

Reduction in IV t-PA Door to Needle Times Using an Acute Stroke Triage Pathway

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ABSTRACT: Objective: To determine the effectiveness of an Acute Stroke Triage Pathway in reducing door to needle times in acute stroke treatment with IV t-PA. **Background:** A previous study at our tertiary referral centre, examining IV t-PA door to needle times, was completed in 2000. The median door to needle time was beyond the recommended National Institute for Neurological Disorders and Stroke (NINDS) standard of 60 minutes. In November 2001, an Acute Stroke Triage Pathway was introduced in the emergency room (ER) to address this issue. The goal of this pathway was to rapidly identify patients eligible for treatment for IV t-PA, so that CT scans and lab studies could be arranged immediately upon ER arrival. Our hypothesis was that the Triage Pathway would shorten door to CT and door to needle times. **Design/Methods:** Using retrospective data, pre (n=87) and post (n=47) triage pathway times were compared. The door to CT time was reduced by 11 minutes (p=0.015) and door to needle time was reduced by 18 minutes (p=0.0036) in a subgroup of patients that presented directly to our hospital. **Conclusions:** These results indicate that the Acute Stroke Triage Pathway is effective in reducing Door to CT and Door to Needle Times in patients presenting directly to our ER. However, a majority of treatment times were still beyond NINDS recommendations. Stroke Centers require periodic review of their efficiency to ensure that target times are being obtained and may benefit from the use of an Acute Stroke Triage Pathway.

RÉSUMÉ: Réduction du délai entre l'arrivée du patient et l'administration IV de t-PA suite à l'implantation d'une voie de triage de l'accident vasculaire cérébral aigu. **Objectif:** Déterminer l'efficacité d'un système de triage de l'accident vasculaire cérébral aigu (AVC) pour diminuer le délai entre l'arrivée du patient et l'administration IV de t-PA. **Contexte:** Une étude antérieure effectuée dans notre centre de soins tertiaires pour évaluer le temps écoulé entre l'arrivée du patient et l'administration IV de t-PA a été complétée en 2000. Le temps médian entre l'arrivée et l'administration de t-PA était au-delà des 60 minutes recommandées par le National Institute of Neurological Disorders and Stroke (NINDS). En novembre 2001, une voie de triage de l'AVC a été implantée au service d'urgences pour corriger cette situation. Le but de cette voie était d'identifier rapidement les patients qui sont éligibles à ce traitement de telle sorte que la tomographie par ordinateur et les examens de laboratoire puissent être organisés dès l'arrivée au service d'urgences. Notre hypothèse était que la voie de triage réduirait le délai entre l'arrivée du patient et la tomographie par ordinateur et entre l'arrivée et l'administration de t-PA. **Plan/méthodes:** Il s'agit d'une étude rétrospective comparant le délai pré (n = 87) et post (n = 47) mise en vigueur de la voie de triage. Le temps écoulé de l'arrivée à la tomographie par ordinateur était diminué de 11 minutes (p = 0,015) et de l'arrivée à l'administration de t-PA était diminué de 18 minutes (p = 0,0036) chez un sous-groupe de patients qui se sont présentés directement à notre hôpital. **Conclusions:** Ces résultats indiquent que la voie de triage de l'AVC est efficace pour diminuer le temps écoulé entre l'arrivée et la tomographie par ordinateur et le temps écoulé entre l'arrivée et l'administration de t-PA chez les patients qui se présentent directement à notre service d'urgences. Cependant dans la majorité des cas le temps était encore au-delà des recommandations du NINDS. Les centres spécialisés en AVC doivent effectuer une révision périodique de leur efficacité pour s'assurer que les temps cibles sont atteints. Ces centres peuvent tirer profit de l'implantation d'une voie de triage de l'AVC.

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One major challenge facing acute stroke treatment with intravenous tissue plasminogen activator (IV t-PA) is the efficient triage of eligible patients in order to reduce door to needle times. A meta-analysis of all IV t-PA stroke trials reveals a time-dependent response to IV t-PA. Those treated earlier, especially within the first 90 minutes, have a greater likelihood of recovery than those treated later within the 3 hour window.¹ Further, a shorter arterial recanalization time is associated with an improved clinical outcome.²

A review at eight t-PA stroke centers demonstrated that patients presenting to community and academic institutions could be treated within 55 minutes once hyperacute stroke care

practices were put into place.³ A NINDS national symposium on the rapid identification and treatment of acute stroke recommended a door to CT target time of 25 minutes and a door

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to needle target time of 60 minutes.⁴ At our institution, the median IV t-PA door to needle time over a five-year period was 84 minutes and the median door to CT time was 67 minutes.⁵ These times were significantly greater than the diagnostic and treatment times recommended by NINDS. The major contributors to lengthened door to needle times included delays in emergency room (ER) stroke triage and scanning. It was hypothesized that an acute stroke triage pathway and earlier stroke pager activation would reduce door to needle times.

METHODS

All patients treated with IV t-PA at our hospital, pre and post pathway, were included. On November 1, 2001, an acute stroke triage pathway was implemented (Figure). Data was gathered retrospectively from patient charts in those treated before the pathway, and prospectively after implementation. Accurate ER arrival and treatment times were available in all patients. Emergency triage nurses were trained in the use of the pathway by the stroke nurses. Two groups of patients were treated at our hospital: those who presented directly to us and those who arrived at a peripheral hospital first and were then transferred. Outcome measures were mean door to needle and door to CT times for each patient group. Treatment times in patients pre and post implementation were compared using the t-test and then confirmed non-parametrically using the Mann-Whitney test.

RESULTS

A total of 134 patients were included in the study. There were a total of 87 patients in the pre-triage pathway group (control) who were treated between May 1, 1996 and October 31, 2001. The post-intervention group consisted of 47 patients treated between November 1, 2001 and November 2, 2002. There were 62 patients presenting direct to Vancouver General Hospital (VGH) ER in the pre-intervention group and 40 patients in the post-triage pathway group. The remaining patients were triaged at a local community hospital and then transferred to our hospital for treatment. The results are shown in the Table.

The mean door to needle time for all patients before the introduction of the acute stroke triage pathway was 86.2 minutes compared to 77.9 minutes after the intervention (p=0.21). The mean door to CT times in all patients decreased after implementation of the pathway, from 41.9 minutes to 33.6 minutes (p=0.093).

The greatest reduction in treatment and CT times was seen in patients who presented directly to our ER. In these patients, mean door to needle times decreased from 100.5 minutes to 82.9 minutes after the intervention (p=0.0036). Also, for patients arriving directly to our ER, mean door to CT times decreased from 47.7 minutes to 37.0 minutes after introduction of the pathway (p=0.015). For patients transferred from another institution for treatment with IV t-PA, mean door to needle times decreased from 55.0 minutes to 51.4 minutes after the pathway (p=0.81). For this same group, mean door to CT times decreased from 25.9 to 24.0 minutes (p=0.89).

In direct patients treated after the triage pathway was implemented (n=40), 17.5 % were treated within the NINDS recommended treatment time of 60 minutes compared to only 5% in the pre-intervention group (n=62).

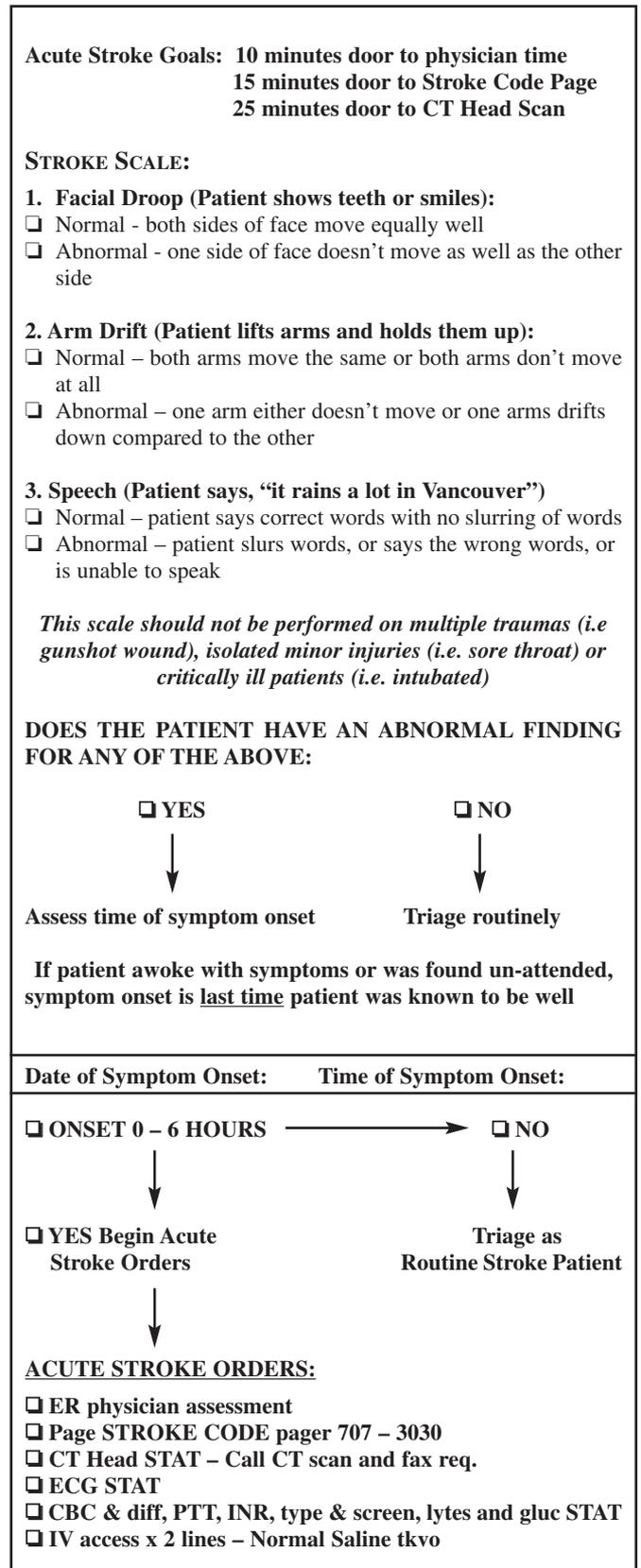


Figure: Vancouver General Hospital Acute Stroke Triage Pathway

Table: Mean Door to Needle and Door to CT Times (in minutes)

Mean Times (in minutes)	Pre-stroke Pathway	Post-stroke Pathway	p-value
Door- Needle (all)	86.2 (SD=40.1)	77.9 (SD=27.15)	0.21
Door- Needle (direct)	100.5 (SD=30.7)	82.9 (SD=25.7)	0.0036
Door- Needle (transfers)	55.0 (SD=41.7)	51.4 (SD=22.8)	0.81
Door-CT (all)	41.9 (SD=31.1)	33.6 (SD=15.9)	0.093
Door to CT (direct)	47.7 (SD=24.0)	37(SD=15.12)	0.015
Door-CT (transfers)	25.9 (SD=41.1)	24.0 (SD=15.8)	0.89

DISCUSSION

Since the clinical efficacy of IV t-PA treatment for acute stroke is shown to be time dependent, it is imperative that stroke centers identify ways in which to reduce door to needle times. Improving treatment times starts with public education. There are a considerable number of variables that can be controlled as soon as patients enter the medical system. One includes the rapid identification of patients as soon as possible as acute stroke treatment candidates by paramedics, triage personnel and emergency room physicians. As well, the timely procurement of CT scans and laboratory studies can reduce the door to needle time. These professionals must be trained to rapidly identify eligible patients so that the stroke service and other personnel (eg. CT scan) can be notified immediately.

The VGH acute stroke pathway is based on the Cincinnati prehospital stroke scale⁶ and is designed for use by triage personnel. It is intended to be a quick and sensitive method of identifying acute stroke patients using a simple algorithm. When a potential patient is screened, stroke team notification occurs immediately, an ER physician sees the patient, and CT scan is notified. The pathway is most beneficial in reducing door to needle times in eligible stroke patients presenting directly to our emergency room. The triage pathway also decreases door to CT times, especially in patients presenting directly to the stroke center. Overall, there was a trend towards improved treatment times in all patients. However, CT and door to needle times were not significantly improved in the patients transferred to VGH from a community hospital after introduction of the acute stroke triage pathway. This can be explained by the fact that the stroke team was notified by the referring hospital and were waiting in the VGH ER for patient arrival. This occurred both before and after introduction of the pathway, accounting for the lack of significant change in door to CT and door to needle times.

While IV t-PA treatment times were improved, a majority of patients presenting directly to our ER still had door to CT and

door to needle times beyond NINDS recommendations. Therefore, it is of paramount importance for stroke programs to monitor their efficiency and validate changes in patterns of practice. Jahnke et al⁷ recently showed that implementation of a stroke triage pathway improved treatment times. Thus, a triage pathway appears to be beneficial in improving efficiency. Other methods, including implementation of local triage pathways, emergency response personnel education, and ambulance to hospital diversion protocols are options to improve treatment times in transferred patients.

In summary, implementation of an acute stroke triage pathway reduces door to CT, door to needle and overall treatment times. However, stroke programs must continually evaluate and monitor their efficiency to ensure timely administration of IV t-PA.

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