

## Stroke Care: It's About Time!

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It's about time!

There is no better phrase that defines each and every step of the stroke chain of survival. The acronym *FAST* (*face, arm, speech, time*) has been ubiquitous for years in messaging to the lay public, thanks to the diligent promotion of the American Heart Association and American Stroke Association. Yet while time to stroke recognition is critical, of equal importance is the time to stroke quantification, time to the destination hospital, time to CT, time to IV tPA and time to mechanical thrombectomy (MT). The recognition that EMS is a key player in the chain of survival is critical to success. Not only does EMS set the dominoes in motion, but it can also help guarantee data loop closure from entry to postdischarge.

It's time to widen the lens to get a clearer picture of how quality stroke care unfolds. It's about time we begin to leverage the system to optimize stroke care locally, regionally and nationally. Simply said:

- It's about time to recognize the significant impact EMS has on the outcomes of stroke patients.
- It's about time EMS leadership joined forces with local neurointerventionalist physicians.
- It's about time EMS actively participated in tailoring the stroke response to local resource availability.
- It's about time time-dependent stroke processes were measured and transparently reported.
- It's about time EMS transport decisions for stroke patients hinged on outcome data.

## **The South Florida Dilemma**

Like most urban regions of the country, stroke care in South Florida operated in silos for decades. A typical story read like this: The patient or family member dialed 9-1-1; EMS responded and transported to a local hospital; the hospital treated the patient; the patient was discharged.

This wouldn't be a problem except that each of the steps has numerous variables to be considered. Is the EMS agency performing to a high standard? Is the hospital examining its processes and measuring its outcomes? Are patients achieving better outcomes at one hospital versus another? To complicate matters, follow-up on patients by EMS systems has typically occurred on an ad hoc basis and rarely led to constructive feedback for either party. Patients were sometimes held at primary stroke centers (PSCs) instead of being transferred to competitors with interventional capabilities, while some "comprehensive" stroke centers existed on paper yet cryptically performed at subpar levels. A system of care did not exist, and the data feedback loop was not driving quality in the region. Something had to be done.

## **The History of Stroke Care**

Between IV tPA's approval in 1995 and 2010, there was debate and only hesitant adoption of intravenous thrombolysis by many providers. This was in part driven by only modest evidence of IV tPA's impact for the most severe stroke patients. Starting in 2011 the Target: Stroke initiative helped bring publicity to process quality and move the stroke community toward higher percentages of patients treated—and in parallel toward shorter door-to-needle times.<sup>1</sup>

In 2012 the first stent retriever was introduced, and stroke experts quickly realized its potential. Without robust data, treatment was offered in a nonsystematic approach, and despite clear anecdotal evidence of efficacy, patients arriving in PSCs were transferred for intervention on a case-by-case basis.<sup>2</sup>

After two years of grassroots lobbying, in 2012 half of Broward County's EMS agencies started to quantify stroke severity using a prehospital tool to identify patients for bypass, in part to permit enrollment into randomized thrombectomy trials. Then in 2013 high-performing South Florida hospitals began posting their door-to-needle times for EMS agencies to review. As awareness and peer pressure increased, in just three years the mean door-to-needle time in Florida dropped from the high 70-minute range to the high 40s, as the system of care became increasingly better at, and passionate about, delivering IV tPA.

Since 2015, with the publication of six randomized trials documenting the dramatic superiority of mechanical thrombectomy as far as 24 hours out, the stroke system of care has needed to reinvent itself.<sup>3-7</sup> Over and over paramedics found themselves being called back to the ED to retransport the same stroke patient with obvious symptoms from a PSC to a CSC 10 minutes down the road for MT.

Following the example of ST-elevation MI and its ECG-based field pre-alert approach (which has cut door-to-balloon times from 90 minutes to less than 60), EMS medical directors and stroke interventionalists in South Florida collaborated in a newly formed coalition, the Broward EMS Stroke Coalition (BESC). The group broke through a seemingly impenetrable wall by routing patients with a high probability of an emergent large-vessel occlusion (ELVO) directly to a CSC.

As the local stroke champions shared data from their high-performing centers, effectively creating a new local performance benchmark, EMS medical directors began to request, supported by the Florida EMS quality assurance statute, stroke process and outcome data from the other facilities that weren't voluntarily disclosing their data. This process was cumbersome and inefficient at best, yet it set a standard that EMS was an active participant in the stroke chain of survival. While looking to enhance the overall system of care, BESC became the driving force between patients' entry into the system and ultimate outcome.

## **EMS Agency, Meet Your Neurointerventionalist**

Recognizing that the hospital side of the equation was of critical importance to the process, outstanding clinicians who understood the value of collaboration with EMS and other community partners made their presence felt by disrupting their hospitals' stroke processes and personally reaching out to each and every EMS agency. This face-to-face engagement was something the prehospital community had never experienced—for years the groups had functioned in silos.

Once the forces joined, there was a palpable difference in the system's quality of care, sense of community and sense that everyone mattered. The lesson learned was the critical importance of the EMS agency connection with the stroke neurointerventionalist—two parties who link at the beginning of the case and also at the end (during follow-up, feedback and survivor dinners).

By 2016 hospitals in Broward County had begun collecting stroke process data and sharing and benchmarking it through the AHA Get With The Guidelines–Stroke (GWTG-S) tool. Thanks to years of determination, data collection had become an accepted part of providing high-quality stroke care. What was missing was a mechanism to provide feedback to the hospitals and EMS agencies.

## **Supercharging Data Feedback**

Lightning struck again when EMS leaders in the region joined forces with the Florida Puerto Rico (FL-PR) Stroke Registry, a NIH-funded statewide quality improvement project led by Ralph Sacco, MD, to help identify and reduce disparities in stroke care.<sup>8</sup> In 2016 the tool was reconfigured to look at prehospital and hospital data points to find best practices with a focus on outcomes.

After a concerted effort, by January 2017 all hospitals receiving stroke patients in Broward and Palm Beach counties agreed to join the GWTG-S registry and the FL-PR registry to participate in a countywide benchmarking dashboard. The registries function in parallel to provide quarterly hospital data dashboards structured to improve outcomes. Currently almost every hospital in the tricounty region (also including Miami-Dade) is participating with the process, and now, for the first time, hospitals have agreed to provide 90-day outcome data on patients receiving stroke treatment with IV tPA and MT.

The collaboration between EMS leaders and hospital stroke champions has led to a dramatic reduction of key time intervals. While robust data is still being gathered for publication, we can now say that only a fraction of patients arrive to PSCs in Broward County via EMS. With that, the percentage of the ischemic stroke population offered mechanical thrombectomy has more than tripled in the Southeast Florida counties that have adopted bypass and instituted EMS prenotifications based on a severity scale (RACE in Broward and Palm Beach) to the interventional teams.

Currently the two busiest centers achieve door-to-groin medians of 40 minutes or less, showing that by improving the system of care, simplifying identification of candidates and dropping complex imaging protocols, dramatic improvement beyond even the current national IV thrombolysis average is possible. Analysis of pooled randomized thrombectomy trials has cast doubt as to whether IV tPA even provides additional benefit in patients with ELVO. Randomized trials are ongoing in Europe on the impact of bypass with longer transport distances and whether forgoing IV tPA treatment in favor of direct mechanical thrombectomy will lead to similar clinical outcomes.

If these trials show that IV tPA treatment in the “drip and ship” model does not confer clinical benefit and that the delays associated with transfer outweigh the longer transport times of bypass, then even communities with a lesser density of CSCs than our tricounty region, and thus longer transport times, will have to think about bypass directly to CSCs for patients with suspected ELVO.

We are confident that local benchmarking through our registry-generated dashboards will further reduce variability and improve care for all stroke patients. The Florida legislature has recognized the

importance of these quality improvement projects and approved legislation to create a statewide stroke registry.

It's about time for EMS to rise to the occasion and participate in every step of the stroke process. It's about time for collaboration to begin to bridge the gap between clinical silos. It's about time to guarantee that every stroke victim receives the optimal treatment possible in their region. It's about time that data collection be seamless and outcomes be used to drive process changes for entire systems.

We cannot improve what we don't measure. It's about time we get started.

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