LETTER TO THE EDITOR

Author Response

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Dear Editor,

Thank you for the opportunity to respond to the letter regarding our article.[1,2] We read it with great interest and would like to discuss our viewpoint about the queries raised by Mehri and Finsterer[1] We would like to draw their attention to our study's main objective, which was to determine the compliance rates with stroke quality metrics adopted from AHA/ASA's GWTG approach and to study the clinical outcomes associated with them in ischemic stroke (IS) and intracerebral hemorrhage (ICH) patients.[3,4] They have raised a few questions regarding the patient outcomes associated with the quality of interventions provided. They have also mentioned the concern regarding stroke-associated outcomes, which may have a considerable impact due to potential disease-related factors.

We believe that the clinical outcomes of patients with strokes of either type may be contingent not only on satisfying performance quality metrics but also on the specifics of the intervention unit's equipments, facilities, and their quality standards. We understand that the patients who were eligible for medical interventions including [thromboendarterectomy (TEA) and/or mechanical thrombectomy (MTE)] but could not undergo these procedures due to resource limitations, their clinical outcomes would have worsened compared to those who underwent these interventions. Their concern about the lack of availability of the desired neuroimaging in some patients [computed tomography (CT) performed instead of magnetic resonance imaging (MRI)] and the same could result in an inappropriate intervention is relevant. However, we would like to mention here that the study hospital facility is equipped with both CT and MRI; having said this, we were unable to perform MTE or TEA due to the fact that these facilities are being made available now but were not available at the time of the study. Considering door-to-imaging time (DIT) and door-to-needle time (DTN), we have used the same metrics in IS as well as ICH (except DTN, since it doesn't imply hemorrhagic stroke). We have found time delays in DIT in 45% and 40% of IS and ICH patients, respectively.[2] Quality improvement strategies with regards to MTE/TEA and DIT have since been implemented.

In response to Mehri and Finsterer's following queries, AHA/ASA's GWTG approach clearly defines the need for the appropriate use of antihypertensives and antidiabetics in ICH, in addition to other medical and/or pharmacotherapy interventions.[3,4] We are unanimous that the degree of bleeding, the degree of perifocal edema, the presence or absence of intraventricular incursion, and the decision between conservative and surgical treatment plays an important role in the course of an ICH. Studying the impact of these factors in addition to the impact of compliance with stroke quality metrics will require a prospectively designed study with a larger sample size or probably registry-based data systems wherein the risks of data bias are minimized, which was not feasible for us; hence, we have not considered studying this factors. In response to the ICH classification, of 56 patients with ICH; 40 had primary ICH (mainly caused due to malignant hypertension), and the remaining had secondary ICH. Of 16 patients with secondary ICH, 10 had ICH caused by vascular malformations, mainly aneurysm and cavernous angioma; 3 patients had cerebral venous sinus thrombosis; and 3 patients had ICH with underlying vasculitis. We believe that the ICH classification exerts a considerable impact on patient outcomes. However, due to the relatively small number, we did not study the impact of these factors on ICH outcomes.

During our study period, on admission, 35 patients with IS and 6 patients with ICH were diagnosed with having carotid artery stenosis (CAS) or occlusion (CAO), which was assessed using carotid artery ultrasound at a median (IQR) of 14 (8–21) h of admission. Due to the scattered data about the patients with IS caused by CAS or CAO and the relatively small sample size, we were unable to study the impact of these factors on patient outcomes. It has been demonstrated that individuals who receive carotid artery stenting, or TEA, within two weeks following IS achieve better long-term outcomes than those who do not receive it. Therefore, as a practice, we usually transfer such patients to healthcare institutes where similar facilities are available, especially those patients who have a larger amount of CAS or CAO and those who are willing to undergo stenting/TEA. With regards to the next query, a total of 30 patients with IS who were included in our study were on prehospital anticoagulation with rivaroxaban (26 patients) and warfarin (4 patients). We couldn't measure the anti-factor-Xa activity due to patients' unaffordability and other laboratory/

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resource limitations. The patients who were on rivaroxaban did not receive thrombolysis. Three of the four patients on warfarin had an INR of less than 1.5 and hence received thrombolysis. None of the ICH patients in our study were on therapeutic anticoagulation. To answer the next query by Mehri and Finsterer, we would like to cite data from our study's discussion section regarding the clinical outcomes of IS patients who did not undergo thrombolysis. In our study, 144/200 (72%) did not receive thrombolysis, mainly due to presentation outside the time window.[2] The middle cerebral artery (MCA) stroke accounted for 45% of the patients in our study, followed by internal carotid artery (ICA) (18%), posterior cerebral artery (PCA) (15%), anterior cerebral artery (ACA) (11%), brainstem (7%), and MCA plus ICA (4%). While we believe that the stroke subtype has an important impact on clinical outcomes; acute stroke care, and discharge care, including adequate rehabilitation, enable IS patients to attain functional independence between 30 and 90 days, especially when it's their first-ever stroke.[4–6] Assessment of clinical outcomes of individual stroke subtypes and outcomes associated with ICH location and stroke volume is out of the scope of our study.[2] Looking at associations of these factors with individual patients, disease, and/or intervention-based factors will require a larger sample size (probably registry-based). We could not analyze this further as suggested by Mehri and Finsterer[1] due to sample size limitations.

At last, we express our gratitude to Mehri and Finsterer, for posing important clinical questions and highlighting several points for the discussion regarding our study. Their letter will definitely help us improve the design of future studies.

Availability of Data and Material

All the data regarding study is included in the article.

Author Contribution

VRS, BP, and SI: Design and conception and discussed available data with coauthors; VRS: Literature search, wrote the first draft, and gave final approval; SI and JS: Discussion, correction, and final approval.

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