

ORIGINAL ARTICLES

Comparison of acute ischemic stroke care quality before and during the COVID-19 pandemic in a private tertiary hospital in metro Manila, Philippines

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Abstract

Background: The Coronavirus Disease 2019 (COVID-19) pandemic had disrupted established medical care systems worldwide, especially for highly time-sensitive acute conditions such as stroke. Strategies to maintain the quality of stroke care during the COVID-19 outbreak are crucial to prevent indirect mortality and disability due to suboptimal care. **Objective:** We conducted a single center analysis to compare the time-based measures for acute ischemic stroke care quality before and during the COVID-19 pandemic. **Methods:** A retrospective study was done utilizing the Registry of Stroke Care Quality (RES-Q) database. All acute ischemic stroke patients who presented within 4.5 hours of symptom onset in Makati Medical Center were included. Patient characteristics, treatment received, in-hospital time-based measures of stroke care quality and clinical outcomes were compared between the two periods- pre-COVID-19 and COVID-19. **Results:** There were 151 patients during the pre-COVID-19 period and 108 patients during the COVID-19 period who presented to the hospital with acute ischemic strokes within 4.5 hours of symptom onset. There was significantly higher NIHSS scores on admission and MRS scores on discharge during the COVID-19 period. There was no significant difference in the door-to-scan time, door-to-needle time and door-to-groin time between the two periods.

Conclusion: There is no significant change in the acute ischemic stroke care quality on the basis of in-hospital time-based measures: door-to-scan time, door-to-needle time, and door-to-groin time, between the pre-COVID-19 and COVID-19 periods. Further studies on pre-hospital challenges are recommended to identify specific targets for improvements in stroke care during pandemics.

Keywords: Stroke, COVID-19, door-to-needle time, door-to-groin time, acute stroke care

INTRODUCTION

Established systems of medical care have been disrupted since the emergence of the Coronavirus Disease 2019 (COVID-19) pandemic. In the Philippines, total hospital admissions for stroke and other high burden diseases had a decline of about 54% in year 2020 compared with 2019.¹ Many restrictions imposed by COVID-19 pandemic compromised treatments, especially for highly time-sensitive acute conditions such as stroke. There have been significant service reorganizations that altered stroke management pathways in the prehospital and in-hospital emergency care settings.²⁻⁵ Strategies to maintain the quality of stroke care while enforcing strict

infection control measures during the COVID-19 outbreak are crucial to prevent indirect mortality and disability due to suboptimal care.^{5,6}

Currently, data are not available regarding the effect of pandemic on delivery of acute ischemic stroke care in the Philippines. Quiles and colleagues have studied the impact of COVID-19 pandemic to stroke admissions and patient outcomes in another tertiary hospital in the Philippines. Their findings showed decreased admissions of transient ischemic attacks and mild strokes, but increased admissions of moderate to severe strokes, with poorer outcomes of stroke patients during the COVID-19 period. However, they were not able to compare in-hospital time

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based measures for stroke care quality.⁷ The authors aim to compare adherence to evidence-based performance measures for acute ischemic stroke care before and during the pandemic. Recognizing the impact of COVID-19 pandemic in stroke care quality would aid in making appropriate strategy adjustments in acute stroke treatment in the current and future pandemics.

METHODS

Study design and subjects

A retrospective study was done. Data was derived from the Registry of Stroke Care Quality (RES-Q) which is a database developed as an initiative of the European Stroke Organization- Enhancing and Accelerating Stroke Treatment (ESO-EAST), with collaboration to many other national stroke societies worldwide including the World Stroke Organization (WSO). The RES-Q is used not only in monitoring, evaluation, and improvement of stroke management in the registered institutions, but also in identifying gaps in healthcare delivery at the national, regional, and hospital level.⁷ Contributing institutions have access to quarterly, bi-annual, and annual reports, and evaluations of their hospital performance based on the National Institute of Neurological Disorders and Stroke (NINDS) criteria for stroke management.

Makati Medical Center is a private tertiary hospital in the Philippines capable of providing intravenous thrombolysis and endovascular thrombectomy. This institution has been contributing to the RES-Q database since the start of 2019. From this registry, all acute ischemic stroke patients clinically diagnosed by a neurologist and verified by radiographic evidence: computed tomography (CT) or magnetic resonance imaging (MRI), who presented to Makati Medical Center within 4.5 hours from symptom onset (time-window eligible for thrombolysis) were included in this study. Those who were diagnosed with hemorrhagic stroke or with no identified cerebral infarcts after imaging studies, and those who refused diagnostics, management or discharged against medical advice which would render incomplete data in the registry were excluded. Patients were divided into 2 groups: those who were admitted from March 16, 2019 to March 15, 2020 were included in the pre-COVID-19 period and those admitted from March 16, 2020 to March 15, 2021 were included in the COVID-19 period. The division of periods was based on the onset of community lockdowns

and quarantines in the Philippines from March 16, 2020.

The research was approved by the Institutional Review Board of Makati Medical Center. All identifying information were concealed in the data-gathering process. Corresponding codes or numbers were assigned to patients to ensure the confidentiality of data.

Data collection

The following information were collected from the RES-Q database- age, sex, National Institutes of Health Stroke Scale (NIHSS) score on admission, length of hospital stay, Modified Rankin Scale score on discharge, and the measures of time-based performance for stroke care quality: onset-to-door time, door-to-scan time, door-to-needle time (for ischemic stroke patients who underwent intravenous thrombolysis) and door-to-groin time (for ischemic stroke patients who underwent mechanical thrombectomy). The factors that may affect the stroke severity and outcomes like comorbidities and delays in presentation time were not included.

Data analysis and statistics

All outcome variables were stratified and compared between the two periods, namely the pre-COVID-19 period and the COVID-19 period. Continuous variables were reported as mean and standard deviation (SD) and were compared with independent t-test and Mann-Whitney U-test for normally and non-normally distributed data, respectively. Categorical variables were reported as proportions and percentages and were compared with chi-square or Fisher exact test. All probability values were two-sided and a level of significance of less than 0.05 (p-value < 0.05) were considered statistically significant.

RESULTS

As shown in Figure 1, there was a total of 500 stroke patients admitted in the pre-COVID-19 period and 558 in the COVID-19 period. Most of the patients were excluded due to late presentation to the hospital of more than 4.5 hours after the onset of symptoms on both time periods. There was a 100% increase in the number of hemorrhagic strokes (from 38 to 77) during the COVID-19 period compared with the pre-COVID-19 period. On the other hand, a 28% decrease in acute ischemic stroke who consulted within 4.5 hours of symptom onset was noted.

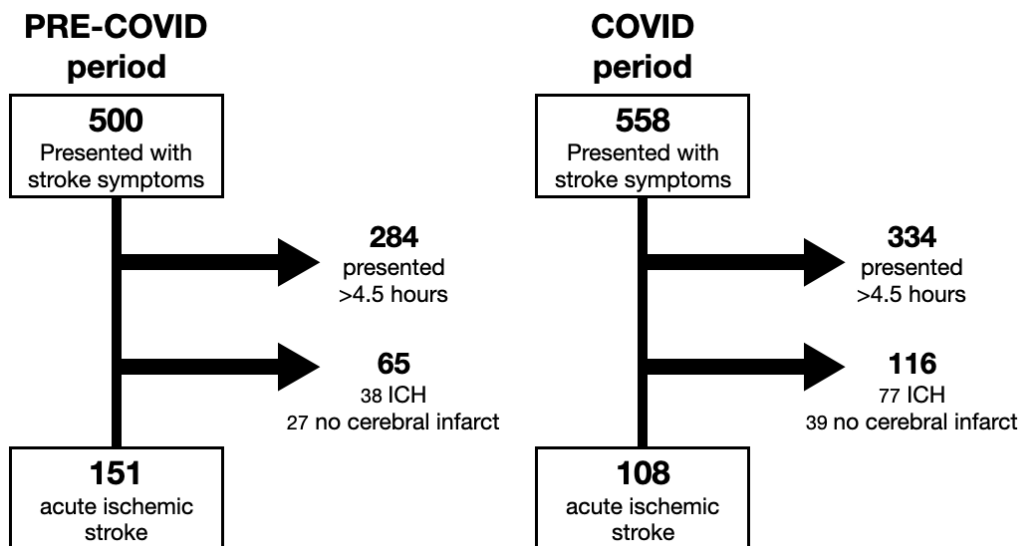


Figure 1. Number of patients excluded due to time of presentation and non-ischemic stroke type during the pre-COVID-19 and COVID-19 periods. *ICH: Intracerebral hemorrhage

There is no significant difference in the age and gender of patients between the 2 periods (Table 1). The number of patients who underwent intravenous thrombolysis and endovascular thrombectomy, and the length of hospital stay were not significantly different as well. However, the NIHSS score at admission and MRS score at discharge were both higher in the COVID-19 period with statistical significance (p value <0.001).

Table 2 shows the different time-based measures for stroke care quality. All the parameters (onset-to-door time, door-to-scan time, door-to-needle time and door-to-groin time) did

not show statistical difference between the pre-COVID-19 and COVID-19 periods.

DISCUSSION

Our study showed a 28% decrease in acute ischemic stroke cases seen within the time-window for thrombolysis during the COVID-19 period. These patients seen during the pandemic were observed to have higher NIHSS scores on admission and MRS scores on discharge. This study also showed that in-hospital stroke care quality measures have no significant change between the pre-COVID-19 and COVID-19

Table 1: Characteristics and treatment received by acute ischemic stroke patients during the pre-COVID-19 and COVID-19 periods. *MRS \geq 3 have poorer outcomes since there is moderate to severe disability requiring assistance, and even death.

	Pre-COVID-19 period (n=151)	COVID-19 period (n=108)	p value
Males, n (%)	74 (49%)	60 (56%)	0.842
Age (years), mean \pm SD (range)	61 \pm 16 (19-97)	59 \pm 16 (24-98)	0.449
NIHSS at presentation, mean \pm SD (range)	5 \pm 6 (0-29)	9 \pm 7 (0-28)	< 0.001
MRS \geq 3 at discharge*, n (%)	40 (27%)	69 (64%)	< 0.001
Intravenous thrombolysis, n (%)	30 (20%)	26 (24%)	0.417
Endovascular Thrombectomy, n (%)	6 (4%)	5 (4%)	0.796
length of hospital stay (days), mean \pm SD (range)	11.4 \pm 12 (1-60)	11.3 \pm 15 (1-70)	0.191

Table 2: Time-based stroke care quality measures for acute ischemic stroke during the pre-COVID-19 and COVID-19 periods

Time-based stroke care quality measures	Pre-COVID-19 period (n=151)	COVID-19 period (n=108)	p value
Onset-to-door time (mins), mean \pm SD (range)	83 \pm 73 (21-270)	87 \pm 76 (14-240)	0.345
Door-to-scan time within 1 hour, n (%)	135 (89%)	102 (94%)	0.172
Door-to-needle time (mins), mean \pm SD (range)	71 \pm 31 (33-229)	59 \pm 23 (30-185)	0.397
Door-to-groin time (mins), mean \pm SD (range)	263 \pm 55 (100-624)	321 \pm 63 (120-743)	0.662

periods.

The decrease in acute ischemic stroke cases admitted during the COVID-19 period is rather expected since decline in stroke admissions was seen throughout the world during the pandemic.^{7,9-13} Interestingly, evident from this study is the 100% increase in hemorrhagic stroke- from 38 during the pre-COVID-19 period to 77 cases seen during the COVID-19 period. This finding may indirectly be explained by the significantly higher NIHSS scores of patients presenting to the hospital. COVID-19 is highly contagious causing fear or worry about virus infection and transmission, hence, patients with mild symptoms tend to avoid going to the hospital and wait at home for the disease to improve or the pandemic to get under control.¹⁴ Because of this, there is less patients with mild stroke symptoms that actually seek consultation. At the same time, more severe cases have no choice but to go to the hospital hence the higher NIHSS scores observed and the higher cases of hemorrhagic strokes seen since it is more likely to be rapidly progressive than ischemic strokes.

In terms of stroke care quality, our study showed no significant difference in the onset-to-door time, door-to-scan time, door-to-needle time, and door-to-groin time during the pre-COVID-19 and COVID-19 periods. Although not statistically significant, the mean door-to-needle time (59 minutes) during the COVID-19 period in our findings even met the NINDS criteria of \leq 60 minutes compared to pre-COVID-19 period (71 minutes). This is despite the challenges of wearing appropriate personal protective equipment (PPE) prior to entering the emergency department and following tight hospital policies on infection control. This also emphasizes the importance of increased COVID-19 screening measures without significantly impacting stroke care in terms of the time-based parameters mentioned. The

consistency in acute stroke management during the pre-COVID-19 and COVID-19 periods was also seen in various studies done in other Asian and Western countries.^{12,15-19} Possible reasons for improvement of work efficiency in stroke centers during the COVID-19 period are the following: more medical workforce is available and there is decreased waiting times for use of medical devices due to lesser number of stroke patients visiting the hospital.²⁰

Since in-hospital stroke care quality measures during the COVID-19 period is not significantly different with pre-COVID-19 period, the observed significant increase in the proportion of patients discharged with poorer outcomes (MRS \geq 3) in the COVID-19 period may have been due to pre-hospital challenges. Aside from reluctance to seek consultation due to fear of infection, other possible pre-hospital challenges that might delay access to medical care during the COVID-19 pandemic are lack of hospital vacancies due to overwhelming COVID-19 cases and problems with transportation such as availability of public utility vehicles or ambulance, road check points and entry restrictions to certain areas. Prehospital stroke care should still observe the concept of "time is brain" emphasizing urgent transport of acute stroke patients while maintaining appropriate safety measures to control COVID-19 transmission.⁵ The patients in this study presented already with more severe symptoms on admission, hence more disability can be expected on discharge. However, this association needs further investigation.

The limitations of this study were first, the findings in this research may not be generalizable since only a single center is included. Challenges of the COVID-19 pandemic in the pre-hospital settings which could also affect the number of stroke admissions and severity of symptoms at presentation were not described in this study. Onset-to-door times in this paper may not reflect

the true delays in treatment since we included only those presented to the hospital within the 4.5-hour time window eligible for thrombolysis. Another limitation is that the clinical status of patients recorded in the registry was only during discharge. MRS taken at 3 months follow up is recommended.

In conclusion, there is no significant change in the acute ischemic stroke care quality on the basis of in-hospital time-based measures: door-to-scan time, door-to-needle time, and door-to-groin time, between the pre-COVID-19 and COVID-19 periods. Further studies on pre-hospital challenges are recommended to identify specific targets for improvements in stroke care during pandemics.

DISCLOSURE

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