

Beat the Clock: Using a Visual Tool for Process Improvement in Ischemic Stroke Care Door to Needle Times

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Abstract

Introduction: Time is of the essence when caring for stroke patients. Early recognition and assessment can be challenging. The community hospital's Primary Stroke Center door to needle (DTN) time was an average of 81.5 minutes. There were several reasons for this delay; such as inability to recognize stroke symptoms and get the team activated, as well as prioritizing timely arrival in CT scan. Through the use of a visual software tool to facilitate team coordination and time tracking, it was possible to improve stroke care efficiency and significantly decrease DTN times.

Methods: The hospital implemented a process improvement with the use of *Trauma Timer*^{TM1} - a web-based computer program with a large digital clock and animated, color-coded stopwatch. *Trauma Timer*TM was used to coordinate and time the team's actions during each phase of evaluation and treatment. The results were recorded for later review to ascertain precisely which phases were responsible for the delay. The team was able to review the results in a timely manner to improve performance as well as outcomes.

Results: The average DTN time decreased from 81.5 minutes to 38.2 minutes within the first 7 months and was sustained with only minor variation for the duration of the pilot.

Outcome: Using *Trauma Timer*TM improved efficiency and care of stroke patients as evidenced by an increased tPA administration rate and reduced DTN times by 43.3 minutes.

¹ Information is available at www.traumatimer.com

Introduction

Ischemic stroke remains one of the leading causes of morbidity and mortality in the United States. It is the fifth leading cause of death and the leading cause of severe life-long disability, (AHA/ASA Guidelines, 2018). Ischemic stroke is a time-critical emergency in which expert diagnosis and rapid treatment is necessary to achieve positive outcomes, (Ahmed, L.C., 2009). The American Heart Association's Get With The Guidelines-Stroke (GWTG-Stroke) program has been developed to measure and improve the quality of care and outcome for patients presenting with symptoms consistent with stroke. Ischemic stroke is time critical. Recombinant tissue plasminogen activator (rtPA) must be administered within 4.5 hours of symptom onset. Hospitals have been challenged to improve “door to needle times” for administration of rtPA. (Heidenreich, P., et al., 2017). Realizing that administration of this medication is only effective in improving outcomes if certain elements are met, the situation becomes even more challenging in busy Emergency Departments. The important elements in this timeline, which must be completed within 60 minutes of arrival at the hospital according to the GWTG-Stroke guidelines, include:

- early recognition of patients arriving with stroke symptoms
- activation of the team of experts
- completion and interpretation of non-contrast head computerized tomography (CT) scan
- physician ordering the weight-based rtPA
- preparation of the medication either by pharmacy or nursing
- administration of the intravenous medication

Background

Hospitals across the US have developed protocols to achieve the metrics of “door to needle time DTN) within one hour” (Smith et al., 2015). The ED at a small community hospital in Northwest New Jersey was not unlike these other hospitals. The hospital’s

ED consisted of 15 bays with annual visits of approximately 34,000 patients. At the onset of the program the ED had an average DTN of 81.5 minutes with a wide range of actual times and several missed opportunities due to these delays. It became abundantly clear that a new approach was needed. There was also a reluctance on the part of the physicians when considering the administration of rtPA due to potential feared side effects. The stroke committee began looking at each element of the time critical segments to isolate where the barriers occurred. The analysis of the data showed a wide range of obstacles including failure of EMS to alert the hospital to a potential stroke patient, the inability of nursing staff to prioritize, delays in ordering CT, delays in facilitating patients to CT scan, and delays in obtaining CT results. To isolate the ED's obstacles and make improvements a solution was needed. Hospital-wide education was required to improve the staff's understanding; as well as a visual tool.

Process Change Tool Implementation

Trauma Timer™ is a web-based computer program with a large digital clock and animated, color coded stopwatch that makes it easy to read even from a distance. The clock face displays the phases of the protocol as sequential time slices and shows the time spent on each phase as the minute hand progresses. Checklists are displayed below the stopwatch to keep the entire team focused on the timely care of this individual stroke patient. The display can be viewed on multiple devices. Using *Trauma Timer™* as a central point of reference eliminates any confusion as to the exact status of the protocol among the medical professionals involved. At the conclusion of the protocol the results are displayed on the screen, saved on the secure database, and can be printed as well. Using the secure web portal, the data were then reviewed to ascertain exactly which segment was responsible for the delay. The team was then able to review the results in a timely manner to improve performance as well as outcomes.

The new program (process change) was implemented in February 2015 and was utilized through February 2018. It was evident from the data that the areas for improvement were in getting the CT ordered and getting the patient to CT scan. Once the patient had the CT done, results were obtained quickly. With this finding, the stroke

team concentrated its efforts on hospital wide education for the staff including both nurses and physicians. With the focus on education and an increased emphasis on care of each individual stroke patient, the times for arrival to MD exam decreased significantly. The use of the *Trauma Timer*[™] created excitement within the department, so the entire team knew there was a potential tPA candidate in the department. Physicians were in friendly competition with each other to get the best DTN time. Review of baseline data indicated that prior to the use of *Trauma Timer*[™] it was unclear as to why the arrival to CT result was so long. Post implementation data demonstrated the delays were with early recognition. The major causes for the delays were in recognition by nursing and facilitating the physician to the bedside. Reviewing each stroke patient in real time assisted the staff to see exactly where the delays occurred. The process improvement involved a multi department approach with collaboration amongst the different departments. The entire culture of the hospital changed. Each obstacle could be identified at a glance and real time adjustments in process were made. It was the process of this hospital to have pharmacy at the bedside to mix the tPA. With the added feature of viewing the display on multiple devices, a tracking display was installed in the pharmacy, so pharmacists were able to view in real-time where the team was in the process for timely medication mixing and administration.

Results

Using the *Trauma Timer*[™] the hospital was able to obtain the best DTN time of 16.3 minutes and an average DTN time of 38.2 minutes, representing an improvement of 43.3 minutes. During the beginning stages of implementation features were added to the program such as the ability to see the display on more than one workstation. An additional feature was the ability to start the clock in the patient's room and push the display to the larger main screen in the department. The addition of when the patient was "last known well" (LKW) is captured by the timer and it counts the minutes elapsed to support the evidence-based practice of administering within 4.5 hours, (Schwamm, L. et al., 2009) as well as the ability to have more than one session in operation at a time. During the later sessions, the program was altered to accommodate new

recommendations of DTN within 45 minutes, and the hospital changed its protocols to accommodate this GWTG-stroke recommendation. The hospital's tPA administration rate increased from 15% to 21% with an average DTN time of 38 minutes. This hospital was able to maintain DTN times of <45 minutes 75% of the time as well as DTN times of <60 minutes 90% of the time.

Conclusions

The improvement in DTN times and efficiency in the care of stroke patients is possible with the use of *Trauma Timer*[™] which serves as a visual tool to keep the entire team focused on the task at hand, a means to change the culture of the department and a way to measure results and improve performance. This hospital was able to out-perform other Primary Stroke Centers in the surrounding area as well as many Comprehensive Stroke Centers. The program allows for customization according to hospital specific protocols and it has implications for use with other conditions that are time sensitive; such as STEMI and Sepsis.

References

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