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ORIGINAL RESEARCH

Effect of SARS-CoV2 Infection on Endovascular Thrombectomy Outcomes – Data from the Florida Stroke Registry

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ABSTRACT

BACKGROUND AND PURPOSE: Endovascular thrombectomy outcomes are impacted by changes in stroke systems of care. During the pandemic, SARS-CoV2 positive status had major implications on hospital arrival and treatment models of non-COVID related hospital admissions. Using the Florida Stroke Registry, we compared the rates of in-hospital death and discharge outcomes of patients treated with endovascular thrombectomy who tested positive for SARS-CoV2 infection during their hospitalization.

MATERIALS AND METHODS: Data from Get with the Guidelines-Stroke hospitals participating in the Florida Stroke Registry during the COVID pandemic from March 2020 to December 2022 were reviewed to identify endovascular thrombectomy patients with coding for SARS-CoV2 testing during their hospital stay. Associations between SARS-CoV2 status and favorable endovascular thrombectomy outcomes of mRS (0-2) at discharge, discharge to home or rehabilitation centre, symptomatic intracerebral hemorrhage, in-hospital mortality, and independent ambulation at discharge were examined using multivariate logistic regression modeling adjusting for demographics, vascular risk factors, and clinical characteristics. Temporal analyses were used to compare outcomes across the study period.

RESULTS: A total of 8,184 patients underwent endovascular thrombectomy (median age 71.1 years, female 50%, mean NIHSS 14), of these, 180 (2.2%) were SARS-CoV2 positive. Compared to SARS-CoV2 negative endovascular thrombectomy patients, those who tested positive were younger, more frequently male, but with comparable stroke severity at presentation. In multivariable analysis, adjusting for baseline differences and confounding variables, there was a 33% lower likelihood of being discharged to home/inpatient rehab (OR=0.67, 95% CI=(0.49-0.93)), 65% higher odds of in-hospital death (OR=1.65, 95% CI=(1.06-2.58)), as well as a 85% less chance of having a high mRS (>2) at discharge (OR=0.15, 95% CI=(0.04-0.60)) for patients with positive SARS-CoV2 infection. However, a similar risk of symptomatic intracerebral hemorrhage was present compared to SARS-CoV2 negative patients (OR=0.97, 95% CI=(0.50-1.88)). Temporal analysis of SARS-CoV2 positive patients showed no significant differences.

CONCLUSIONS: In this large multicenter stroke registry, despite comparable clinical presentation and in-hospital treatment timelines, SARS-CoV2 positive status negatively impacted thrombectomy outcomes.

ABBREVIATIONS: AIS = acute ischemic stroke; LVO = large vessel occlusion; EVT = endovascular thrombectomy; FSR = Florida Stroke Registry; sICH = symptomatic intracerebral hemorrhage.

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SUMMARY SECTION

PREVIOUS LITERATURE: Previous studies have examined the outcomes of endovascular thrombectomy as treatment for large vessel occlusion stroke in patients with SARS-CoV2, but these studies are few and have often compared multiple hospital systems with varying systems of care. Although it has been shown that patients with SARS-CoV2 and large vessel occlusion stroke have overall worse outcomes, it is not clear if these changes in outcome are due to the disease process itself, the changes in systems of care, or a combination of both the disease and systems of care.

KEY FINDINGS: Despite comparable clinical presentation and in-hospital treatment timelines, patients with SARS-CoV2 had worse outcomes after endovascular thrombectomy for large vessel occlusion. The pre-hospital timelines and changes in systems of care during the pandemic were likely the main contributors to these observed differences.

KNOWLEDGE ADVANCEMENT: This is the first study to examine such a large cohort in the United States of endovascular thrombectomy patients. The use of the Florida Stroke Registry provides a unique ability to examine all hospitals in Florida participating in Get with the Guidelines¤-Stroke.

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INTRODUCTION

Endovascular thrombectomy (EVT) is the standard of care for treatment of select patients with acute stroke related to a large vessel[1]. Additionally, it is also known that post EVT care in a dedicated stroke unit or neurological intensive care unit is superior to post-EVT care in other units[2,3]. These treatment paradigms, or systems of care, are essential in ensuring optimal outcomes in patients receiving EVT for large vessel acute ischemic strokes (AIS).

The SARS-CoV2 pandemic created unprecedented challenges to every aspect of healthcare, especially on systems of care and resource allocation[4]. These challenges were amplified in the setting of emergency care and time sensitive treatments including EVT for large vessel AIS. Though there has been research examining the relationship of SARS-CoV2 and AIS, as well as AIS and EVT outcomes, limited data report on outcomes following EVT in AIS patients who are SARS-CoV2 infection positive[5-12].

The Florida Stroke Registry (FSR) is a statewide database that collects data on stroke care throughout the state. FSR provides a unique opportunity to examine the impact of SARS-CoV2 infection status on outcomes of EVT in AIS patients. We compared in hospital and discharge outcomes of endovascularly treated patients with versus without a SARS-CoV2 positive infection status during their hospitalization.

MATERIALS AND METHODS

STROBE checklist for observational study methodology was followed. Data from Get with the Guidelines □-Stroke hospitals participating in the Florida Stroke Registry from March 2020 to December 2022 were reviewed. This study period was selected because on March 9, 2020, the Florida Governor issued an executive order which declared a state of emergency for the entire state due to COVID-19[13-16]. Figure 1 describes the details of study inclusion. Patients who had an ICD-10 procedural code for EVT and coding for SARS-CoV2 testing during their hospital stay were included. EVT was defined as the use of any form of mechanical thrombectomy devices for treatment of an acute intracranial occlusion with or without intra-arterial thrombolysis. These patients were categorized into SARS-CoV2 positive or negative groups (Supplemental Data). Associations between SARS-CoV2 status, clinical presentation, and post-EVT hospital outcomes were studied.

Favorable post-EVT were defined as mRS (0-2), discharge to home or to an acute rehabilitation centre, and independent ambulation at discharge. Unfavorable in-hospital outcomes of symptomatic intracerebral hemorrhage (sICH) and in-hospital mortality were also examined. These outcomes were examined using multivariate logistic regression modeling adjusting for demographics, vascular risk factors, and clinical characteristics with generalized estimating equations. Odds ratios (OR) with 95% confidence intervals were calculated using multivariate modeling with age, sex, race, insurance, smoker, hypertension, diabetes, dyslipidemia, atrial fibrillation, history of coronary artery disease, previous stroke, arrival Mode, IV thrombolysis, region, large vessel occlusion location, admission NIHSS, time period, onset to arrival, door to CT, door to needle, door to puncture, onset to puncture, onset to puncture <6hrs, onset to puncture 6-24hrs, onset to puncture >24hrs, and admitting service as covariates. Two different models were run to elucidate the most impactful covariates and minimize confounding. The first multivariate model used age, sex, insurance, race, EMS delivery mode, time variables, tPA administration, diabetes mellitus status, and diagnosis of atrial fibrillation. The second multivariate model used all previously mentioned variables and also the remaining covariates of smoking status, hypertension, hyperlipidemia, coronary artery disease, prior stroke, large vessel occlusion location, arrival NIHSS score, admitting service, and admission care. Temporal analyses compared outcomes in SARS-CoV2 positive patients across the years 2020-2022 using 2020 as the index year and comparing against 2021 and 2022. Temporal analysis was completed on only the outcomes of good mRS at discharge, discharge to home or an acute rehabilitation center, sICH, and in-hospital mortality, due to a low number of patients independently ambulating at baseline. For covariates with informative missingness, the Missing Indicator Method, which adds indicator variables to indicate the missing pattern, was used in the multivariate analysis to improve model performance.

RESULTS

A total of 8,184 patients underwent EVT during the study period, of these, 180 (2.2%) were SARS-CoV2 positive. Study participant characteristics and hospital characteristics are presented in the Supplemental Data.

The patients with SARS-CoV2 infection were more likely to be younger (67.2 years versus 71.1 years), male (58.3 male versus 42% female), have increased onset to arrival time (229 minutes versus 161 minutes), and have increased onset to puncture time (379 minutes versus 291 minutes).

Overall, 81% of all EVT patients had an mRS > 2 at discharge, 4760 (57%) were independently ambulating, and 4760 (58%) were discharged to home or rehabilitation centre. Additionally, over all EVT patients 447 (5.5%) had sICH and 783 (9.6%) died in hospital. Table 1 details in-hospital mortality, rate of sICH, and favorable discharge outcomes stratified based on SARS-CoV2 status. Adjusting for baseline differences and confounding variables there was a 33% lower likelihood of being discharged to home/inpatient rehab (OR=0.67, 95% CI=(0.49-0.93)), 65% higher odds of in-hospital death (OR=1.65, 95% CI=(1.06-2.58)), as well as a 85% less chance of having a high mRS (>2) at discharge (OR=0.15, 95% CI=(0.04-0.60)) for patients with positive SARS-CoV2 infection, as shown in Table 2. However, a similar risk of symptomatic intracerebral hemorrhage was present compared to SARS-CoV2 negative patients (OR=0.97, 95% CI=(0.50-1.88)).

Temporal analysis of year to year comparisons of outcomes using 2020 as the index year showed no significant differences in odds of a good mRS at discharge (2020 vs 2021 OR 1.54; 95% CI 0.89,2.67 and 2020 vs 2022 OR 1.04; 95% CI 0.47,2.28), sICH (2020 vs 2021 OR 0.76; 95% CI 0.54,1.11 and 2020 vs 2022 OR 0.4671; 95% CI 0.59, 1.27), and in-hospital mortality (2020 vs 2021 OR 0.89, 95% CI 0.75,1.05 and 2020 vs 2022 OR 0.92 95% CI 0.74,1.14), discharge to home or acute rehab centre (2020 vs 2021 OR 0.95; 95% CI 0.86,1.05 and 2020 vs 2022 OR 1.02; 95% CI 0.91,1.14) in SARS-CoV2 positive versus negative patients when comparing the years of 2020 to 2021 and 2020 to 2022 (Table 3).

DISCUSSION

Despite younger age and similar timelines of presentation and neurological severity, when controlling for confounding variables, EVT treated patients who were SARS-CoV2 positive had lower odds of achieving favorable discharge outcomes of discharge to home or rehabilitation centre, good mRS (0-2) at discharge, and higher odds of in-hospital mortality.

The currently available studies on SARS-CoV2 status and EVT outcomes for AIS patients are equivocal about outcomes following EVT[5-12]. Many of the available studies are of smaller cohorts (n<50) and some are across many countries or regions, leading to potential for differences in systems of care and treatment guidelines that may not represent true differences in stroke outcomes between SARS-CoV2 positive and negative patients. Our analysis of Get with the Guidelines-Stroke data across the state of Florida shows that patients with SARS-CoV2 receiving EVT for large vessel occlusion strokes are less likely to have a favorable discharge location (home/rehab versus other) and a good mRS (0-2) at discharge, while also having increased risk of in-hospital mortality. Although it has been posited by other groups that these unfavorable outcomes in SARS-CoV2 patients receiving EVT may be due to the natural course of the SARS-CoV2 disease, our group believes that there is another prominent factor involved in these differences; changes in systems of care and clinical treatment pathways that were instituted as the SARS-CoV2 pandemic descended on the world[17-20]. These systemic changes may be reflected in multiple data points in this study such as the increased time from onset to groin puncture (average 379 versus 291 minutes) shown in the Supplemental Data. Increased times were seen in onset to arrival, door to needle, and door to CT time as well. These increases in time may be reflective of the increased time needed to don personal protective equipment such as respirators, N95 masks, and gowns for both EMS personnel and receiving nurses and physicians in the emergency department and operating rooms. Clinical treatment pathways were also altered as the pandemic began. For example, some institutions required intubation of patients in the emergency department prior to transportation to the endovascular suite for EVT. These patients also required isolation, especially early in the pandemic when stopping the spread of the disease was of great importance as no vaccine was available and little was known about the disease. Additionally, some patients may have been more reluctant to seek acute care for stroke symptoms, leading to increased time from symptom onset to groin puncture. This is shown in our data with greater percentages of SARS-CoV2 patients having onset to puncture times 6-24 hours or >24 hours, rather than <6 hours. The reluctance of all people to obtain medical care during the pandemic is well documented, even among those with acute stroke[20]. Fear of spreading the disease and decreased casual interactions that often lead to the discovery of a loved one with a stroke syndrome may have been reasons for these increased times between presentation and treatment in SARS-CoV2 patients.

The impact of SARS-CoV2 on the brain has been well documented, spanning the investigation of cellular endothelial changes in cerebral blood vessels to acute ischemic events in the setting of SARS-CoV2 predicting worse outcomes in patients with clinical encephalopathy[21-23]. These impacts on brain vasculature, and the fact that CNS ischemic events as a cause of acute encephalopathy has been shown to be a predictor of poor outcomes, presents another explanation for worse outcomes among patients with SARS-CoV2 undergoing EVT for large vessel AIS.

Another system of care factor that may have played a role in the observed differences in outcomes seen here is the admitting service and locations where care was administered. It has been shown that care in a dedicated neurological unit (Neuro ICU, stroke unit) independently improves outcomes of EVT patients[2,3]. As the pandemic began patients were being cared for in non-neurologically specific environments by non-neurological providers to stop the spread of the disease by concentrating SARS-CoV2 patients in one place, thereby limiting exposure of other patients and staff. Another explanation for the observed differences in outcomes for SARS-CoV2 positive

patients in this study may be the differences in admitting service/care service, however we have too large missingness in our data to answer this question at the present.

As this will not likely not be the last pandemic, it is relevant and important to keep the SARS-CoV2/COVID-19 impact on systems of care for AIS in mind. By doing this we can create resiliency in our systems of care to avoid these discrepancies in outcomes in the future.

LIMITATIONS

The retrospective nature of this study is an inherent limitation and potential source of bias. Additionally, significant missingness in some of the variables in the FSR database is a potential source of confounding.

CONCLUSIONS

In this large muliticentre stroke registry we found that despite similar risk factors, neurological symptom severity, NIHSS scores, and in-hospital treatment timelines, SARS-CoV2 positive patients were more likely to be, male, have increased onset to arrival time, and increased onset to puncture time. The major finding of our study was that increased treatment timelines for SARS-CoV2 positive patients were associated with lower likelihood of discharge to home or rehabilitation, lower likelihood of mRS<2 at discharge, and a higher likelihood of in-hospital mortality. Temporal assessment showed similar results across the years of 2020, 2021, and 2022. These findings provide novel insight from a large database to add to the emerging literature examining outcomes of concurrent SARS-CoV2 infection in the setting of EVT for target vessel occlusion AIS. Future studies should examine EVT outcomes using a larger group of SARS-CoV2 positive patients as increased analytic power may provide further insights about the associations reported here.

REFERENCES

1. McCarthy DJ, Diaz A, Sheinberg DL, et al. Long-Term Outcomes of Mechanical Thrombectomy for Stroke: A Meta-Analysis. *ScientificWorldJournal*. 2019;2019:7403104. Published 2019 May 2. doi:10.1155/2019/7403104.
2. Jørgensen HS, Nakayama H, Raaschou HO, et al. The effect of a stroke unit: reductions in mortality, discharge rate to nursing home, length of hospital stay, and cost. A community-based study. *Stroke*. 1995;26(7):1178-1182. doi:10.1161/01.str.26.7.1178
3. Langhorne P, Ramachandra S; Stroke Unit Trialists' Collaboration. Organised inpatient (stroke unit) care for stroke: network meta-analysis. *Cochrane Database Syst Rev*. 2020;4(4):CD000197. Published 2020 Apr 23. doi:10.1002/14651858.CD000197.pub4.
4. Moynihan R, Sanders S, Michaleff ZA, et al. Impact of COVID-19 pandemic on utilisation of healthcare services: a systematic review. *BMJ Open*. 2021;11(3):e045343. Published 2021 Mar 16. doi:10.1136/bmjopen-2020-045343.
5. Zureigat H, Alhusban M, Cobia M. Mechanical Thrombectomy Outcomes in COVID-19 Patients With Acute Ischemic Stroke: A Narrative Review. *Neurologist*. 2021;26(6):261-267. Published 2021 Nov 4. doi:10.1097/NRL.0000000000000360.
6. Wang Z, Teng H, Wu X, et al. Efficacy and safety of recanalization therapy for acute ischemic stroke with COVID-19: A systematic review and meta-analysis. *Front Neurol*. 2022;13:984135. Published 2022 Aug 30. doi:10.3389/fneur.2022.984135.
7. Al Kasab S, Almallouhi E, Alawieh A, et al. International experience of mechanical thrombectomy during the COVID-19 pandemic: insights from STAR and ENRG. *J Neurointerv Surg*. 2020;12(11):1039-1044. doi:10.1136/neurintsurg-2020-016671.
8. de Havenon A, Yaghi S, Mistry EA, et al. Endovascular thrombectomy in acute ischemic stroke patients with COVID-19: prevalence, demographics, and outcomes [published correction appears in J Neurointerv Surg. 2021 Nov;13(11):e26. doi: 10.1136/neurintsurg-2020-016777corr1]. *J Neurointerv Surg*. 2020;12(11):1045-1048. doi:10.1136/neurintsurg-2020-016777.
9. Escalard S, Maïer B, Redjem H, et al. Treatment of Acute Ischemic Stroke due to Large Vessel Occlusion With COVID-19: Experience From Paris. *Stroke*. 2020;51(8):2540-2543. doi:10.1161/STROKEAHA.120.030574.
10. Pezzini A, Grassi M, Silvestrelli G, et al. Impact of SARS-CoV-2 on reperfusion therapies for acute ischemic stroke in Lombardy, Italy: the STROKOVID network. *J Neurol*. 2021;268(10):3561-3568. doi:10.1007/s00415-021-10497-7.
11. Qureshi AI, Baskett WI, Huang W, et al. Utilization and Outcomes of Acute Revascularization Treatments in Ischemic Stroke Patients with SARS-CoV-2 Infection. *J Stroke Cerebrovasc Dis*. 2022;31(1):106157. doi:10.1016/j.jstrokecerebrovasdis.2021.106157.
12. Jabbour P, Dmytriw AA, Sweid A, et al. Characteristics of a COVID-19 Cohort With Large Vessel Occlusion: A Multicenter International Study. *Neurosurgery*. 2022;90(6):725-733. doi:10.1227/neu.0000000000001902.
13. Sawczyńska K, Wrona P, Kęsek T, et al. Mechanical thrombectomy in COVID-19-associated ischaemic stroke: patient characteristics and outcomes in a single-centre study. *Neurol Neurochir Pol*. 2022;56(2):163-170. doi:10.5603/PJNNS.a2022.0026.
14. The COVID Tracking Project . *Data Download.* 2021.
15. Johnston CD, Chen R. The COVID-19 pandemic and its impact on the southern United States. *J Comp Fam Stud.* 2020;**51**:314–323. doi: 10.3138/jcfs.51.3-4.007.
16. Florida Department of Health. *Florida Department of Health Open Data.* 2020.
17. Gupta R, Mouawad NJ, Yi JA. The impact of the COVID-19 pandemic on vascular surgery: Health care systems, economic, and clinical implications. *Semin Vasc Surg*. 2021;34(3):74-81. doi:10.1053/j.semvascsurg.2021.06.003.
18. Rashid Hons M, Gale Hons CP, Curzen Hons N, et al. Impact of Coronavirus Disease 2019 Pandemic on the Incidence and Management of Out-of-Hospital Cardiac Arrest in Patients Presenting With Acute Myocardial Infarction in England. *J Am Heart Assoc*. 2020;9(22):e018379. doi:10.1161/JAHA.120.018379.
19. Rednor S, Eisen LA, Cobb JP, et al. Critical Care Response During the COVID-19 Pandemic. *Crit Care Clin*. 2022;38(3):623-637. doi:10.1016/j.ccc.2022.01.007.
20. Ganesh A, Stang JM, McAlister FA, et al. Changes in ischemic stroke presentations, management and outcomes during the first year of the COVID-19 pandemic in Alberta: a population study. *CMAJ*. 2022;194(12):E444-E455. doi:10.1503/cmaj.211003.

21. Legriel S, Badenes R, Engrand N, et al. Outcomes in Patients With COVID-19 With Acute Encephalopathy and Coma: An International Prospective Study. *Neurology*. 2023;100(22):e2247-e2258. doi:10.1212/WNL.0000000000207263.
22. Greene C, Connolly R, Brennan D, et al. Blood-brain barrier disruption and sustained systemic inflammation in individuals with long COVID-associated cognitive impairment [published correction appears in Nat Neurosci. 2024 May;27(5):1019. doi: 10.1038/s41593-024-01644-0]. *Nat Neurosci*. 2024;27(3):421-432. doi:10.1038/s41593-024-01576-9.
23. Sashindranath M, Nandurkar HH. Endothelial Dysfunction in the Brain: Setting the Stage for Stroke and Other Cerebrovascular Complications of COVID-19. *Stroke*. 2021;52(5):1895-1904. doi:10.1161/STROKEAHA.120.032711.

Table 1. Raw data for investigated patient outcomes. Values are presented "mean (% of total)" unless otherwise noted.

Variable	**Level**	**Overall N=8184**	**SARS-CoV2? No N=8004**	**SARS-CoV2? Yes N=180**	**P-Value**
Discharge location	1-Home	2894 (35%)	2839 (35%)	55 (31%)	0.40
	2-Rehab	1866 (23%)	1827 (23%)	39 (22%)	
	3-Hosp	1059 (13%)	1031 (13%)	28 (16%)	
	4-SNF	1383 (17%)	1354 (17%)	29 (16%)	
	5-Other	199 (2.4%)	194 (2.4%)	5 (2.8%)	
	6-Died	783 (9.6%)	759 (9.5%)	24 (13%)	
Discharge Ambulation	1 - Able to ambulate independently	4670 (58%)	4555 (57%)	115 (64%)	0.17
	2 - Unable/With assistance	355 (4.3%)	348 (4.3%)	7 (3.9%)	
	3 - ND/Missing	3159 (39%)	3101 (39%)	58 (32%)	
Discharge mRS	High (>2)	1488 (81%)	1445 (80%)	43 (96%)	**0.01**
	Low (0-2)	354 (19%)	352 (20%)	2 (4.4%)	
Symptomatic intracerebral hemorrhage <36hrs	Yes	447 (5.5%)	438 (5.5%)	9 (5.0%)	0.78
In-hospital mortality, %	Yes	783 (9.6%)	759 (9.5%)	24 (13.3%)	0.20

Table 2. Outcomes of SARS-CoV2 positive versus negative AIS patients undergoing EVT (endovascular thrombectomy). Multivariate Model 1 adjusts for age, sex, race, insurance, diabetes, atrial fibrillation, arrival mode, IV thrombolysis, and time period. Multivariate Model 2 adjusts for all variables in Table 1.

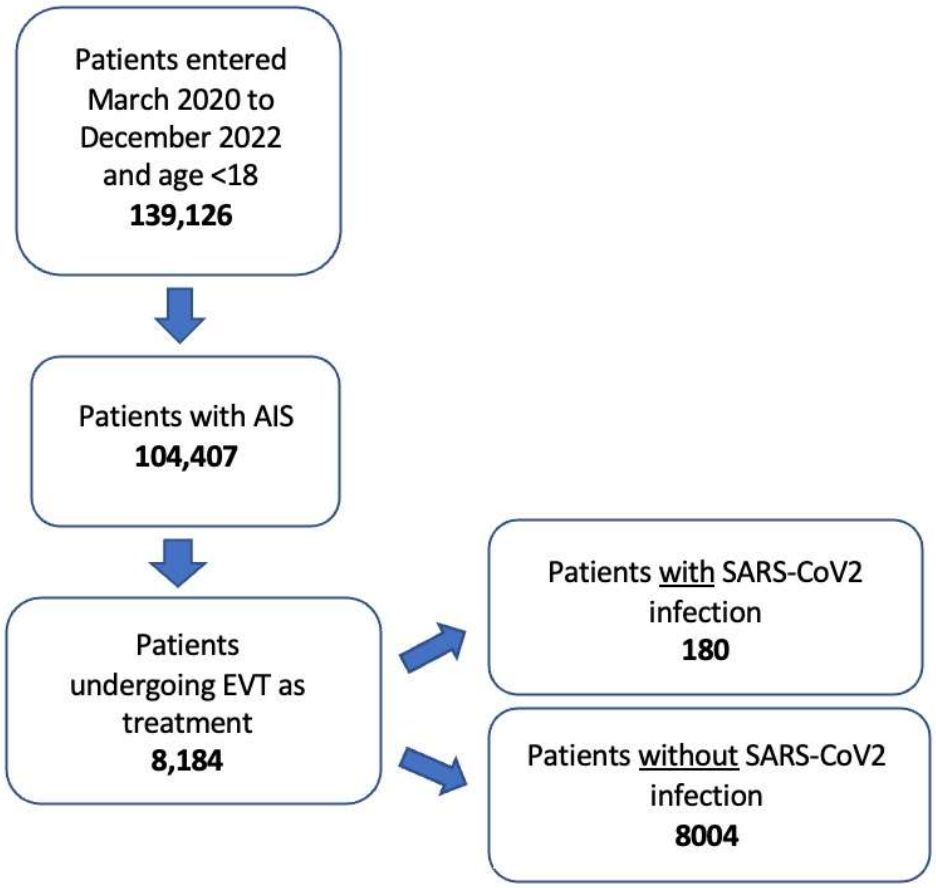
Outcome SARS-CoV2 positive versus negative EVT patients	**Univariate OR's (95% CI)**	**Multivariate Model 1 OR's (95% CI)**	**Multivariate Model 2 OR's (95% CI)**
Favorable discharge location (home/rehabilitation vs other)	0.82 (0.62, 1.09), p=0.17	0.66 (0.48, 0.90), **p=0.009**	0.67 (0.49, 0.93), **p=0.014**
Good mRS at discharge (0-2)	0.608 (0.05, 6.78), p=0.6857	0.17 (0.04, 0.62), **p=0.007**	0.15 (0.04, 0.60), **p=0.007**
sICH	0.956 (0.49,1.85), P=0.89	1.00 (0.52, 1.94), p=0.99	0.97 (0.50, 1.88), p=0.93
In-hospital mortality	0.1735 (0.47, 1.13), p=0.16	1.58 (1.02, 2.45), **p=0.04**	1.65 (1.06, 2.58), **p=0.03**
Independent ambulation at discharge (restricted to patients who were independently ambulating at presentation)	0.989 (0.66,1.47), p=0.96	0.92 (0.61, 1.39), p=0.69	0.95 (0.62, 1.45), p=0.81

Table 3. Temporal analysis of outcomes in SARS-CoV2 positive patients to examine changes throughout the pandemic (2020-2022).

Outcome	Time period	aOR	95% CI
Favorable discharge location (home/rehabilitation vs other)	2020 vs 2021	0.95	(0.86, 1.05)
	2020 vs 2022	1.02	(0.91 1.14)
Good mRS at discharge (0-2)	2020 vs 2021	1.54	(0.89, 2.67)
	2020 vs 2022	1.04	(0.47, 2.28)
SICH	2020 vs 2021	0.78	(0.54, 1.11)
	2020 vs 2022	0.87	(0.59, 1.27)
In-hospital mortality	2020 vs 2021	0.89	(0.75, 1.05)
	2020 vs 2022	0.92	(0.74, 1.14)

FIGURE LEGENDS

Figure 1. Details of study participant inclusion flow chart. Florida Stroke Registry (FSR), acute ischemic stroke (AIS), endovascular thrombectomy (EVT).



SUPPLEMENTAL FILES

Supplemental Data. Patient clinical characteristics in the SARS-CoV2 positive and negative groups. Values are presented "mean (% of total)" except for time variables that are presented as "median (range)" or unless otherwise noted.

Variable	Level	Overall N=8184	SARS-CoV2? No N=8004	SARS-CoV2? Yes N=180	P-Value
Age		71.06 (14)	71.14 (14)	67.23 (15)	**<.001**
Sex	Female	4069 (50%)	3994 (50%)	75 (42%)	**0.03**
Race	Asian	84 (1.0%)	83 (1.0%)	1 (0.6%)	0.377
	Black	1546 (19%)	1515 (19%)	31 (17%)	
	Hispanic	152 (1.9%)	146 (1.8%)	6 (3.3%)	
	Other	15 (0.2%)	14 (0.2%)	1 (0.6%)	
	White	6387 (78%)	6246 (78%)	141 (78%)	
Insurance	1 - Private	1723 (21%)	1677 (21%)	46 (26%)	**0.02**
	2 - Medicare	4673 (57%)	4591 (57%)	82 (45%)	
	3 - Medicaid	529 (6.5%)	514 (6.4%)	15 (8.3%)	
	4 - Self/None	1259 (15%)	1222 (15%)	37 (21%)	
Smoker	Smoker? Yes	1145 (14%)	1112 (14%)	33 (18%)	0.09
Hypertension	Hypertension? Yes	6117 (75%)	5980 (75%)	137 (76%)	0.67
Diabetes	Diabetes Mellitus? Yes	2253 (28%)	2197 (27%)	56 (31%)	0.28
Dyslipidemia	Dyslipidemia? Yes	3814 (47%)	3733 (47%)	81 (45%)	0.66
Atrial Fibrillation	Atrial Fib/Flutter? Yes	2449 (30%)	2401 (30%)	48 (27%)	0.33
Coronary Artery Disease (CAD)	CAD/prior MI? Yes	1736 (21%)	1693 (21%)	43 (24%)	0.37
Stroke	Previous/Stroke TIA? Yes	1767 (22%)	1730 (22%)	37 (21%)	0.73
Arrival Mode	1 - EMS from home/scene	6215 (76%)	6091 (76%)	124 (69%)	0.09
	2 - Private transport/taxi/other from home/scene	510 (6.2%)	498 (6.2%)	12 (6.7%)	
	3 - Transfer from other hospital	1405 (17%)	1361 (17%)	44 (24%)	
	4 – Not done or unknown	50 (0.6%)	50 (0.6%)	0 (0.0%)	
	5 - Missing	2 (0.02%)	2 (0.02%)	0 (0.00%)	
IV thrombolysis	Yes	2395 (29%)	2352 (29%)	43 (24%)	0.11
Region	East Central	1497 (18%)	1468 (18%)	29 (16%)	0.61
	North and Panhandle	1438 (18%)	1401 (18%)	37 (21%)	
	PR	44 (0.5%)	44 (0.5%)	0 (0.00%)	
	South	3389 (42%)	3317 (42%)	72 (40%)	
	West Central	1772 (22%)	1730 (22%)	42 (23%)	
Large vessel occlusion location	Anterior cerebral artery	63 (0.8%)	62 (0.8%)	1 (0.6%)	0.61
	Basilar artery	388 (4.7%)	381 (4.8%)	7 (3.9%)	
	Internal carotid artery	953 (12%)	932 (12%)	21 (12%)	
	Middle cerebral artery	5391 (66%)	5263 (66%)	128 (71%)	
	Vertebral artery	68 (0.8%)	66 (0.8%)	2 (1.1%)	
	Other	1321 (16%)	1300 (16%)	21 (12%)	
Admission NIHSS median		14 (8.2)	14 (8.2)	16 (8.2)	0.28
Admission NIHSS	NIHSS 0-5	1162 (14%)	1139 (14%)	23 (13%)	\0.93
	NIHSS 6-12	2198 (27%)	2156 (27%)	42 (23%)	
	NIHSS 13 and greater	4650 (57%)	4541 (57%)	109 (61%)	
	NIHSS missing	174 (2.1%)	168 (2.1%)	6 (3.3%)	
Time Period	2020.3 - 2021.2	2887 (35%)	2855 (36%)	32 (18%)	**<.001**
	2021.3 - 2022.2	3212 (39%)	3123 (39%)	89 (49%)	
	2022.3 - 2022.1	2085 (25%)	2026 (25%)	59 (33%)	
Onset to arrival (minutes), median		162 (57, 554)	161.00 (56, 554)	229.00 (66, 552)	0.13
Door to needle (minutes), median		29 (21, 38)	29 (21, 38)	32 (23, 40)	0.20
Door to puncture (minutes), median		82 (56, 115)	82 (56, 115)	80.5 (57, 115)	0.83
Door to CT (minutes), median		11 (8, 18)	11 (8, 17)	12 (8, 19)	0.32
Onset to puncture (minutes), median		293 (151, 749)	291 (151, 748)	379 (190, 835)	**0.009**
Onset to puncture, %	<6h	3659 (45%)	3587 (45%)	72 (40%)	0.07
	6-24hrs	2457 (30%)	2398 (30%)	59 (33%)	
	>24	484 (6.0%)	466 (5.8%)	18 (10%)	
	Missing	1584 (19%)	1553 (19%)	31 (17%)	

Variable	Level	Overall N=8184	SARS-CoV2? No N=8004	SARS-CoV2? Yes N=180	P-Value
Admitting service	Medicine	1730 (21%)	1676 (21%)	54 (30%)	**0.002**
	Surgery	5 (0.1%)	5 (0.1%)	0 (0.0%)	
	Neuro Critical Care	254 (3.1%)	249 (3.1%)	5 (2.8%)	
	Neurology	1127 (14%)	1091 (14%)	36 (20%)	
	Neurosurgery	242 (3.0%)	238 (3.0%)	4 (2.2%)	
	Other	42 (0.5%)	40 (0.5%)	2 (1.1%)	
	Missing	4784 (58%)	4705 (59%)	79 (44%)	
Admission care	General	144 (1.8%)	139 (1.7%)	5 (2.8%)	**<.001**
	Stroke Unit	238 (2.9%)	228 (2.9%)	10 (5.6%)	
	Multiple	1777 (22%)	1721 (21%)	56 (31%)	
	Neuro	902 (11%)	882 (11%)	20 (11%)	
	Observation	2 (0.02%)	2 (0.02%)	0 (0.00%)	
	Other	93 (1.1%)	87 (1.1%)	6 (3.3%)	
	Other ICU	321 (3.9%)	311 (3.9%)	10 (5.6%)	
	Missing	4707 (57%)	4634 (58%)	73 (41%)	