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**Brief Reports**

# PHARMACIST IMPACT ON ISCHEMIC STROKE CARE IN THE EMERGENCY DEPARTMENT

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☐ **Abstract—Background: The Froedtert Acute Stroke Team (FAST) is composed of various health professionals who respond to stroke calls, but it does not formally include a pharmacist at this time. However, emergency department (ED) pharmacists have been actively involved in patient evaluation and facilitation of i.v. recombinant tissue plasminogen activator (rtPA) preparation and administration in the ED. ED pharmacists are qualified to dose and prepare rtPA, as well as screen for contraindications to therapy. Objective: The primary objective was to compare the accuracy of rtPA dosing, mean door-to-rtPA time, and identification of contraindications to rtPA therapy when a pharmacist was present vs. absent in the ED. Methods: This is a retrospective study of 105 patients who received rtPA for acute ischemic stroke in the ED at a comprehensive stroke center from January 1, 2008 to October 1, 2012. Results: A total of 105 patients were included in this study. Dosing accuracy was similar when a pharmacist was present vs. absent (96.6% vs. 95.6%; $p = 0.8953$). The median door-to-rtPA time when a pharmacist was present was statistically significantly shorter than when a pharmacist was absent (69.5 vs. 89.5 min; $p = 0.0027$). When a pharmacist was present, a door-to-rtPA time of < 60 min was achieved 29.9% of the time, as compared with 15.8% in the pharmacist-absent group ($p = 0.1087$). Conclusions: Pharmacist involvement on stroke teams may have a beneficial effect on door-to-rtPA time and patient care in the ED.** © **2016 Elsevier Inc.**

☐ **Keywords—pharmacist; ischemic stroke; alteplase; recombinant tissue plasminogen activator; rtPA**

## INTRODUCTION

Quick action is critical to restoring cerebral blood flow and preserving brain tissue in patients with acute ischemic stroke. Intravenous alteplase or recombinant tissue plasminogen activator (rtPA) has been shown to provide neurologic improvement and better outcomes if administered early to ischemic stroke patients (1,2). A shorter time to treatment is associated with greater benefit, especially if rtPA is initiated within 90 min of symptom onset. In a pooled analysis of six large rtPA studies, the odds ratio for favorable outcome at 3 months was 2.81 (95% confidence interval [CI] 1.75–4.50), 1.55 (95% CI 1.12–2.15), 1.40 (95% CI 1.05–1.85), and 1.15 (95% CI 0.9–1.47) in patients initiated on rtPA within 90 min, 1.5 to 3 h, 3 to 4.5 h, and 4.5 to 6 h, respectively (3). The 2013 American Heart Association/American Stroke Association (AHA/ASA) guidelines recommend rtPA for treatment-eligible patients diagnosed with acute ischemic stroke who present within 3 h of symptom onset (1). The

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treatment window may be extended to 4.5 h in patients who do not meet the following additional exclusion criteria: age older than 80 years, National Institute of Health Stroke Scale >25, current oral anticoagulant therapy regardless of international normalized ratio (INR), evidence of >1/3 of middle cerebral artery territory ischemic injury, or a history of both diabetes and ischemic stroke (1). However, rtPA is not completely benign, as it carries a high risk of spontaneous intracranial hemorrhage if administered erroneously or to patients who possess known contraindications to therapy.

Target: Stroke[SM], a national quality initiative of the AHA/ASA, has identified Ten Best Practice Strategies (Table 1) to achieve door-to-rtPA times of <60 min in eligible ischemic stroke patients (4). Pharmacists are in a unique position to enhance Best Practice Strategies 7, 8, and 9, which include mixing rtPA ahead of time, rapid access to i.v. rtPA, and utilizing a team-based approach (4). Froedtert & The Medical College of Wisconsin, a Level I trauma center and comprehensive stroke center in Milwaukee, WI, utilizes a stroke team composed of neurologists, emergency department (ED) physicians, and nurse specialists to respond to stroke calls. Although the Froedtert Acute Stroke Team (FAST) did not formally include a pharmacist member at the time of this study, ED pharmacists had been actively involved in patient evaluation and facilitation of rtPA preparation and administration within the ED. Pharmacists are qualified to dose and prepare rtPA for immediate administration, screen for contraindications to therapy, and ensure that patients receive the correct dose every time. Formal integration of the pharmacist in the response to acute ischemic stroke may contribute to greater attainment of goal door-to-rtPA times and the potential for improved patient outcomes. The purpose of this study is to retrospectively examine the pharmacist's impact on door-to-rtPA time and dosing accuracy within the ED at Froedtert.

**Table 1. Target Stroke[SM] Ten Best Practice Strategies (4).**

| Strategy | Best Practice |
|---|---|
| 1 | Advance hospital notification by EMS |
| 2 | Rapid triage protocol and stroke team notification |
| 3 | Single call activation system |
| 4 | Stroke tools |
| 5 | Rapid acquisition and interpretation of brain imaging |
| 6 | Rapid laboratory testing (including point of care testing if indicated) |
| 7 | Mix tPA medication ahead of time |
| 8 | Rapid access to i.v. tPA |
| 9 | Team-based approach |
| 10 | Prompt data feedback |

EMS = Emergency Medical Services; tPA = tissue plasminogen activator.

## METHODS

### *Study Design and Setting*

This study is a retrospective analysis comparing door-to-rtPA time, identification of contraindications, and dosing accuracy of rtPA for patients treated for acute ischemic stroke with and without a pharmacist present in the ED of a comprehensive stroke center. During the study period, ED pharmacists staffed daily and were available for consult from 10:00 AM to 6:30 PM.

### *Selection of Participants*

Patients were included in the study if they received i.v. rtPA for acute ischemic stroke in the ED from January 1, 2008 to October 1, 2012. Patients were excluded if they were younger than 18 years old, received a partial dose of rtPA, initiated on rtPA at an outside institution, hypertensive and antihypertensive agents were unable to lower blood pressure to <185/110 mm Hg for rtPA initiation, had missing or incomplete documentation in the electronic medical record, or if rtPA was given for another U.S. Food and Drug Administration labeled indication, such as ST-elevation myocardial infarction, pulmonary embolism, or central venous catheter occlusion. The electronic medical records of patients who met inclusion criteria were then reviewed to determine whether or not a pharmacist was involved during rtPA administration. Pharmacist involvement was defined as encounters with documentation in the notes, order entry, or automating dispensing cabinet override. Patients who received rtPA with pharmacist involvement were categorized to the pharmacist present group. The remaining patients were assigned to the pharmacist absent group.

### *Data Collection*

Data collected from the medical record included demographic information, time of patient presentation to the ED, rtPA bolus and infusion doses and times administered, weight used to calculate rtPA dose, staff who dispensed rtPA, medication history status on ED arrival, blood pressure, antihypertensive agents administered if applicable, INR, platelets, and glucose values. The weight used to dose rtPA was extrapolated by dividing the dose administered by 0.9, with the assumption that the intended dose was 0.9 mg/kg. To assess whether or not the rtPA was dosed accurately, the extrapolated weight was then compared with actual patient weight obtained and documented in the electronic health record. Door-to-rtPA time was defined as the time of presentation to the ED to the time of administration of the rtPA bolus. Expedited review was granted and approved by the Froedtert Institutional Review Board.