

STROKE*45
MEMORIAL MEDICAL CENTER

Publication Year: 2013

Summary:

Rapid diagnostic protocol speeds life-saving emergency intervention for acute stroke patients

Hospital: Memorial Medical Center

Location: Springfield, IL

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Category:

- C: Clinician Initial Evaluation & Throughput

Key Words:

- Communication
- Consults
- Continuity of Care
- Information Systems
- Lean Six Sigma
- Patient Satisfaction
- Stroke

Hospital Metrics:

- Annual ED Volume: 70,000
- Hospital Beds: 500
- Ownership: Community Based, Not-For-Profit
- Trauma Level: 1
- Teaching Status: Yes

Tools Provided:

- Door-to-Diagnostic Test Completion Timeline
- Intervention Results: Charts 1-4

Clinical Areas Affected:

- Ancillary Departments
- Emergency Department
- Triage

Staff Involved:

- Administrators
- Ancillary Departments
- Clerks
- Communications
- Consult Services
- ED Staff
- Nurses
- Pharmacists
- Physicians

Innovation

STROKE*45 addressed an inefficient process related to diagnosing and treating acute stroke patients in the Emergency Department (ED).

Our average door to diagnostic-test-completion time and average door-to-tpa-administration time was well over benchmark, our patients were not receiving care as quickly or as consistently as we expected. As a Joint Commission Accredited Primary Stroke Center with the vision of being a national leader for excellence in patient care, our goal was to streamline, standardize and expedite the existing stroke diagnosis process as a means to provide faster treatment to acute stroke patients. STROKE*45 provides a systematic diagnostic process that promotes effective and efficient care to all stroke patients.

A complete redesign of the ED's stroke diagnostic process was required including:

- changing how staff and physicians are notified of and react to a stroke patient's arrival to the ED;
- how neurology and radiology physicians are consulted;
- which diagnostic tests are really required; and
- the optimal sequence and time frame that these tests must be completed.

Using Lean Six Sigma methodology, STROKE*45 was designed and implemented and has resulted in a systematic process that complies with treatment milestones based on evidence-based practice, which reliably provides better care to our patients.

The use of Lean Six Sigma methodology and the DMADV (define, measure, analyze, design, verify) framework led to the creation and design of the STROKE*45 innovation. The team was able to define the existing problem, analyze the process and outcome measures to identify the root cause of the problem, design the new, innovative STROKE*45 process and verify its effectiveness. Despite certification as a Primary Stroke Center, we had not addressed this problem in the past; however, it became clear we had room for improvement in order to be consistent with our vision to obtain best practice performance.

Innovation Implementation

Through implementing STROKE*45, we created a timeline for providers and staff to follow that outlines specific actions and milestones that must be achieved in the patient's diagnostic experience ([See Door-to-Diagnostic Test Completion Timeline](#)). Once launched, STROKE*45 protocol creates an almost "NASCAR pit-crew" like feel among ED, lab and imaging physicians and staff who, as a result of the STROKE*45 process, now have a sense of urgency to move the patient through the diagnostic process in an expedited manner. The process begins with the patient being triaged, flagged as a possible STROKE*45 patient, assigned a bed and seen by a provider within 5 minutes of their arrival to the ED. The ED physician then activates the STROKE*45 order set and protocol by which the ED Unit Clerk sends out a Gang Page which alerts the on-call Stroke Attending and resident, Radiologists, CT, Lab, Pharmacy, Interventional Radiology, Patient Placement and inpatient ICU of the potential stroke patient that may need intervention and/or ICU bed placement. This notification occurs within 10 minutes of the patient's arrival.

Next, an ECG is completed, blood is drawn and sent to the lab and the ED physician evaluates the patient with the National Institute of Health Stroke Scale to determine the severity of the stroke which impacts which imaging tests the patient will undergo. These steps, as well as transporting the patient to the CT, occur within 20 minutes of the patient's arrival. The basic head CT is completed within 25 minutes of arrival and then any secondary imaging studies, as ordered by the emergency physician, are completed. Front loading all of these steps into the first 25 minutes of the patient's stay in the ED allows all results to be available to the physicians within 45 minutes of the patient's arrival which allows physicians and staff to execute treatment interventions faster.

Another process change resulting from this innovation includes a redesign of the ED Stroke Order Set by Emergency and Neurology physicians as a means to reduce the amount of unnecessary tests being performed on acute stroke patients as well as to promote ordering tests that take less time to turnaround. For example, the complete metabolic panel was switched to a basic metabolic panel in the order set which, on average, is processed 7 minutes faster yet still provides the physicians with the information required to make diagnostic and treatment decisions. Also, ED staff send a bright green piece of paper that reads "45" to the lab with the patient's blood specimens so staff checking in specimens in the lab, who are expecting the patient's blood as a result of notification through the Gang Page, can quickly identify the specimens as STROKE*45 and send them through an expedited processing and analysis process in the lab so results are available faster.

Timeline

Overall, preparation, design and implementation of STROKE*45 took approximately 6 months. Work began on this innovation in February 2012 when in-depth analysis of our data began. The Lean Six Sigma DMADV methodology was deployed and weekly team meetings began in March which culminated in a 5 hour Rapid Action Planning session at the end of April wherein the new innovation was designed. Education, process and policy changes, order set updates, trial runs and other necessary implementation steps were taken throughout May and June and the STROKE*45 process went live and saw its first patient on July 9, 2012. The most time consuming part of developing and implementing STROKE*45 involved the team meetings through which we identified our shortcomings and designed the innovation. Actual implementation took the least amount of time and when we replicated STROKE*45 at our health systems' two critical access hospitals, we were able to do so in about one month since the innovation already existed and the only things that needed to be completed were education to staff and physicians and swapping out order sets.

Results

Since STROKE*45 went live in July 2012, our Emergency Department has executed the STROKE*45 process on 107 acute stroke patients and has seen a 65% improvement in door-to-diagnostic-test-result time (**Intervention Results: Chart 1**). What used to take, on average, 114 minutes is now done within 40. Additional improvements include a 51% improvement in door-to-CT-completion time (45 minutes at baseline to 22 minutes post-improvement) (**Intervention Results: Chart 2**), a 63% improvement in door-to-lab-test-completion time (102 minutes to 39 minutes) (**Intervention Results: Chart 3**) and an improvement in ED Stroke Order Set utilization from 49% to 90%.

Finally, for eligible patients, STROKE*45 has improved door-to-tPA by 40% with eligible patients now receiving tPA, on average, within 74 minutes of arrival compared to our pre-innovation process that averaged 122 minutes (**Intervention Results: Chart 4**).

Cost/Benefit Analysis

The primary cost associated with implementing this innovation relates to the time spent by the project team in team meetings. Given that this innovation involved a change in practice and did not require technological improvements, hiring additional employees or purchasing new equipment or supplies, the benefit of the innovation greatly outweighed the costs and is further proof that using Lean Six Sigma in the Emergency Department is an effective tool that any hospital can utilize to improve care at little or no additional cost. There were some minor costs incurred related to printing for the bright green lab "45" alert papers and purchasing pagers for the STROKE*45 notification for the few staff that didn't already have access to them but these costs were insignificant compared to the clinical gains of STROKE*45. STROKE*45 does not contribute to cost savings or additional revenue; however, for every 15 minutes saved in door-to-tPA administration time, there is an associated 5% reduction in mortality which is a far greater savings than any financial savings.

Advice and Lessons Learned

1. The power of Lean Six Sigma DMADV model in producing significant and lasting results in a complex and high stress environment like the Emergency Department.
2. The critical need to engage with strong physician champions on clinical improvement projects.

3. The importance of control plans to sustain improvements.
4. The importance of ongoing communication and data transparency via weekly results to key stakeholders.
5. The utility of running practice simulations of new processes with mock patients as a means to work out trouble spots before real patients experience the process.
6. The importance of expanding learning and process improvements to other appropriate organizations/departments across the health system once the innovation has been proven effective.
7. Recognition that Lean Six Sigma is more about creating lasting culture change than about the use of statistical tools and techniques, and such change can only be achieved via strong, visible senior leadership support, clinical integration with medical staff and dedication to a multi-year organizational change process.

The primary resources involved in starting up this innovation were time and commitment from the STROKE*45 project team. In rolling out this innovation to other hospitals, two critical access hospitals in our case, the resources required are even less considering the bulk of time and resources expended in implementing this innovation involved designing the process and identifying process defects. Since the innovation now exists and is proven effective, implementing this innovation in another ED would primarily involve education for staff and physicians.

Sustainability

To sustain these results, a detailed control plan was developed during the DMADV process. The hospital's Stroke Coordinator reviews each STROKE*45 case within a week of the patient's visit and then highlights results in a weekly report that is seen by all Emergency physicians and staff as well as by Stroke physicians and lab and imaging leadership. If at any time a patient's experience is less than our expectation, department and physician leaders follow-up with the physicians and staff involved in the patient's care in order to help improve their practice.

Tools to Download

- [Door-to-Diagnostic Test Completion Timeline](#)
- [Intervention Results: Charts 1-4](#)

DOOR-TO-DIAGNOSTIC TEST COMPLETION

TIMELINE



IN MINUTES

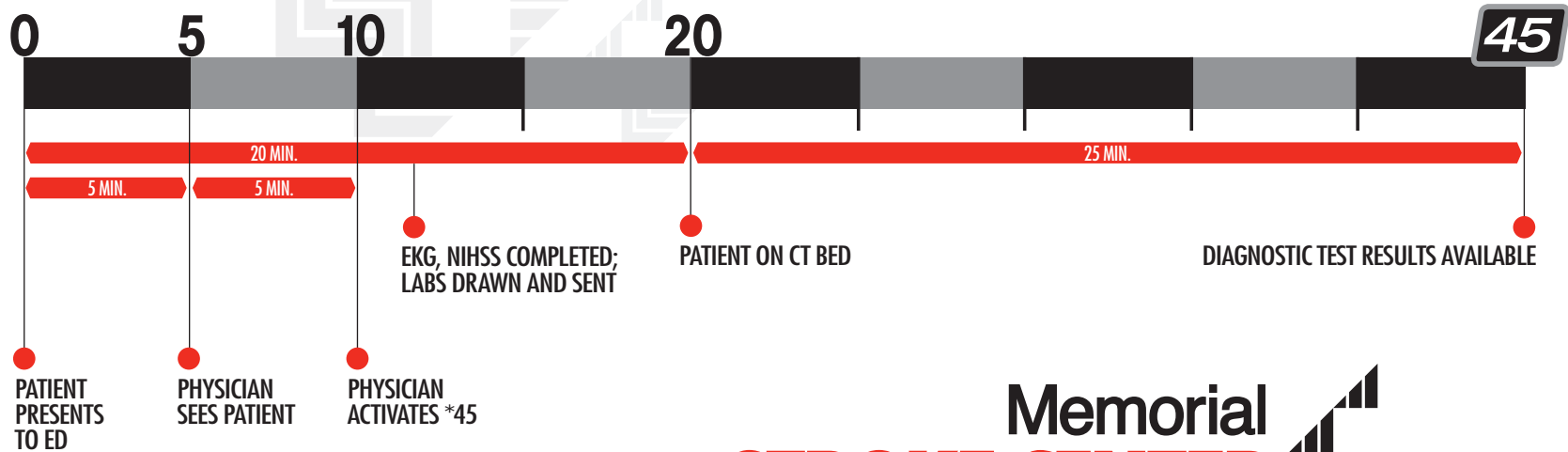


CHART 1: Door to Last Result Available All Cases

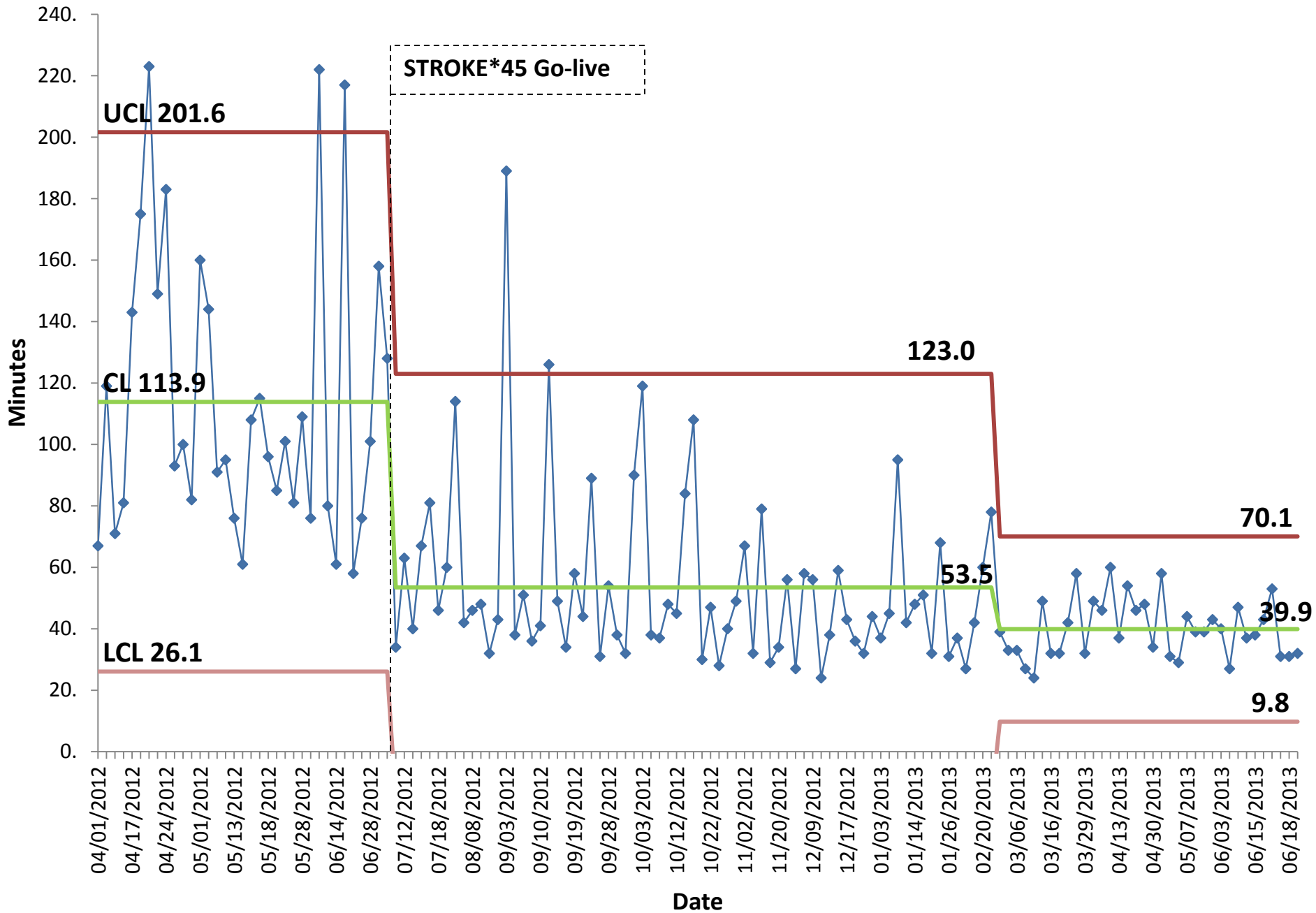


CHART 2: Door to CT Complete

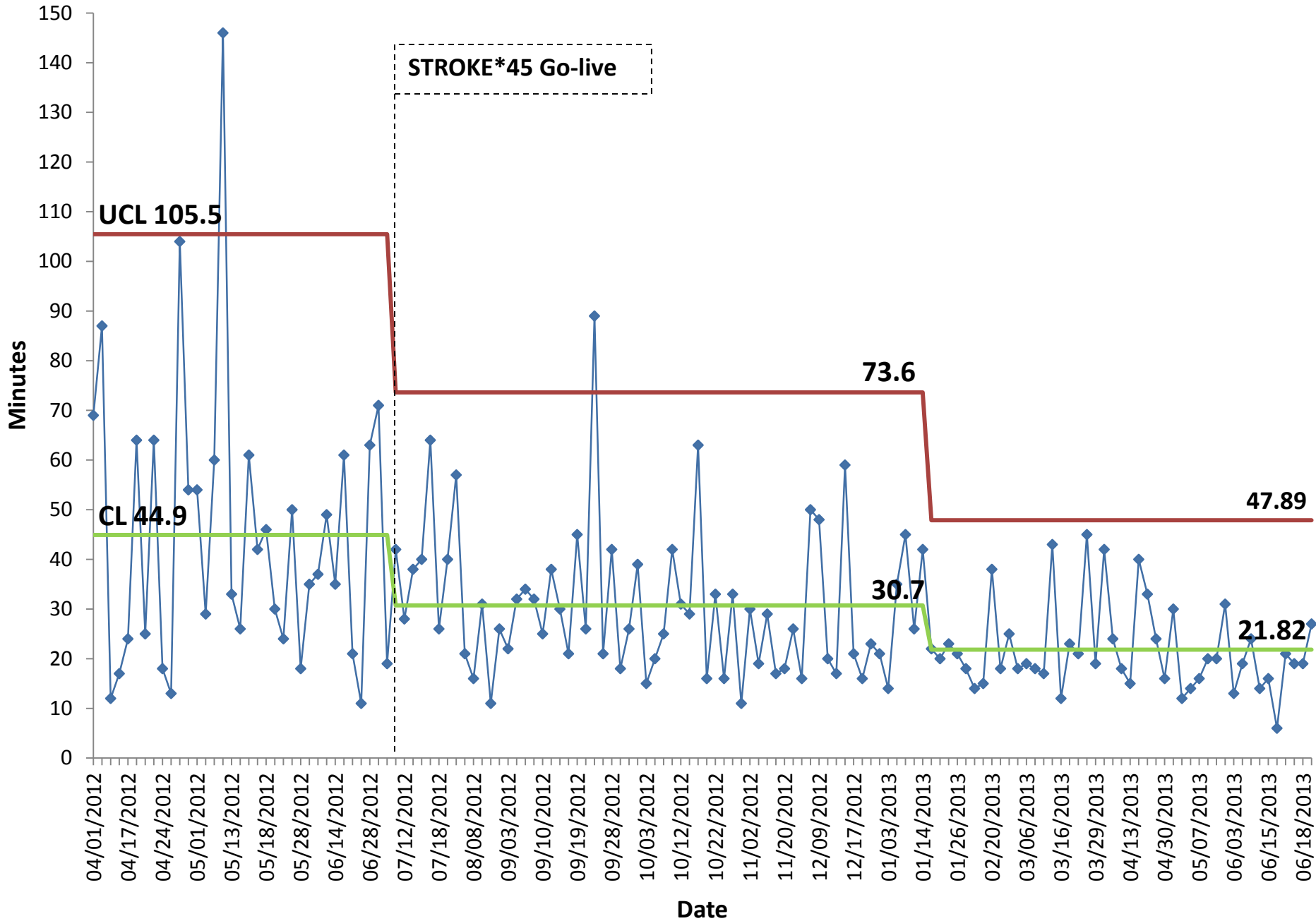


CHART 3: Door to Lab Test Completion Time

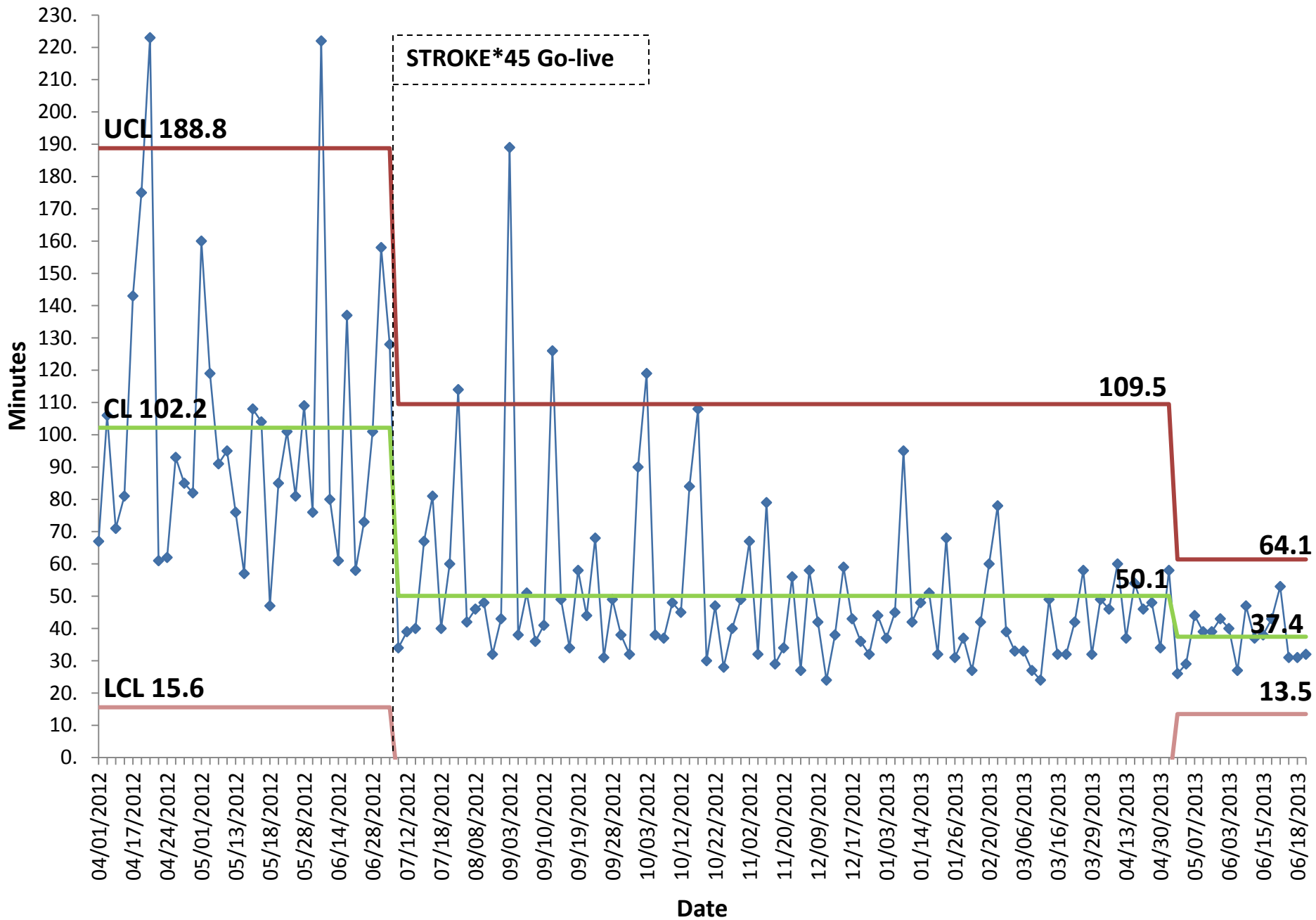


CHART 4: Door to tPA Administration

