

Older Stroke Patients with High Stroke Scores Have Delayed Door-To-Needle Times

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Introduction: The timely administration of intravenous (IV) tissue plasminogen activator (t-PA) to acute ischemic stroke patients from the period of symptom presentation to treatment, door-to-needle (DTN) time, is an important focus for quality improvement and best clinical practice. *Methods:* A retrospective review of our Get With The Guidelines database was performed for a 5-hospital telestroke network for the period between January 2010 and January 2015. All acute ischemic stroke patients who were triaged in the emergency departments connected to the telestroke network and received IV t-PA were included. Optimal DTN time was defined as less than 60 minutes. Logistic regression was performed with clinical variables associated with DTN time. Age and National Institutes of Health Stroke Scale (NIHSS) score were categorized based on clinically significant cutoffs. *Results:* Six-hundred and fifty-two patients (51% women, 46% White, 45% Hispanic, and 8% Black) were included in this study. The mean age was 70 years (range 29-98). Of the variables analyzed, only arrival mode, initial NIHSS score, and the interaction between age and initial NIHSS score were significant. DTN time more than or equal to 60 minutes was most common in patients aged more than 80 years with NIHSS score higher than 10. *Conclusions:* The cause of DTN time delay for older patients with higher NIHSS score is unclear but was not related to presenting blood pressure or arrival mode. Further study of this subgroup is important to reduce overall DTN times. **Key Words:** Acute ischemic stroke—stroke treatment—antithrombotic—tissue plasminogen activator.

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Introduction

Treatment with intravenous (IV) tissue plasminogen activator (t-PA) has unequivocally shown to improve outcomes in patients with acute ischemic stroke (AIS) as demonstrated by multiple randomized trials.¹ Currently, t-PA is indicated for treatment of AIS within 4.5 hours of symptom onset.² Several factors have been shown to mitigate the effect of IV t-PA including age, treatment delay, symptom severity, and certain comorbidities.^{3,4} Among these, the only potentially modifiable one is time to treatment. The efficacy of IV t-PA is strongly time dependent. Therefore, timely administration of IV t-PA by shortening the period from presentation to treatment, the so-called door-to-needle (DTN) time, is an important focus for quality improvement.^{5,6}

The Get With The Guidelines (GWTG)-Stroke is an in-hospital program for improving stroke care by promoting consistent adherence to the latest scientific treatment guidelines.⁷ Since its initiation in 2003, up to 1656 hospitals have entered more than 2 million patient records into the GWTG-Stroke database. This has resulted in numerous published studies demonstrating the program's success in achieving measurable patient outcome and improvements.⁷ In this study, we sought to identify various modifiable factors that could potentially improve DTN time for IV t-PA administration in AIS patients.

Methods

We performed a retrospective review of patient data from the GWTG-Stroke database of a 5-hospital telestroke network between January 2010 and January 2015 (IRB protocol #HSC20160088N). Only AIS patients that were triaged in the emergency departments of the 5 hospitals and treated with IV t-PA within 4.5 hours of symptom onset were included in this study. A neurologist evaluated all patients remotely and made the decision to treat with IV t-PA. Patients were divided into 2 groups based on DTN times of less than 60 and more than or equal to 60 minutes, respectively. Predefined variables presumed to influence DTN times included age, sex, race/ethnicity, initial National Institutes of Health Stroke Scale (NIHSS) score, presenting systolic blood pressure (SBP), arrival mode, last known well (LKW) time, and time of t-PA administration. Mean age and NIHSS scores were examined as continuous variables and categorized into tertiles based on clinically significant cutoffs. Age was categorized as less than 65, 65-80, and more than 80 years; initial NIHSS score was less than 5, 5-10, and higher than 10. Arrival mode was dichotomized as ambulance transport from home/scene and private transport/taxi/other. Time of t-PA administration was dichotomized as 07:00- 18:59 and 19:00-06:59 hours.

Statistical Analyses

Variables were compared between groups using chi-square test, Mann-Whitney *U*-test, and Fisher's exact test. Logistic regression analysis was performed with predefined variables as well as the interaction of age and initial NIHSS score. A subset analysis of variables for patients aged more than 80 years was performed with initial NIHSS score dichotomized as less than 10 and higher than or equal to 10. Additionally, reasons for delay in this subset were categorized. Significance was set at $P < .05$. Analyses were performed using R software (GNU Affero General Public License, V. 3) (R Foundation for Statistical Computing, Vienna, Austria).

Results

Patient Demographics

Patient group of 652 (51.1% women, 46.5% White, 45.9% Hispanic, and 8% Black) was included for analyses with a mean age of 70 ± 14 (Table 1). Among this population, 328 received IV t-PA within less than 60 minutes and 324 received it more than or equal to 60 minutes after arrival. There was a trend for older age and more women in the delayed group ($P = .06$). There were no race/ethnic differences, and the number of patients distributed between groups was comparable.

Clinical Variables and Arrival Mode

Group comparison demonstrated no significant differences for NIHSS score, SBP, and time of t-PA administration (Table 1). The mode of arrival by emergency medical services (EMS) was more likely in the no delay group ($P = .03$).

Logistic Analysis Model

Logistical regression analysis revealed significant factors associated with DTN time to be initial NIHSS score, arrival mode, and the interaction between age and initial NIHSS score (Table 2). This interaction revealed a greater probability of delayed IV t-PA administration more than or equal to 60 minutes for patients aged more than 80 years with high NIHSS score. On the contrary, patients aged less than 65 years with high NIHSS score had a greater probability of early IV t-PA administration less than 60 minutes (Fig 1).

Over Eighty Years of Age

Subset analyses of variables for patients aged more than 80 years revealed significantly lower presenting SBP and greater probability of EMS arrival mode in the group NIHSS score higher or equal to 10 (Table 3). In the subgroup aged more than 80 years with IV t-PA more than or equal to 60 minutes, reasons for treatment delay were only documented in 19% (29 of 151) of the cases. Reasons given for the delay include unable to determine eligibility ($n = 4$), initial refusal ($n = 5$), hypertension requiring

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