

## Patterns of Care and Temporal Trends in Ischemic Stroke Management: A Brazilian Perspective

Monique Bueno Alves, RN, MSc,\*† Gisele Sampaio Silva, MD, MPH, PhD,\*†  
 Renata Carolina Acri Miranda, RN,† Rodrigo Meireles Massaud, MD,†  
 Andreia Maria Heins Vaccari, RN,† Miguel Cendoroglo-Neto, MD, PhD,\*† and  
 Solange Diccini, RN, PhD\*

*Background and Purpose:* Demonstration of an improvement process of quality indicators in stroke care is essential to obtain certification as a primary stroke center (PSC). Our aim was to evaluate factors that influence temporal trends in quality indicators of ischemic stroke (IS) in a Brazilian hospital. *Methods:* We evaluated patients discharged with IS from a tertiary hospital from January 2009 to December 2013. Ten predefined performance measures selected by the Get With the Guidelines-Stroke program were assessed. We also compared 5 quality indicators available from a secondary community hospital for the first year of the series to those found in the tertiary hospital. *Results:* We evaluated 551 patients at the tertiary stroke center (median age 77.0 years [interquartile range 64.0-84.0]; 58.4% were men). The quality indicators that improved with time were the use of cholesterol-lowering therapy ( $P = .02$ ) and stroke education ( $P = .04$ ). The median composite perfect care did not consistently improve throughout the period ( $P = .13$ ). After a multivariable adjustment, only thrombolytic treatment (odds ratio [OR] 2.06,  $P < .01$ ), dyslipidemia (OR 2.03,  $P < .01$ ), and discharge in a Joint Commission International's (JCI) visit year (OR 1.8,  $P < .01$ ) remained as predictors of a perfect care index of 85% or higher. The quality indicators with worse performance (anticoagulation for atrial fibrillation and cholesterol reduction) were similar in the tertiary and secondary community hospitals. *Conclusions:* We found a significant improvement in some quality indicators across the years in a PSC located in Latin America. The overall perfect care measure did not improve and was influenced by being discharged in a JCI visit year, having dyslipidemia, and having undergone thrombolytic treatment. **Key Words:** Stroke—quality indicators—stroke care—ischemic stroke—stroke center—outcomes.

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From the \*Universidade Federal de São Paulo, São Paulo, Brazil; and †Programa Integrado de Neurologia and Instituto de Ensino e Pesquisa, Hospital Israelita Albert Einstein, São Paulo, Brazil.

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Address correspondence to Monique Bueno Alves, RN, MSc, 50 Ventura Ladalaro Street, Apt21B, São Paulo, São Paulo 05704-140, Brazil. E-mail: [monique\\_bueno@hotmail.com](mailto:monique_bueno@hotmail.com).

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### Introduction

Several studies have demonstrated that better performances are achieved in facilities with implemented quality programs for stroke as well as for other diseases such as heart failure and myocardial infarct. The potential consequences of a higher adherence to quality indicators include lower rates of readmission and mortality based on the practice of evidence-based medicine.<sup>1,2</sup> Quality programs, such as the Get With the Guidelines (GWTG), monitor and encourage adherence to quality indicators. To obtain

and maintain the certification as a primary stroke center (PSC), for example, the demonstration of an improvement process of quality indicators in stroke care is essential.<sup>3</sup> Therefore, following temporal trends is an important part of the certification process by which hospitals can evaluate and improve their performances.

Factors influencing adherence to performance measures for patients with acute stroke or transient ischemic attack have been previously evaluated in the American population. However, such predictors have been scarcely studied outside the United States.<sup>4,5</sup> Brazil is a country with cultural aspects and health-care practices that could influence predictors of adherence to stroke protocols. Brazil is also a country with very limited availability of stroke quality programs, with only 3 stroke centers certified by the Joint Commission International (JCI) as PSCs and 1 center certified by the Canadian Stroke Network.<sup>4</sup> Knowledge on the predictors of adherence to performance measures in Brazil could facilitate the implementation of stroke protocols worldwide. Our aim was to evaluate factors that influence temporal trends in indicators of health-care quality performance of ischemic stroke (IS) in Brazil using a composite measure based on the GWTG program for IS in a Brazilian tertiary hospital.

## Methods

We evaluated a database of consecutive patients with IS discharged from a private tertiary hospital in São Paulo from January 2009 to December 2013. The hospital was certified by the JCI as a PSC since 2007 and had 625 beds at the time of the present study. We included patients aged 18 years or older with a confirmed diagnosis of IS admitted by the emergency department. In-hospital strokes, transient ischemic attacks, and transferred patients were excluded.

Data collected included demographics, stroke risk factors, National Institutes of Health Stroke Scale (NIHSS) score at admission, in-hospital treatment, modified Rankin Scale score at discharge, neuroimaging characteristics, and thrombolysis status using a standardized, structured questionnaire. Risk factors were considered if noted on the patient's chart or if medications for known risk factors were used before hospital admission or at discharge.<sup>6</sup> As part of our hospital stroke program, all patients admitted with a diagnosis of IS were identified and followed up daily by a case manager nurse who prospectively evaluated medical records. IS was defined as an episode of neurological dysfunction caused by focal cerebral infarction confirmed by neuroimaging.<sup>7</sup> Ten predefined performance measures selected by the GWTG stroke program as targets for stroke quality improvement were evaluated<sup>8-10</sup>:

- 1) Intravenous (IV) recombinant tissue plasminogen activator (rtPA) in patients who arrive 2 hours or less after symptom onset and who were treated within 3 hours of symptom onset (IV rtPA  $\leq$  3 hours)

- 2) Antithrombotic medication (antiplatelet or anticoagulant) prescribed within 48 hours of admission (early antithrombotics)
- 3) Deep venous thrombosis (DVT) prophylaxis (warfarin, heparin, low-molecular-weight heparin, other anticoagulants, and pneumatic compression devices) within 48 hours of admission in nonambulatory patients at risk of DVT (DVT prophylaxis)
- 4) Antithrombotic medication (antiplatelet or anticoagulant) prescribed at discharge (antithrombotics at discharge)
- 5) Anticoagulation prescribed at discharge in patients with documented atrial fibrillation (AF) or atrial flutter (anticoagulation for AF)
- 6) Lipid-lowering medication prescribed at discharge if the low-density lipoprotein (LDL) is higher than 100 mg/dL, if the patient was treated with a lipid-lowering agent before admission, or if the LDL was not documented (cholesterol reduction)
- 7) Smoking cessation intervention (counseling or medication) at discharge for current or recent smokers (smoking cessation)
- 8) Door-to-computerized tomography (CT) read time in patients presenting with stroke symptoms within 3 hours or less (door-to-CT time target = 45 minutes)
- 9) Door-to-needle time in patients who received IV rtPA (door-to-needle time)
- 10) Stroke education provided to a patient or caregiver, including 5 components: explanation of which are the modifiable stroke risk factors, stroke warning signs and symptoms, how to activate emergency medical services, need for follow-up, and medications prescribed (stroke education)

Eligible patients were those admitted without any medical contraindications documented as reasons for nontreatment for each of the applicable measures. Discharge and subacute measures excluded patients who died.<sup>3,4</sup> All quality indicators not documented in the patient's chart were scored as not done; therefore, we had no missing data. Data for IV rtPA of 3 hours or less, early antithrombotics, DVT prophylaxis, antithrombotics at discharge, anticoagulation therapy at discharge in patients with documented AF or atrial flutter, lipid-lowering medication prescribed at discharge if the LDL was higher than 100 mg/dL, and door-to-needle time in patients who received IV rtPA were extracted from an electronic medical prescription system. Door-to-CT times were extracted directly from the electronic medical record and the CT scanner report. When stroke education and smoking cessation interventions were not documented at the patient's chart, the performance indicators were scored as not performed. The percentage of adherence to these measures was obtained for each individual patient through an

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