Pace of Progress in Stroke Thrombolysis
Are Hospitals Running To Stand Still?

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Stroke is a time-sensitive medical emergency and a leading cause of disability in the United States. Therapies to halt and even reverse ischemic injury to the brain, such as intravenous tissue-type plasminogen activator (tPA), are available, but the systems to deliver them rapidly have not been optimized to ensure timely treatment of as many eligible patients as possible. Although 40,000 to 50,000 acute ischemic stroke patients per year receive tPA, benefits from the drug are not simply related to receiving it or not but rather are closely linked to time from onset to treatment. Delays to treatment lead to more disability because every additional 5 minutes is tantamount to the permanent loss of nearly 10 million brain cells. National guidelines and quality measures have, therefore, emphasized speed of stroke thrombolysis, focusing on the time between patient arrival to the hospital and tPA administration, also known as door-to-needle (DTN) time. Alarming recommendations that hospitals evaluate acute ischemic stroke patients and administer tPA within 60 minutes of a patient’s arrival to the emergency department have existed since the original National Institutes of Neurological Disorders and Stroke tPA trial. Despite this, as the first decade of the new millennium closed, US hospitals were not meeting this goal in a majority of patients.

In response to lagging performance nationwide, the first phase of the American Stroke Association Target: Stroke campaign began in January 2010 and provided Get With The Guidelines-Stroke participating hospitals best practice strategies and supporting resources to reduce DTN time. The 10 best practice strategies were selected after a systematic review of published data and included strategies such as emergency medical services prenotification of hospitals, activating the stroke team with a single call, and rapid acquisition and interpretation of brain imaging. Over the evaluation period, the Target Stroke phase 1 initiative led to a 15-minute reduction in median DTN times and an increase from 26% to over 53% of all ischemic stroke patients receiving tPA within 60 minutes of arrival. This study established that nationwide performance improvement is feasible, albeit taking nearly 3 years to show effectiveness, and has led to global initiatives to tackle the same problems worldwide.

In this issue of Circulation: Cardiovascular Quality and Outcomes, Xian et al provide an update on the impact of the second phase of Target: Stroke which was launched in April 2014. Phase 2 set a new goal of administering tPA to eligible patients within 45 minutes of arrival and included an additional best practice strategy, moving patients directly to computed tomography (CT) from the ambulance or triage, along with other hospital practices that could potentially reduce DTN time. In this analysis of hospital-level implementation of best practices, the authors identified 16 effective DTN time-reducing strategies. If all 16 were implemented, a 20-minute reduction of DTN time could be achieved. Although high rates of implementation of many best practice strategies were reported, there were several notable opportunities for additional improvement given their low frequency of utilization at participating hospitals: CT scanners located in the emergency department (median frequency 46%), direct to CT protocols (40%), routine tPA premixing protocols (29%), premixing of tPA (25%), and tPA initiation in the CT scanner (0%).

On the heels of these important findings, in this same issue, Kamal et al provide evidence that a novel, single-center quality improvement project, HASTE (Hurry Acute Stroke Treatment and Evaluation), that focused on these less frequently adopted yet potentially more radical redesigns, can lower median DTN times by almost a third from 53 minutes in phase 1 to 35 minutes in phase 3. Two strategies, transporting patients directly from emergency medical services to the CT scanner and premixing and administering tPA in the CT scanner after study completion, had the largest independent effects (30% and 32%, respectively) on reducing DTN times.

Because the highest impact strategies in HASTE are among the least implemented best practices in Target Stroke phase 2, these studies taken together with other international prototypes of DTN time optimization suggest that achieving these impressive levels of DTN performance in the United States will require adoption and implementation of these more challenging process redesigns across many more hospitals. In Helsinki, the implementation of 12 best practice measures at a single center reduced median DTN time to 20 minutes. Subsequently, 3 best practices from Helsinki (emergency medical services prenotification, direct to CT, and tPA treatment in the CT scanner) were successfully implemented at a single center in Melbourne, with a reduction in median DTN time to 25 minutes. Besides protocol and sometimes structural redesign, practices such as the Helsinki model of acute stroke care require participation and careful coordination throughout

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discussions of the American Heart Association/American Stroke Association Stroke Council, Clinical Cardiology Forum, Cardiologists, Cardiologists' Association, and the American Heart Association. The process included an expert panel to develop the guidelines. The guidelines were based on systematic reviews of the literature, expert opinion, and consensus-building processes. The guidelines were then reviewed and approved by the American Heart Association/American Stroke Association Stroke Council, Clinical Cardiology Forum, and the American Heart Association.

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