Access to specialized care and primary prevention are associated with better outcomes in cardiovascular diseases. The burden of stroke, and vascular disease in general, is higher in lower-income countries where 82% of all cardiovascular deaths (14 million) occurs annually. For example, in emerging/low-middle income countries (ELMICs; those with low gross domestic product and health expenditures), stroke affects individuals 1 to 2 decades earlier (50% <70 years of age compared with 20% in high-income countries) and case-fatality rates are higher. Poor control of vascular risk factors and limited access to acute and primary care are the most commonly invoked associated factors. Secondary prevention, an important window of opportunity for treatment, is also largely missed in ELMICs. Interestingly, limited information is available on access to care and “process measures” (a measure that focuses on processes that lead to desired outcomes) from these countries.

In the present study, Dr de Carvalho and colleagues describe the prevalence of vascular risk factors, process measures, and outcomes of consecutive patients with stroke admitted to 19 acute care hospitals in Fortaleza, Brazil. Among 2407 patients, ischemic stroke was the most frequent subtype (76%) followed by intraparenchymal hemorrhage (15%), subarachnoid hemorrhage (6.0%), and undetermined subtype (76%) followed by intraparenchymal hemorrhage (15%), subarachnoid hemorrhage (6.0%), and undetermined stroke (3%). The mean age was 68 years. The median time from symptoms onset to hospital admission was 12.9 hours and to neuroimaging 3.3 hours. In-hospital mortality was 20.9% (43.3% for undetermined stroke!) and the frequency of modified Rankin Scale score ≥2 at discharge was only 20%.

There are 3 novel and interesting aspects of this study. First, the proportion of patients with pre-existing disability, defined as modified Rankin Scale score >3, was 32.6%. More surprising, and likely related, 42.9% of the patients had a previous stroke. A vascular episode (stroke in this case) is the most significant risk factor for a recurrent event and thus the study reveals the opportunity missed by not focusing an aggressive prevention strategy on previously affected patients. Of note, when compared with other studies, there was a high prevalence of diabetes (49%) and hypertension (88%) among patients with ischemic stroke. Because the study included consecutive patients with stroke (limiting the selection bias), these findings suggest an inadequate access to cardiovascular prevention.

Second, the authors reported on process measures associated with access to care (eg, stroke unit admission) and stroke prevention before discharge (eg, antithrombotics, statins, antihypertensive agents). This is a major strength of the article considering the limited information on process measures of stroke care from Central and South America and other ELMICs. Of interest is the low use of statins (52%) and high prevalence of pneumonia (19%) among patients with an ischemic stroke when compared with other studies.

Finally, only 7.2% of patients received a basic cerebrovascular investigation including electrocardiography, echocardiography, and carotid Doppler. There was a significant underuse of studies as shown by only 3.5% of patients who underwent MRI, 27% carotid ultrasound, 32% echocardiograms, and 2.9% digital angiography (only one third of patients with subarachnoid hemorrhage had angiograms). These limited evaluations probably explain why most patients did not receive adequate stroke treatment. Studies performed were also delayed as reflected by a prolonged 15 days length of stay on average. Only 12% of patients were admitted to a stroke unit, and only 1.1% of the patients with ischemic stroke received thrombolysis (similar to other reports from Argentina). Interestingly, although in general patients did not have complete vascular evaluations, those admitted to what the authors defined as “stroke units” had suboptimal but significantly greater rates of laboratory testing compared with those evaluated in the general wards. This underscores the value of dedicated vascular units even when overall management is not adequate. Together, these findings suggest not only a limited access to stroke prevention, but also to interventions and investigations in the acute phase of stroke.
thus affecting early identification of the stroke mechanism to further guide therapeutic and preventive strategies.

**Lessons Learned From This Study**

Public reporting has been associated with better outcomes.\(^{12}\) For example, in a large study using propensity score matching (to attenuate differences in baseline characteristics), public reporting of hospital outcomes was associated with reductions in mortality for acute myocardial infarction, congestive heart failure, pneumonia, sepsis as well as for both ischemic and hemorrhagic stroke.\(^{12}\) The basis for effective public reporting is the transparency of data. Therefore, the authors should be commended for revealing the modest results found in their analysis. These findings should lead to modifications in process measures aiming at a specific risk benchmark and may positively influence other local or similar type of health facilities in the region. This could be accomplished by optimizing access to stroke care, facilitating required investigations, increasing the use of dedicated vascular units, and consulting with stroke specialists by telemedicine or by transferring patients to tertiary stroke centers. Unfortunately, some of these ideas may not be feasible in the short term for ELMICs and this will translate in too many lives lost. However, recent data from carotid and coronary artery disease studies have shown that medical treatment results in at least similar outcomes compared with invasive revascularization.\(^{13,14}\) This provides a unique opportunity because pharmacological treatments are easier to access than the more complex and expensive surgical and endovascular therapeutic strategies. Widespread use of the polypill may further facilitate the possibility to accomplish effective vascular prevention.\(^{15}\) Despite a wealth of impressive results from stroke prevention and treatment studies, the worldwide gap between what is known and what is done becomes an abyss in ELMICs. The authors clearly reflect this with their study in a city representative of the 500 million population in Latin America. Brasil (in the “BRIC” group together with Russia, India, and China) is considered 1 of the rising stars in the emerging economies, yet major disparities in the population that are characteristic of emerging regions explain the paradox of suboptimal health management in the midst of economic prosperity. A rapidly aging population and the occidentalization (eg, growing rates of smoking, obesity, and sedentary lifestyles) of ELMICs will exponentially increase during the next decade the already grim problem posed presently by cardiovascular disease. Perhaps the most relevant lesson from this article is related to the potential it provides to increase awareness among policymakers and health administrators about the importance of early and effective access to acute stroke care and secondary prevention before discharge. The successful implementation of strategies toward these goals will result in fewer and less disabling strokes. As such, the present article has the potential to influence policymakers to impact on the lives of stroke patients not only in Fortaleza, Brazil, but globally.

**Disclosures**

None.

**References**


**Key Words:** health indicators • health policy • organized stroke care • outcomes • outcomes research • performance • process measures • public policy • stroke management
Translational Research: From Observational Studies to Health Policy: How a Cohort Study Can Help Improve Outcomes After Stroke

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