “hub and spoke” model to a PSC is the way many patients receive thrombolytics and are routed to a center where a neurologist is readily available especially in a rural setting. Future considerations will be routing those patients who will benefit from early endovascular treatment directly to a CSC either by ground or air transport. As is always the case, the use, availability and risk of air transport must be taken into account when making mode of transportation decisions.

The need for the addition of interventional neurology for intra-arterial therapy including thrombectomy in large vessel occlusions is now supported by recent literature. Utilizing this intervention in which symptoms do not resolve after IVT or in situations where the patient may not be a candidate for thrombolysis becomes a secondary decision. Since thrombectomy can be performed up to 12 hours post onset of symptoms (3), and early neurointervention is brain-sparing (4, 5, 7), ACEP must weigh the benefit of bypassing PSC and going directly to CSC for suspected LVO.

In communities where multiple hospital systems have invested large sums of money to be able to receive acute strokes, and who compete for acute stroke patients, the politics of bypassing these hospitals for a CSC becomes an area of lively debate. Given the paucity of data where large numbers of patients received embolectomy alone, future prospective studies are needed. Inherent in that debate becomes identifying which patients will ultimately need and benefit from interventional therapy and having confidence that, much like Level 1 Trauma Centers, prehospital providers can identify the specific criteria and choose the subset of patients whose outcomes will be positively affected by the multidisciplinary care received at a CSC. ACEP feels that an objective must be to educate and entrust our EMS clinicians with these decisions in concert with strong EMS medical direction and a commitment to look at those cases that were routed to a CSC. Additionally, timely feedback regarding this medical decision-making to assure that the right patients are routed to the right level of care in the right amount of time is essential.

The data on the outcome of primary thrombectomy without tPA is limited thus making a case for “drip and ship” either from a PSC or a smaller catchment hospital that is tPA capable with neurologic consult more likely in the vast majority of presentations. (1) Current literature suggests that the number of acute strokes amenable to intra-arterial treatment will increase as the science advances, (19) and estimates remain that about 10% of acute strokes will be eligible for interventional treatment (8). However, with the availability of advanced, expedited neuroimaging and the realization of the devastating affects of an untreated ELVO, stroke system design must evolve and assure that each and every candidate for interventional treatment receives the benefit of immediate evaluation and consideration within the shortest amount of time minimizing irreversible brain infarction. (8)

As care for time sensitive illnesses such as acute myocardial infarction and major trauma have evolved so must the destination decisions for acute ischemic strokes.

Early recognition of ELVO and appropriate prehospital destination decision making to a Comprehensive Stroke Center within the treatment window accepted in each community will inevitably save time and improve morbidity and mortality in the patients we serve.

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