

Brief Report

Stroke management pathway during COVID-19 pandemic scientific statement by the Saudi Stroke Society

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Health care systems worldwide are overwhelmed by the current Coronavirus disease 2019 (COVID-19) pandemic. While it is ongoing, patients continue to present to hospitals with other serious conditions, including stroke. Since April 2020, Saudi Arabia has witnessed an increase in the number of infected patients with COVID-19. As of May 2020, there are more than 80,000 infected patients and more than 400 COVID-19 related deaths in Saudi Arabia (<https://covid19.moh.gov.sa/>). To navigate through this unprecedented challenge, health authorities led by the Saudi Ministry of Health (MOH) have taken extraordinary measures to control the pandemic. To streamline stroke care during this pandemic, the Saudi Stroke Society in collaboration with the Saudi Patient Safety Center published new guidelines on prioritization of stroke patients' access to care during COVID-19 pandemic depending on case severity and urgency (<https://www.spsc.gov.sa/English/PublishingImages/Pages/guidelines/15%20May%202020.pdf>).

To address the stroke care pathway during this pandemic, the society decided to produce a scientific statement to guide health care workers caring for stroke patients. This statement is not intended to replace the best evidence-based practices in regular circumstances, but rather streamline these practices within a safe environment during this difficult time.

There are 4 key messages in this document. First, protecting health care workers is a priority. Second, like COVID-19, stroke continues to be a medical emergency that can result in substantial morbidity and mortality if not treated appropriately. Third, stroke is treatable disease if urgent attention and treatment are provided. Fourth, COVID-19 is associated with higher thrombotic events, including ischemic stroke, and clinicians must recognize and manage those cases with appropriate interventions.^{1,2}

The Saudi Stroke Society board asked stroke neurologists within Saudi Arabia to join a scientific team to generate this statement. Several certified stroke neurologists volunteered to join the writing group,

and all have declared no conflict of interest related to this statement. The group held several online meetings to streamline the writing process, which included defining the scope and objectives, literature review, and interpretation of the evidence. The main focus of this statement is to address challenges in stroke care during the COVID-19 pandemic. For literature review we screened PubMed database, and only papers published in the English language were considered. The minimum evidence for consideration was a case series. Group consensus was the rule for all recommendations. The final draft was sent for internal review among the society board members, followed by external review by 2 independent stroke neurologists.

In Saudi Arabia, the incidence of any stroke or transient ischemic attack (TIA) is approximately 25,000 cases per year, which translates into one stroke or TIA victim every 15 to 20 minutes and one death every 90 minutes. This results in significant burden on our economy and health care systems.³ Furthermore, more than one-third of COVID-19 patients can have neurological symptoms, particularly cerebrovascular events.¹ Large vessel occlusion (LVO) strokes have been reported in relatively young patients with COVID-19.⁴

The hypothesis for the underlying stroke mechanism in COVID-19 cases is related to the hyperactivation of inflammatory factors by the virus, in addition to induction of a state of hypercoagulability indicated by high levels of D-dimer, fibrinogen, and C-reactive protein as well as platelet abnormalities and activation of vascular endothelium, which all together increase the risk of cerebrovascular disease.⁵

Pre-hospital care. The first step in the stroke patient's journey is coming to the hospital. Patients either arrive by car or ambulance. During this difficult time, with extended curfew hours around the country, this journey must be restructured to account for these challenges.

Recommendations. When 997 or 911 receive calls of suspected stroke cases, they should be screened for COVID-19 symptoms as per the MOH-approved triage for acute respiratory symptoms score. (<https://www.moh.gov.sa/en/CCC/healthp/regulations/Documents/Novel%20Corona%20Virus%20Infection%20Guidelines.pdf>).

Field evaluation should be Limited to one emergency medical services (EMS) person. Paramedics should wear full personal protective equipment (PPE) for suspected COVID-19 cases.

Emergency room evaluation. Stroke patients presenting to emergency rooms during these difficult times are at risk of limited stroke triage scrutiny, leading to missed acute cases that deserve immediate attention

doi: 10.17712/nsj.2020.3.20200079

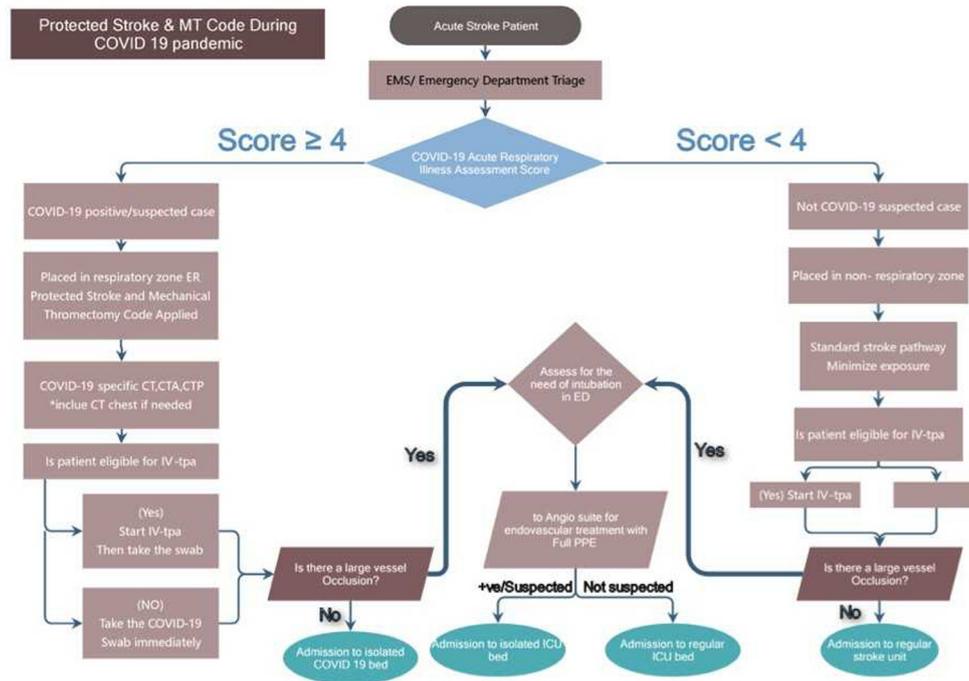


Figure 1- Protected stroke and mechanical thrombectomy code pathway.

for thrombolysis or endovascular treatment (EVT). On the other hand, those patients can have limited communication abilities caused by their deficit, which can jeopardize the infection-control measures that must be taken with all patients during these exceptional times. Also, stroke due to LVO requires rapid assessment and timely EVT. Such intervention can be very challenging during the COVID-19 pandemic as proper, safe, and timely delivery of care is needed while on the same time protecting health care workers and other patients is a priority.⁶

Recommendations. Thrombolysis with intravenous alteplase should not be delayed when indicated to perform the COVID-19 swab.

Tenecteplase may be utilized in LVO before EVT. However, its routine use during the COVID-19 pandemic as a substitute to Alteplase is not supported by substantial evidence.

When feasible, the hospital should have a designated COVID-19 angiography room.

The angiography suite should be stockpiled with all required PPE and materials for endovascular interventions to minimize procedural interruption.

One physician and one nurse can care for the patient during the emergency stay, provided patient safety is not jeopardized.

It is reasonable to perform a focused neurological examination and utilize Telestroke or robotic equipment if available to limit health care workers' exposure.

All stroke patients with LVO going to the angiography room should be assumed COVID-19 patients until proven otherwise. The Saudi Center for Disease Prevention and Control guidelines on the application of standard precautions should be followed for all patients, which includes contact and droplet precautions for suspected COVID-19 cases as well as airborne precautions for aerosol-generating procedures (https://covid19.cdc.gov.sa/wp-content/uploads/2020/03/EN_Health-practitioner-infection-control-measures.pdf).

Patients with LVO who are deemed candidate for EVT might be considered for intubation if they have any of the following features: Decreased level of consciousness, Severe stroke with National Institute of Health Stroke Scale (NIHSS) score of ≥ 20 , dominant hemispheric stroke, or patients with obvious respiratory compromise.

If intubation is deemed necessary, it is better to be performed electively in the emergency department and preferably in a negative pressure room.

Because of limited visitation policies nowadays, procedural consent might be waived or obtained by two physicians as an emergency procedure^{9,10}

Extubation in the angiography suite is discouraged. We encourage that only one neurointerventionalist, one nurse, and one interventional radiology technician be present in the angiography room and wearing full PPE.

Unless there is an intubated patient, the anesthetist with the anesthesia technician can stay outside the angiography suite wearing standard PPE, provided they have a good visual exposure to the patient and monitors. We propose a flowchart to address acute stroke patients hospital journey during this pandemic (Figure 1).

Admission. The number of COVID-19 patients requiring hospitalization is exponentially growing. The MOH has launched an active surveillance program with millions of residents in Saudi Arabia expected to be tested for the virus. This will considerably increase the numbers of positive cases and those requiring hospitalization. Mass screening by laboratory testing can result in increased bed occupancy, critical care beds shortage, and potentially stroke unit beds being converted into critical monitor beds for COVID-19 patients. Furthermore, this may lead to hospitals being overwhelmed with numbers beyond what intensivists, pulmonologists, or internists can manage. This can mandate health care personnel from different specialties, including neurologists, to care for COVID-19 cases. On the other hand, there have been several reports of a significant decline in stroke admission worldwide. Some countries have reported an approximately 50% decline. These reports suggest that this decline might have been caused by minor stroke or TIA patients choosing not to seek hospital care or that they are being discharged from emergency departments in fear of getting infected with the virus in the hospital environment.⁷

Recommendations. During the COVID-19 pandemic, it might be reasonable to limit admission to selected stroke cases and expedite outpatient stroke services to serve those evaluated and discharged from emergency departments. For more detailed admission recommendations for all stroke types, visit <https://www.spsc.gov.sa/English/Pages/Home.aspx>

If a hospital's critical care bed capacity is overwhelmed with COVID-19 cases, it might be reasonable to admit thrombolysis cases into regular beds with close blood pressure monitoring for 24 hours until a follow up Computed Tomography (CT) scan is performed as per protocol.⁸

Inter-hospital transfer. The COVID-19 pandemic promoted the expansion of Telemedicine in many health care systems to reduce the risk of viral transmission while maintaining health care delivery. Telemedicine improves the quality of medical care in rural areas, allows urgent expert evaluation, and reduces the number of inter-

hospital transfers of acute stroke patients admitted to a community hospital.⁹ Policies for inter-hospital transfer need to be revised during these times as some stroke referral hospitals can get overwhelmed with COVID-19 patients.

Recommendations. Telestroke services should be encouraged to minimize inter-hospital transfer of stroke patients.

If transfer is needed, patients must be screened for COVID-19 as per the MOH-approved triage score. Full PPE precaution should be taken with suspected or confirmed cases.

Rehabilitation. Rehabilitation is an integral part of the stroke patient journey. The exact practice varies based on the patient's need, clinician experience, and local protocols. During the pandemic, the service needs to be restructured early based on the risk of the patient's critical outcomes if rehabilitation is not initiated. These include risk of hospitalization, extended hospital stay, or functional decline. This must be weighted against the potential infection risk of the health care workers.¹⁰

The rehabilitation needs must be identified early. Patients who are not identified as having urgent needs initially can be followed up in 1–2 months. Rehabilitation is likely to be suboptimal and should focus on the most immediate needs of the patients. If available, new technologies to deliver rehabilitation, like Telerehabilitation resources may be utilized.

Recommendations. For negative COVID-19 patients, standard infection control measures should be followed.

For COVID-19 suspected or confirmed patients, rehabilitation specialists must wear the recommended PPE as per protocol.

Rehabilitation equipment should be disinfected rigorously following each session with confirmed or suspected COVID-19 cases to avoid the spread of infection.

For suspected or confirmed COVID-19 patients, nurses can be trained through Telerehabilitation on basic assessment and measures to serve patients' needs.

Patients with ongoing intense rehabilitation needs scheduled for discharge should be sent to appropriate care setting to continue their care.

In conclusions, stroke care in these difficult times is challenging with risk of infection on health care workers and potential gaps in access to care. This statement aims to guide health care providers to navigate through this difficult situation with ease. Most of the recommendations, if not all, are based on limited evidence and sometimes specialist's opinions because of the evolving nature of this illness and the

whole experience. However, we believe this subject merits input from the Saudi Stroke Society to support our colleagues to deliver the best care possible that our patients deserve.

Received 19th May 2020. Accepted 8th June 2020.

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References

- Mao L, Jin H, Wang M, Hu Y, Chen S, He Q, et al. Neurologic Manifestations of Hospitalized Patients With Coronavirus Disease 2019 in Wuhan, China. *JAMA Neurol* 2020; e201127.
- Klok FA, Kruip M, van der Meer NJM, Arbous MS, Gommers D, Kant KM, et al. Incidence of thrombotic complications in critically ill ICU patients with COVID-19. *Thromb Res* 2020; 191: 145-147.
- Alhazzani AA, Mahfouz AA, Abolyazid AY, Awadalla NJ, Aftab R, Faraheen A, et al. Study of Stroke Incidence in the Aseer Region, Southwestern Saudi Arabia. *Int J Environ Res Public Health* 2018; 15: 215.
- Oxley TJ, Mocco J, Majidi S, Kellner CP, Shoirah H, Singh IP, et al. Large-Vessel Stroke as a Presenting Feature of Covid-19 in the Young. *N Engl J Med* 2020; 382: e60.
- Escher R, Breakey N, Lammler B. Severe COVID-19 infection associated with endothelial activation. *Thromb Res* 2020; 190: 62.
- Alqahtani SA, Alnaami I, Alhazzani A. Protected Stroke Mechanical Thrombectomy Code During the Coronavirus (COVID-19) Pandemic: Southwestern Part of Saudi Arabia Stroke Unit Local Protocol. *Cureus* 2020; 12: e7808.
- Markus HS, Brainin M. COVID-19 and stroke-A global World Stroke Organization perspective. *Int J Stroke* 2020; 15: 361-364.
- Faigle R, Butler J, Carhuapoma JR, Johnson B, Zink EK, Shakes T, et al. Safety Trial of Low-Intensity Monitoring After Thrombolysis: Optimal Post Tpa-Iv Monitoring in Ischemic Stroke (OPTIMIST). *Neurohospitalist* 2020; 10: 11-15.
- Zerna C, Jeerakathil T, Hill MD. Telehealth for Remote Stroke Management. *Can J Cardiol* 2018; 34: 889-896.
- Thomas P, Baldwin C, Bissett B, Boden I, Gosselink R, Granger CL, et al. Physiotherapy management for COVID-19 in the acute hospital setting: clinical practice recommendations. *J Physiother* 2020; 66: 73-82.

Statistics

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