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A protocol for acute stroke unit care during the COVID-19 pandemic

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Background: Acute stroke unit (ASU) care is proven to reduce mortality and morbidity. During the COVID-19 crisis, established physical units and care practices within existing physical units are likely to be disrupted. Stroke patients with possible suspected COVID-19 infection may be isolated in other wards outside the ASU. Methods: Our hospital developed an adapted ASU protocol which includes key elements for stroke unit care, can be utilized by staff not familiar with stroke care with minimal training and can be implemented in various settings. Results: The adapted protocol has 3 categories of Acute monitoring (neurological observations, blood pressure and input-output monitoring, investigations and specific post-reperfusion issues), Stroke complications (focusing on 5 common complications) and Unified team (describing daily check-ins, patient education, communication, discharge planning and post-discharge support). Conclusions: Details are presented in the article in a format that it can be adopted by other centers facing similar issues in order to ensure ASU care is not compromised.

Keywords: COVID-19—Stroke units—Stroke—Pandemic—Continuity of care—Ischemic stroke

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Introduction

Limited resources, manpower shortages, tight infection control, physical distancing regulations and stay-at-home policies, we are all adapting our systems to care for stroke patients during this challenging time. There are different phases in the care of stroke patients and these may overlap; hyperacute care often involving reperfusion treatments, acute stroke unit (ASU) management as an inpatient and subsequently rehabilitation focus in an inpatient or outpatient setting. There have been reports providing guidance and protocols for hyperacute reperfusion treatment provision such as the management of stroke activations, considerations for intravenous thrombolysis and endovascular clot retrieval.1-3 Whilst some reports have commented on considerations along the spectrum of stroke care,4,5 there has been little guidance beyond hyperacute stroke treatment.

Care in ASU is proven to reduce mortality and disability with long lasting benefits up to 10 years after stroke onset.6 During this pandemic, ASU care is likely to be affected in many hospitals. Many may have their physical stroke units displaced due to bed utilization needs for coronavirus disease 2019 (COVID-19) infected and suspect cases. Most hospitals have staff deployed outside their usual workplaces to cover emergency, isolation and screening services therefore disbanding the acute stroke unit team of multi-professional healthcare providers. In our hospital, we estimate that 20—25% of our doctors, nurses and therapists from the stroke ward have been deployed to other areas. Staff shortages are often compounded by quarantine of staff due to COVID-19 patient exposure or acute respiratory illnesses. Thus, patients may be scattered across various wards in the hospital, are being managed by healthcare providers who
are unfamiliar with stroke care and are not trained to use established stroke pathways and protocols. Furthermore, stroke patients who have concomitant acute respiratory symptoms or contact history will need to be isolated and therefore cared in areas other than the ASU.

At the Singapore General Hospital, our ASU has remained physically intact but many ASU staff have been deployed elsewhere ASU due to the COVID-19 crisis. The stroke team attending to patients at the emergency department don full personal protection equipment as patient COVID-19 risk status is unknown. Once this has been determined, the patient may be admitted to isolation wards. We have encountered stroke patients being managed in isolation wards due to suspected possible COVID-19 infection, including some who had been treated with intravenous thrombolysis and endovascular clot retrieval. In order to orientate staff in these circumstances, our stroke team had to brief healthcare workers in these isolation wards on the care of these stroke patients, which was difficult as many had no neurology training and usually practice in other specialty areas. We realized that our ASU pathway was developed to be used by healthcare workers trained to use it, familiar with its format and was too complex to be used by untrained staff.

Methods

An interprofessional team with medical, nursing and allied health backgrounds at the Singapore General Hospital developed an adapted ASU protocol that was easy to use and ensured that the key elements the acute stroke unit are maintained. This protocol focuses on the ASU phase of stroke care with some rehabilitation aspects which occurs just before or after the ASU phase. This tool may be useful to others facing similar issues in hospitals across the world.

Results

Our adapted ASU guide has 3 components based on the ASU acronym- Acute monitoring, Stroke complications and Unified team approach. It has been outlined in a one-page document (Fig. 1) that can be provided to healthcare workers caring for stroke patients in isolation or non-ASU wards so that the key elements of the proven stroke unit management are maintained and therefore stroke patients can benefit from its proven effects. It requires a short briefing and specifics for the individual patient should be handed over. We emphasize that the stroke team should continue care following inpatient admission to ensure that there is continuity of care for patients and their families.

Acute stroke monitoring

There are 4 elements included in this section: neurological observations, blood pressure measurement, input-output charting, investigations and specific issues following hyperacute reperfusion treatments.

Neurological observation for stroke deficits usually involves the National Institute Health Stroke Scale (NIHSS) which requires specific training and certification. Instead we use monitoring with the Glasgow Coma Scale (GCS), pupillary size and reaction and NIHSS component 1, 10, 5 and 6 (level of consciousness, dysarthria, motor arm and motor leg) (Fig. 2). This monitoring can be performed without any formal training as GCS is part of standard nursing training and the others are easily communicated with written documents. Whilst this is not as comprehensive as the NIHSS, it is a reasonable alternative for untrained staff and covers key components. Use of GCS is limited for assessing neurological deterioration in stroke. The frequency of observations should be specified and the nursing team should receive advice on when to activate the medical team of any differences in neurological status. Blood pressure is particularly important in acute stroke patients and this is emphasized as a separate component. The frequency of measurements should be specified and targets above and below that require escalation should also be specified. Daily input and output charting is important as patients may require intravenous fluids and their daily intake may be affected by the stroke. Bowel movements should be noted to avoid constipation. Investigations should be ordered mindfully to avoid unnecessary transfers and use of resources. If there is no urgent need nor significant impact on patient care, the managing team may choose to defer some investigations if there are pressures on hospital resources. For example, work-up to search for a possible patent foramen ovale may be deferred if the suspicion for this is low in a patient with cryptogenic stroke. There may be specific instructions for patients following thrombolysis and endovascular clot retrieval and these should be advised for individual needs accordingly.

Stroke complications

There are 5 stroke complications emphasize in the adapted ASU protocol which should be screened for, prevented, as well as detected and managed early should they occur. These are Venous thromboembolism (VTE), dysphagia complications including aspiration pneumonia, complications from tubes and lines, immobility complications and issues with nutrition.

VTE prophylaxis for stroke patients should be maintained for patients cared outside the ASU. If the staff is not familiar with the indications, intermittent pneumatic compressions devices should be applied universally unless contraindicated. Prevention of aspiration pneumonia is important may not be a particular issue outside the ASU and thus is important to highlight. As the medical and nursing staff may not be trained to assess swallowing, all patients should have a speech therapy assessment for dysphagia screening if possible. Prior to this, patients should be kept nil by mouth or fed through a nasogastric
Other measures are to ensure that the appropriate diet consistency advised by the speech therapist is adhered to; elevate the patient’s head of bed to minimum 30-45 degree if it not contraindicated during and at least 30 minutes after feeding; stop feeds or diet if the patient is drowsy; and to not let the patient swallow food or drink if the patients is drooling, coughing, choking, has frequent throat clearing, is breathless after swallowing or has a wet or gurgling voice. Unnecessary tubes should not be inserted and should be removed as soon as not needed including urinary catheters, intravenous cannula and nasogastric tubes. Intravenous cannula insertion sites...
**Glasgow Coma Scale (GCS)**

| Eye Opening (E) | 4 = Spontaneous | 3 = To sound | 2 = To pain | 1 = None |
|-----------------|-----------------|--------------|-------------|---------|
| Verbal Response (V) | 5 = Oriented | 4 = Confused | 3 = Words | 2 = Sounds | 1 = None |
| Motor Response (M) | 6 = Obey commands | 5 = Localizing | 4 = Normal flexion | 3 = Abnormal flexion | 2 = Extension | 1 = None |

**Pupil size (in mm)**

- Left: 
- Right: 

**Pupillary reaction**

- **Left**
  - B = Brisk
  - S = Sluggish
  - F = Fixed

- **Right**
  - B = Brisk
  - S = Sluggish
  - F = Fixed

**National Institutes of Health Stroke Scale (NIHSS)**

1a. Level of Consciousness (LOC)

| Score | Description |
|-------|-------------|
| 0     | Alert; keenly responsive |
| 1     | Not alert; arousable by minor stimulation |
| 2     | Not alert; requires repeated stimulation |
| 3     | Responds only with reflex motor or autonomic effects, or totally unresponsive |

1b. LOC Questions

| Score | Description |
|-------|-------------|
| 0     | Answers both questions correctly |
| 1     | Answers one question correctly |
| 2     | Answers neither question correctly |

10. Dysarthria

| Score | Description |
|-------|-------------|
| 0     | Normal |
| 1     | Mild-to-moderate dysarthria |
| 2     | Severe dysarthria, or is mute/anarthric |
| UN    | Intubated or other physical barrier |

5a. Motor Arm - Left

| Score | Description |
|-------|-------------|
| 0     | No drift for full 10 seconds |
| 1     | Drift |
| 2     | Some effort against gravity |
| 3     | No effort against gravity; limb falls |
| 4     | No movement |
| UN    | Amputation or joint fusion, explain |

5b. Motor Arm - Right

| Score | Description |
|-------|-------------|
| 0     | No drift for full 10 seconds |
| 1     | Drift |
| 2     | Some effort against gravity |
| 3     | No effort against gravity; limb falls |
| 4     | No movement |
| UN    | Amputation or joint fusion, explain |

6a. Motor Leg - Left

| Score | Description |
|-------|-------------|
| 0     | No drift for full 5 seconds |
| 1     | Drift |
| 2     | Some effort against gravity |
| 3     | No effort against gravity; leg falls |
| 4     | No movement |
| UN    | Amputation or joint fusion, explain |

6b. Motor Leg - Right

| Score | Description |
|-------|-------------|
| 0     | No drift for full 5 seconds |
| 1     | Drift |
| 2     | Some effort against gravity |
| 3     | No effort against gravity; leg falls |
| 4     | No movement |
| UN    | Amputation or joint fusion, explain |

Fig. 2. Neurological observation charting.
should be checked for signs of phlebitis every nursing shift. Patients with stroke often have immobility and hence regular monitoring for pressure issues is needed. Prevention of immobility complications is important and involves regular turning, protection of the hemiplegic shoulder with appropriate positioning, pressure area protection and out-of-bed mobilization. Nutritional needs must be considered as swallowing may be affected. This is especially pertinent for patients on tube feeding.

**Unified team**

This section deals with components of ASU care which are often inter-professional. We have included daily check-ins with the stroke team, patient education, communication with families, discharge planning and support after discharge.

We have adopted daily telephone check-ins by the stroke team contacting the clinical team managing the stroke patient in isolation facilities to discuss daily updates and management plans. The check-ins are initiated by the medical doctor of the stroke team mostly via telephone; however specific nursing and therapy issues are then conveyed and addressed by the appropriate professionals in the stroke team with their colleagues in the isolation wards. This ensures that staff in the non-ASU wards feel supported and can have their queries clarified. Patient education is particularly important as the usual systems of care are disturbed by the COVID-19 crisis. This issue is compounded by non-ASU staff not being familiar with stroke education. Thus we propose that patients are referred to reliable resources and website, and given vetted hard copy reading material. Smoking cessation advice must not be neglected. Videos are used to assist with caregiving training as this may be limited due to physical distancing policies. Most hospitals have a limited or no-visitor policy. For acute stroke patients with physical, communication and/or cognitive impairment, the lack of visits by family and loved ones can result in depression, anxiety and feelings of abandonment. There is a system for patients to speak to and interact with families with facilitated teleconferencing. In addition, regular updates by the healthcare team to patient’s loved ones are provided. Discharge planning is different with the COVID-19 crisis as many post-discharge services are not available due to lockdown or physical distancing restrictions. We attempt to attend to most issues as far as possible as an inpatient to avoid unnecessary outpatient visits. The stroke team physiotherapist checks in with patients by telephone 2 weeks after discharge to assess coping at home and post stroke complications, and any particular issue is brought up to the appropriate stroke team professionals to address. A hospital contact number is provided so that stroke survivors can seek help if needed. Appropriate rehabilitation needs are addressed for discharge. Whilst usual rehabilitation services prior to the COVID-19 pandemic may be curtailed due to lockdown, infection control and other reasons, other options such as tele-rehabilitation, home exercise program, guidance with videos may be considered. International stroke organizations have collated resources for use by stroke clinicians to facilitate the change of practice in treatment delivery. As care may be truncated due to the COVID-19 situation, we advocate for outpatient follow-up for all patient at a multidisciplinary post-stroke clinic to ensure all loose ends are addressed. These clinics are currently face-to-face but we will soon be initiating a virtual post-stroke clinic for patients who will likely not require a physical examination such as those with no or minor residual deficits. Stroke support organizations (SSO) are not able to provide their usual host of services. We are encouraged by our local SSO who has developed online befriending, support groups and other programs. Patients should be referred to adapted care and support services for stroke survivors and their caregivers.

**Conclusion**

The adapted ASU pathway is a guide which has assisted care of stroke patients outside our usual ASU physical ward and pathway, and by staff not familiar with stroke patient management. It was designed to be simple, require little training and cover key elements of ASU care, and can be adopted by other hospitals and centers facing challenges of maintaining ASU care during the COVID-19 crisis.

**Declarations of Competing Interest**

None.

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