

Building a Bridge: EMS Relations as a Foundation for Rapid Stroke Care

By Katherine Kay Brown

During a stroke, 'time lost is brain lost' according to the American Stroke Association.¹ As focus in the industry shifts to more fully address stroke as a disease process, no longer does treatment revolve around rehabilitation and supportive care, which has been the mainstay for decades. With the development and refinement of computed tomography (CT) in the 1970 and 80s (leading to noticing the difference between ischemic and hemorrhagic stroke), and with FDA approval of tissue plasminogen activator (tPA) in 1996, changes in stroke care have been in the works for decades.

We now know that rapid diagnosis of stroke is crucial for immediate and definitive treatment. The narrow window of three hours between onset of symptoms and successful drug administration makes stroke treatment a true emergency, which is only in recent years been given the full import it deserves. As a result, hospitals on the forefront of this shifting paradigm have created stroke programs and/or teams to facilitate rapid patient assessment and diagnosis.²

The focus on rapidly treating stroke has intensified, with over 1,500 hospitals in the country becoming Primary Stroke certified to date. Stroke certification through the use of guidelines published by American Heart Association/American Stroke Association (AHA/ASA) recognizes hospitals that meet standards to support better outcomes for stroke care.³ A recent study showed that certified Primary Stroke Centers had a 0.3% lower mortality at one day, 1.3% lower mortality at seven days, 2.5% lower mortality at 30 days, and 3% lower mortality at one year resulting in 16,000-24,000 less deaths per year.⁴ Corazon believes these results to be highly significant, and indicative of how quicker, more streamlined stroke care can vastly improve outcomes and the overall patient experience before, during, and after stroke.

In order to achieve better patient outcomes, certified hospitals are streamlining their processes and reducing time-to-diagnosis by focusing on:

- Emergency department physician evaluation within 10 minutes of patient arrival, inclusive of validated tools that evaluate patient deficits (NIHSS Stroke Scale) as well as contraindications to tPA
- CT scan performed within 25 minutes of patient arrival

- CT scan interpreted within 45 minutes of patient arrival
- Decision for tPA within 60 minutes of patient arrival

The ability to acutely treat a stroke patient with the intent of resolving or minimizing their neurologic deficits with tPA hinges on the 'last known well' time being less than three hours. Indeed, EMS providers play a pivotal role in initial patient triage and entry into the healthcare system as most strokes occur in the home with EMS providing the first medical contact for more than half of all patients.⁵ Corazon recommends building strong relationships with EMS providers as an initial step in establishing processes for this initial contact with stroke patients (or those with suspected stroke). Stroke teams can be mobilized from the field with notification from EMS, with triage poised and ready for patient arrival in the ED. From there, the time to treatment can be shortened, thereby improving results.

Primary stroke certified hospitals meeting and exceeding the above timestamps have positively impacted stroke patients eligible for tPA administration who have entered their center. However, they are missing the majority of patients – the 50-75% who do not arrive at the hospital within the ideal three-hour treatment window.⁵ Studies have found that the biggest delay between the onset of symptoms and emergency treatment is the time it takes for a patient to recognize that they are experiencing a stroke and decide to seek medical care. Patient education and outreach can work to eliminate these delays. Helping the community recognize the signs and symptoms of stroke, and also understand the correct course of action when stroke is suspected, can decrease these percentages.

Unfortunately, delays in treatment are also the result of poor recognition of signs of stroke by emergency dispatchers and / or a misdiagnosis of stroke by EMS providers.⁵ In order to reach more stroke patients in a timely manner, proactive hospitals have integrated EMS providers into the development of their stroke program as mentioned above. EMS providers initiating a 'Stroke Alert' prior to arrival at the hospital enables the Stroke Alert Team to mobilize and prepare for the patient. Studies at organizations with pre-arrival stroke notification have reduced their door-to-CT times by up to 26% with resultant door-to-tPA median times of 40 min.⁶

In order to pre-notify hospitals of stroke patients, EMS providers must ascertain 'last known well' or 'symptom

onset times'. They are in a unique position of having family, friends, or bystanders immediately available for questioning regarding historic details, pattern of events, and even the patient's baseline neurologic function. They must also accurately identify a stroke versus common stroke-mimic pathologies such as hypoglycemia, alcohol intoxication/drug overdose, seizures, or metabolic disorders. A validated stroke screening tool can be used in less than one minute with studies demonstrating paramedic sensitivity for identifying stroke patients at 86-97% as compared to 61-66% without stroke assessment training.⁷

In order to facilitate rapid communication and understanding of patient status, the same screening tool should be used by both EMS and the hospital. Further, Corazon recommends that the verbal report to the hospital always include the stroke scale assessment. The most commonly used include the Cincinnati Prehospital Stroke Scale (adapted from the NIHSS scale), the Los Angeles Prehospital Stroke Screen, and the Miami Emergency Neurological Deficit Scale (MENDS). Some stroke programs are asking EMS providers to quickly assess for possible fibrinolytic therapy exclusion criteria through discussions with the patient and if they are unable, the family at the home. A sample report sheet incorporating these assessments can expedite the EMS – hospital handoff (Figure 1). This reduces the time spent attempting to ascertain information from a frightened and often neurologically-compromised patient.⁸

EMS Stroke Assessment	Patient Name _____
	DOB _____
Last Known Well (LKW) Time: _____	
Witness to LKW / Ph # _____	
HR/Rhythm _____	BP _____ Gluc _____ Seizure at stroke onset? _____
Pt on Anticoagulant? <input type="checkbox"/> Coumadin <input type="checkbox"/> Eliquis <input type="checkbox"/> Pradaxa <input type="checkbox"/> Xarelto <input type="checkbox"/> Other	
<p><i>Choose one of the following for integration into report sheet.</i> <i>Fill out checklist – verbally share during pre-arrival report to hospital</i></p> <p>Cincinnati Stroke Scale Los Angeles Prehospital Stroke Screen Miami Emergency Neurological Deficit Scale</p>	
<p>Fibrinolytic Therapy Exclusion Checklist for Ischemic Stroke <i>Verbally share during pre-arrival report to hospital</i></p> <p>POSSIBLE INCLUSION CRITERIA</p> <p><input type="checkbox"/> 18 years of age or older</p> <p><input type="checkbox"/> S/S of stroke with neurologic deficit (abnormal Stroke Scale score (as above))</p> <p><input type="checkbox"/> Patient can be transported to a Stroke Center to receive tPA within 3-4.5 hours</p> <p>POSSIBLE EXCLUSION CRITERIA</p> <p><input type="checkbox"/> Active internal bleeding: GI or urinary bleeding within last 21 days, or known bleeding risk</p> <p><input type="checkbox"/> Known bleeding disorder</p> <p><input type="checkbox"/> Within 14 days of major surgery or serious trauma</p> <p><input type="checkbox"/> Within 3 months of stroke, serious head trauma, or intracranial surgery</p> <p><input type="checkbox"/> History of intracranial hemorrhage or brain cancer</p> <p><input type="checkbox"/> Observed seizure at stroke onset</p>	

Figure 1. A sample of a report sheet incorporating stroke assessments, which can expedite the EMS-to-hospital handoff.

As EMS providers are on-scene rapidly diagnosing the patient with a stroke and supporting the patient's ABCs (airway, breathing, and circulation), the clock is ticking with the goal of EMS scene time of < 15 minutes. Performing a serum blood glucose to rule-out the differential diagnosis of hyper or hypoglycemia is part of many ALS (advanced life support) protocols in situations of neurologic dysfunction. So as not to delay transport, EMS providers can place an IV line or two to facilitate potential tPA administration. Also when en route, EMS should obtain blood specimens that can immediately be taken to the lab for processing to rapidly rule-out bleeding disorders and other exclusions to tPA.⁸

State stroke legislation often includes directives for EMS providers to bypass the nearest hospital when transporting stroke patients if there is a designated stroke center nearby. If such a hospital is not readily available then a stroke capable hospital – one with a stroke team, care protocols, and treatment with IV tPA should be utilized, as many hospitals are in the process of being certified. The goal for this directed transfer is definitive stroke treatment on a 24/7 basis.³

Corazon believes that a successful partnership between a primary stroke center and EMS should consist of a multidisciplinary quality improvement committee to review stroke care quality indicators, evidence-based practices, and patient outcomes. Key EMS-related metrics that we advise our clients to include in QI processes are as follows:

- % of time a pre-hospital stroke screen was completed
- % of pre-arrival notifications
- % of stroke team activation prior to EMS arrival
- Patient last known well time - % documented
- % of patients with last known well time < 3 hours
- Door-to-tPA administration time (with and without EMS pre-arrival notification)
- On-scene time for all cases with symptom onset < 3 hours
- % of correct stroke diagnosis by EMS; % missed diagnosis by EMS
-

Aggregated quality information as well as feedback on individual patients transported by EMS will assist in enhancing the accuracy of a stroke diagnosis, increasing the number of patients eligible for tPA with < 3 hour last-known-well times, and reducing door-to-tPA administration time to < 60 minutes.

EMS must be aware that their initial response to a stroke call impacts patient outcomes, as with every 15-minute reduction of door-to-needle time, there is a 5% lower odds of in-hospital mortality.⁹ When first collaborating with an EMS provider, Corazon cautions to err on the side of stroke over-identification with the goal of over-triage of 30% in order to minimize missing patients and delaying their time-sensitive treatment. Over time and with consistent education and feedback to the EMS provider,

the accuracy of EMS-initiated stroke alert calls should improve. As part of the quality process, the stroke alert patients should be compared to their discharge diagnosis, as well as those patients with the discharge of stroke that were initially missed (under-triaged).³ Tracking this data and then using the information for QI can highlight successes, while also pinpointing the areas where process improvement, staff education, or other adjustments are needed.

Based on identified areas of improvement through the QI process as well as key clinical topics, the goal of hospital and EMS education should be to increase the number of patients treated for stroke as well maximize their quality of care. From stroke symptoms, differential diagnosis, and initial assessment to evidence-based treatment according to the AHA/ASA guidelines hospital staff, EMS dispatchers (who begin the stroke identification process) and paramedics can learn together. For every eight patients treated with tPA, one patient returns to living a normal life, what about the others that don't receive that chance? ¹⁰

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