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Journal article

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## **REGIONAL VARIATION IN ACUTE STROKE CARE ORGANISATION**

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**Key words:** stroke, stroke care, acute ischemic stroke, intracerebral hemorrhage, thrombolysis, in- and out-hospital stroke care organisation.

## **Abstract**

**Background:** Few studies have assessed regional variation in the organisation of stroke services, particularly health care resourcing, presence of protocols and discharge planning. Our aim was to compare stroke care organisation within middle- (MIC) and high-income country (HIC) hospitals participating in the Head Positioning in Stroke Trial (HeadPoST).

**Methods:** HeadPoST is an on-going international multicenter crossover cluster-randomized trial of 'sitting-up' versus 'lying-flat' head positioning in acute stroke. As part of the start-up phase, one stroke care organisation questionnaire was completed at each hospital. The World Bank gross national income per capita criteria was used for classification.

**Results:** 94 hospitals from 9 countries completed the questionnaire, 51 corresponding to MIC and 43 to HIC. Most participating hospitals had a dedicated stroke care unit/ward, with access to diagnostic services and expert stroke physicians, and offering intravenous thrombolysis. There was a no difference for the presence of a dedicated multidisciplinary stroke team, although greater access to a broad spectrum of rehabilitation therapists in HIC compared to MIC hospitals was observed. Significantly more patients arrived within a 4-hour window of symptoms onset in HIC hospitals (41 vs. 13%;  $P < 0.001$ ), and a significantly higher proportion of acute ischemic stroke patients received intravenous thrombolysis (10 vs. 5%;  $P = 0.002$ ) compared to MIC hospitals.

**Conclusions:** Although all hospitals provided advanced care for people with stroke, differences were found in stroke care organisation and treatment. Future multilevel analyses aims to determine the influence of specific organisational factors on patient outcomes.

## **1.- Introduction**

Organisation of stroke care is a key factor influencing patient outcomes, having been shown to significantly reduce mortality and disability.[1] Presence of local protocols and pathways, adequate health care resources (including staff), regular quality assessments, and discharge planning appear to positively impact care. However, wide variations have been reported in acute stroke care processes, costs and outcomes worldwide.[2, 3] In addition, there are fewer stroke units in lower-income countries, where acute care tends to be inconsistent, with large differences in average length of hospital stay between countries.[3]

Disparity in stroke care is important as stroke disproportionately affects people in low- and middle-income countries (MIC), compared to high-income countries (HIC).[4] This has resulted in the World Stroke Organisation assigning the highest priority to the detection of barriers and implementation of evidence-based interventions for stroke care.[5] Unfortunately, gaps in information about stroke organisation care from different sites, and in particular according to country income, have hampered the implementation of specifically designed and focussed interventions.

### **1.1.- Aim**

To describe the organisation of care in stroke units from different countries participating in the Head Positioning in Stroke Trial (HeadPoST), and to compare health care resourcing, presence of protocols and discharge planning by country income.

## **2.- Methods**

HeadPoST is an international, cluster-randomised, crossover, open, blinded outcome-assessed clinical trial to determine the effects of lying-flat ( $0^\circ$ ) compared with sitting-up ( $\geq 30^\circ$ ) head positioning in the first 24 hours of hospital admission for patients with acute stroke. Methods have been published in detail elsewhere.[6] Hospitals with established acute stroke care

programs have started recruitment and are at different stages of the trial. As part of the start-up phase, principal investigators at each hospital were required to complete a previously published Hospital Organisation Questionnaire (HOQ) designed by the study investigators to determine how stroke care is organized.[6] The HOQ has only closed questions on a wide variety of stroke topics, including hospital details, stroke pathways, emergency department characteristics, imaging and clinical resources, acute treatment strategies, stroke care and stroke unit, discharge plans, rehabilitation and follow-up services, continuing education, research and quality improvement. Answers were uploaded into an electronic database, identified only by the study assigned number. The HOQ was designed in English and translated into Chinese.

To be included in HeadPoST, hospitals were required to have an established acute stroke care program within a geographically defined area and a sufficient projected throughput of patients to ensure feasibility of recruitment within a short time frame. Local Ethics and regulatory entities have approved the study in the different countries. Study data were collected and managed using REDCap electronic data capture tools hosted at The George Institute for Global Health.[7] Hospitals were classified as MIC or HIC according to the World Bank gross national income per capita criteria.[8]

### **2.1.- Statistical analysis**

Chi squared or Fisher tests were used to compare categorical variables, and Mann-Whitney test was used for continuous variables. IBM SPSS Statistics version 21 was used. A two-sided P value <0.05 was considered significant.

### **3.- Results**

Ninety-four hospitals completed the HOQ between 26 August 2014 and 1 February 2016. According to 2015 World Bank gross national income per capita criteria,[8] hospitals were

allocated in the MIC (51 hospitals; India [5], Sri Lanka [4], Brazil [1], Colombia [1], China [40]), or HIC groups (43; Australia [6], Chile [6], United Kingdom [UK, 28], Taiwan [3]).

### **3.1.- Health service capacity for stroke care**

Hospital characteristics are depicted in Table 1, with most having a dedicated stroke care unit/ward. MIC hospitals were more likely to be academic, with a higher number of beds, including dedicated stroke beds, and also more likely to be located in a metropolitan area (Table 1). Access to diagnostic and other support services was comparable; with local urgent CT available in 49 [98%] of MIC and 43 [100%] of HIC hospitals, and emergency laboratory facilities in 49 [98%] and 43 [100%] of MIC and HIC hospitals, respectively. Most hospitals had access to on-going rehabilitation at the admitting or another hospital, and offered routine outpatient clinic follow-up review for all stroke patients (Table 2).

### **3.2.- Stroke pathway for intravenous thrombolysis**

Compared to MIC hospitals, HIC hospitals had more stroke patients arriving by ambulance and within 4 hours of symptom onset; 81% (interquartile range [IQR] 75-90) vs. 21% (IQR 10-48) ( $P<0.001$ ), and 35% (IQR 25-55) vs. 10% (IQR 6-20) ( $P<0.001$ ). In addition, HIC hospitals received more frequently a pre-alert from the ambulance service to the Emergency Department (ED) prior to patient arrival (39 [91%] vs. 36 [72%],  $P=0.034$ ), and have an acute “code stroke” pager system for potential thrombolysis patients with medical staff from the stroke service available in ED (38 [88%] vs. 21 [42%] hospitals,  $P<0.001$ ). Although there was no significant difference in the proportion of HIC and MIC hospitals offering thrombolysis (Table 1), more acute ischemic stroke (AIS) patients received recombinant tissue plasimogen activator (rtPA) in HIC compared to MIC hospitals (10% [IQR 7-15] vs. 5% [IQR 1-10] ( $P=0.002$ ), respectively. Interventional neuroradiology and neurosurgery were more likely to be available in MIC hospitals (Table 1).

### **3.3.- Human resources in stroke care**

All hospitals had access to physicians with stroke expertise and a dedicated multidisciplinary team. MIC hospitals had a higher total number, as well as range, of medical officers, but this difference is associated with a higher number of dedicated stroke beds in MIC hospitals. No difference was detected in the number of patients to one nurse or health assistant in ED or stroke care unit between MIC and HIC hospitals. However, HIC hospitals offer access to a broader range of rehabilitation therapists compared to MIC. Further details of staffing are provided in Table 2 and Figure.

### **3.4.- Protocols, discharge plans and quality assurance**

The availability of a special pathway, or ward for stroke care was non-significantly higher in HIC hospitals (41 [95%] vs. 40 [82%],  $P=0.056$ ), as were referral protocols to different health professionals more common (Table 2). However, most hospitals had local protocols available for fever control, blood glucose management and swallow assessment, with no significant difference between HIC and MIC hospitals (Table 2). In addition, access to on-going rehabilitation, discharge services with home-based rehabilitation and assessment, and routine outpatient follow-up review was similar between HIC and MIC hospitals, though home nursing service and palliative care were more frequently available in HIC hospitals (Table 2). Continuing stroke management education was available in most hospitals, though quality improvement activity was more frequent in HIC hospitals (Table 2).

## **4.- Discussion**

Most HeadPoST-participating hospitals had advanced health service capacity for stroke care following the recently published World Stroke Organisation classification,[5] with access to coordinated stroke care, physicians with stroke expertise, advanced diagnostic and interventional services, rehabilitation and discharge programs. We acknowledge, however,

that this manuscript relates to selected hospitals participating in a clinical trial, which may not necessarily represent other institutions within and outside these countries, and that the majority of hospitals were located in China and the UK . Nonetheless, this article provides a description of stroke care in MIC hospitals, which are currently under-represented in the literature, with most publications referring to hospitals in Europe,[2] the United States,[9] Canada[10] and Taiwan.[11] This study, therefore, provides an important opportunity to compare and contrast stroke care between MIC and HIC health systems. In particular, the wide array of stroke care in different hospitals from a number of countries allows analyses of the particular characteristics of facilities, patient pathways, staffing, and protocols and quality improvement activities.

Though most MIC hospitals have implemented pre-hospital ambulance pathways for the timely arrival of patients, have an emergency call number, and are located in a metropolitan area, our data show that most stroke patients do not use the ambulance service to go to hospital and therefore fail to arrive within the time window for intravenous thrombolysis. Importantly, responses to the HOQ indicate that service organisation in MIC hospitals is available to ensure appropriate door-to-needle time in those patients arriving within a thrombolysis time window. These data stress the need for comprehensive strategies to provide successful pre-hospital stroke care, with networks ensuring rapid access to health care, timely medical evaluation and diagnosis, and tailored treatment. In addition, educational programs and campaigns to raise awareness of stroke symptoms and the importance of immediate consultation can aid in improving the number of patients being evaluated during the reperfusion window, and thus increase the number of rtPA-treated patients in MIC.[12, 13]

In contrast to thrombolysis management of ischemic stroke, MIC hospitals had more evidence of stroke care focused on intracerebral hemorrhage (ICH) management, including local clinical pathways and on-site neurosurgical availability. This probably reflects the high

prevalence of ICH in MIC hospitals which were located in Asia,[14] but does confirm the ability of implementing care pathways similar to ischemic stroke. This is important, because the pattern of stroke is rapidly changing in Asia with urbanisation, causing an increase in rates of ischemic stroke, and a need to provide pathways and protocols similar to those reported in western countries.[15]

MIC hospitals were predominantly larger with high patient-flow, and this 'volume–outcome relationship' has been shown to be an important predictor of short-term mortality in some,[16] but not all,[17] stroke studies. However, participating HIC hospitals may have adopted a two-tiered (or 'hub-and-spoke') model of stroke care in which a central 'comprehensive stroke centre' serves a number of smaller hospitals working as 'primary stroke centres' for thrombolysis of AIS patients, using protocols for transfer to larger hospitals for interventional therapies and telemedicine assistance.[18] The HOQ may not have captured the entire range of treatment options available to patients in participating HIC hospitals. There were fewer doctors rostered to attend to stroke patients after hours in HIC hospitals and differences in the staffing available to manage stroke patients between MIC and HIC hospitals. Although geriatricians were involved in stroke management in one third of the HIC hospitals, most of the doctors were neurologists in MIC. This may reflect differences in the skill mix of health professionals, resourcing, socio-demographic and cultural characteristics of populations. Further, there are important differences in the demographic characteristics of stroke patients, with those in Asian countries having a lower mean age at the time of stroke compared with those in western countries.[15]

Another difference in stroke care is that MIC hospitals had fewer multidisciplinary stroke care and referral protocols to different health professionals when compared to HIC hospitals.

Moreover, nursing care depended mostly on nurse practitioners in MIC hospitals, although HIC hospitals have a wider range of specialized nurses, with more clinical nurse specialists,

nurse unit managers and research nurses. Restricted multidisciplinary care may have an adverse impact on stroke outcome, as the presence of occupational therapy or physiotherapy, stroke team assessment and continuing education are key for stroke care, showing an effect that is independent of the severity of the disease.[9, 10] Indeed, escalating levels of organised care, measured by the Organised Care Index - a summary score based on hospital availability of occupational therapy or physiotherapy, stroke team assessment of patients, and admission to a stroke unit - were independent predictors of improved stroke survival in Canada[10] and Europe.[2] How these differences in stroke care impact on patient outcome is not known.

In conclusion, differences exist in stroke care organisation within hospitals with advanced health service capacity that have been selected to participate in a large-scale stroke trial. Importantly, these differences exist along the whole stroke care pathway, from pre-hospital, including population awareness of stroke, through acute and rehabilitation hospital care, to long-term community care, including palliative care services. Whilst these differences may reflect variations in funding and/or national health programs between MIC and HIC hospitals, it is important to consider the potential impact on patient outcome, including in the context of the ongoing HeadPoST study. Future multilevel analyses will be required to determine the influence of these organisational factors on patient outcome in different stroke subtypes within MIC and HIC health economies.

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Table 1: Hospital characteristics by World Bank gross national income per capita

	MIC	HIC	P value
Academic status	47 (94%)	29 (67%)	0.001
Number of beds	1000 (800-1800)	600 (404-745)	<0.001
Metropolitan location	43 (84%)	26 (61%)	0.011
Intensive care unit	51 (100%)	43 (100%)	NS
Neurosurgery available	45 (90%)	16 (37%)	<0.001
Interventional neuroradiology available	33 (67%)	15 (35%)	0.003
Dedicated stroke ward/unit	42 (84%)	41 (95%)	NS
Number of dedicated stroke beds	51 (10-100)	28 (10-38)	0.009
Number of stroke patients admitted annually	740 (400-2148)	576 (400-818)	0.046
Intravenous thrombolysis (rtPA)	46 (92%)	42 (98%)	NS
Stroke database	34 (68%)	40 (93%)	0.004

Data are presented in number and percentage or median and interquartile range (IQR)

MIC: middle-income countries, HIC: high-income countries, rtPA: recombinant tissue plasminogen activator, NS: not significant. Academic means it is a teaching hospital. P value from Chi squared, Fisher or Mann-Withney test as appropriate.

Table 2: Stroke care organisation by World Bank gross national income per capita

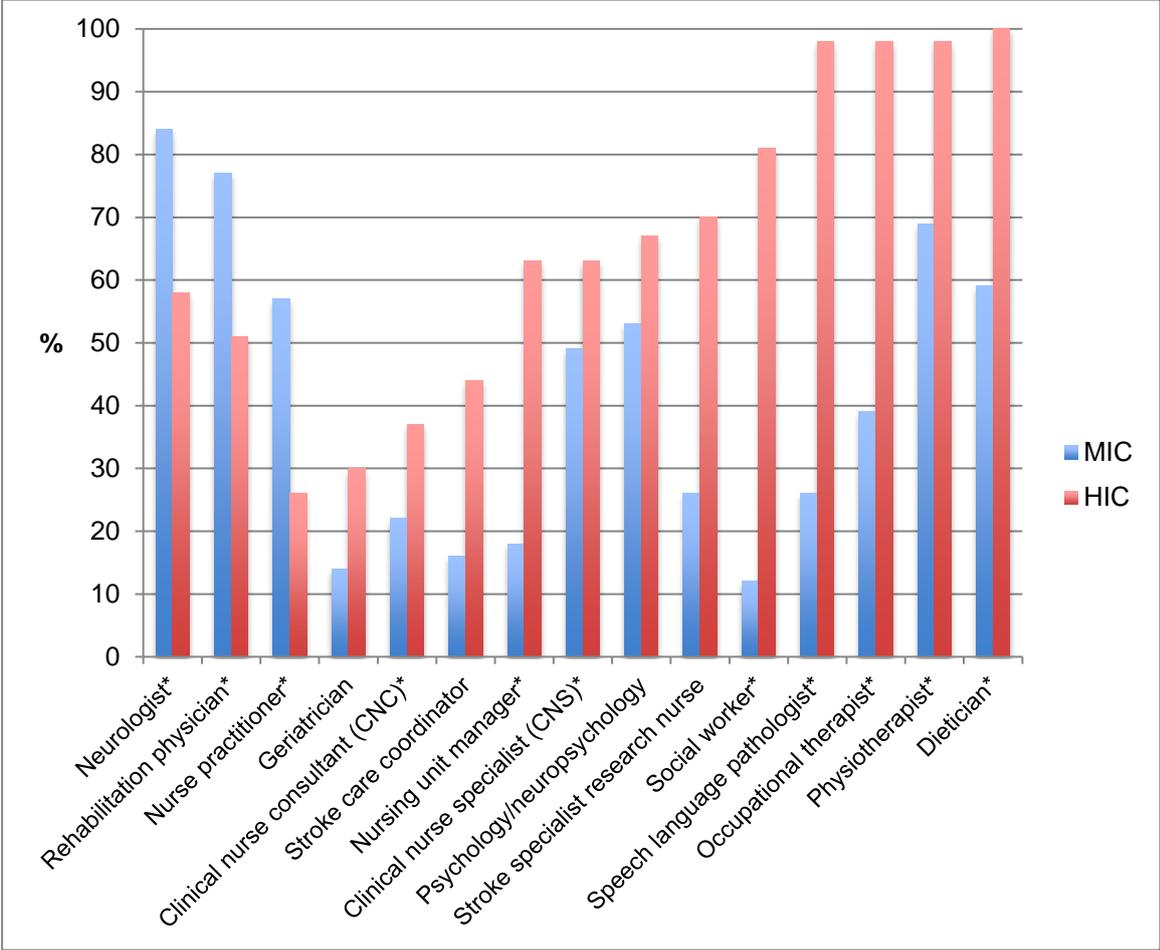
	MIC	HIC	P value
Special pathway, ward or service organisation for stroke care	40 (82%)	41 (95%)	NS
Current ED pathway/checklist for rapid triage and treatment of patients with acute ischemic stroke	48 (94%)	38 (88%)	NS
Clinical pathway/checklist for patients with acute intracerebral hemorrhage	42 (86%)	28 (68%)	0.048
Protocol for administering intravenous rtPA	45 (100%)	41 (100%)	NS
Guidelines for acute treatment of stroke patients in the stroke care unit	44 (94%)	41 (95%)	NS
Local protocols for fever control	45 (88%)	34 (79%)	NS
Local protocols for reducing elevated blood glucose levels	44(86%)	37 (86%)	NS
Local protocols for swallow dysfunction	45 (88%)	41 (95%)	NS
Protocol for referral to the following health professionals:			
Physiotherapist	34 (67%)	36 (84%)	NS
Speech pathologist	16 (31%)	39 (91%)	<0.001
Occupational therapist	17 (33%)	36 (84%)	<0.001
Dietician	24 (47%)	37 (86%)	<0.001
Psychologist	22 (43%)	22 (51%)	NS
Psychiatrist	9 (18%)	21 (49%)	0.002
Social worker	6 (12%)	35 (81%)	<0.001
Swallowing screen performed within 24 hours for all stroke patients	28 (56%)	34 (79%)	0.027
Formal swallowing assessment performed on referral	17 (36%)	31 (72%)	0.001
Discharge summary sent to the General Practitioner	16 (36%)	41 (95%)	<0.001
Routine outpatient clinic follow-up review for all stroke patients	41 (87%)	37 (86%)	NS
Early supported discharge service with home-based rehabilitation and assessment	29 (60%)	33 (77%)	NS
Access to on-going rehabilitation at the hospital or at another hospital	44 (92%)	41 (95%)	NS
Home nursing service available for stroke patients	11 (23%)	26 (63%)	<0.001

Access to palliative care services	17 (37%)	42 (98%)	<0.001
Nursing staff attend continuing education on stroke management	42 (86%)	39 (91%)	NS
Quality improvement activities in the last 2 years for the stroke team	36 (75%)	40 (93%)	0.007
Dedicated stroke team	42 (82%)	41 (95%)	NS
Onsite specialist physicians responsible for stroke patients	47 (92%)	42 (98%)	NS
Number of patients to one staff member in ED:			
Nurse	4.5 (2-8)	4 (3-7)	NS
Health assistant	5 (3-10)	6 (4-8)	NS
Number of patients to one staff member in the stroke care unit:			
Nurse	6 (4-9)	6 (4-8)	NS
Health assistant	5.5 (2-10)	7 (6-8)	NS
Medical staff from the stroke service available in ED	34 (68%)	36 (88%)	0.044
Doctor rostered to attend after hours stroke patients admission	44 (92%)	26 (61%)	<0.001
Multidisciplinary stroke team meetings held at least weekly	24 (48%)	38 (93%)	<0.001
Stroke unit team provide care or advice out of the stroke care unit	36 (78%)	42 (100%)	0.001

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Data are presented in number and percentage or median and interquartile range (IQR)  
ED: emergency department, MIC: middle income countries, HIC: high income countries,  
rtPA: recombinant tissue plasminogen activator, NS: not significant. P value from Chi squared, Fisher or Mann-Withney test as appropriate.

Figure: Percentage of hospitals having different health professionals involved in the management of stroke patients, by country income



\* indicates a statistically significant difference, with P value <0.05  
 MIC: middle-income countries, HIC: high-income countries

## Hospital details

1. Is the hospital a teaching hospital?  Yes  No
2. Number of beds in the hospital? |\_|\_|\_|\_|\_| beds
3. Location of the hospital: *(tick one answer)*  
 Metropolitan / urban  
 Semi-metropolitan / semi-urban  
 Rural / countryside
4. Does the hospital have an intensive care unit?  Yes  No
5. Does the hospital maintain a stroke database?  Yes  No
6. Does the hospital have onsite specialist physicians responsible for stroke patients?  Yes  No
7. Does the hospital use telemedicine links to smaller hospitals?  Yes  No
8. Does the hospital have transfer protocols for acute stroke treatment or care with other hospitals?  Yes  No
9. Does the hospital have a dedicated, multidisciplinary stroke team?  Yes  No

## Stroke pathways

10. Does the city have an emergency call service? *(e.g. 9-1-1, or 0-0-0, or 9-9-9)*  Yes  No
11. Are ambulance services organised for direct transfer to the hospital of suspected stroke patients? *(tick one answer)*  
 Yes  
 No  
 No but, there is agreement to bypass the hospital for another stroke specific service  
 Unsure
12. What proportion of stroke patients arrive at the hospital by ambulance? |\_|\_| %
13. What proportion of stroke patients arrive within 4 hours of the onset of symptoms? |\_|\_| %
14. Is the ED contacted / notified of an acute stroke patient by the ambulance service before arrival at the hospital?  Yes  No

## Hospital organisation questionnaire

15. Do stroke patients have a fast track access to brain imaging from the ambulance to the radiology department?  Yes  No
16. Is there an acute "code stroke" pager system for potential thrombolysis patients?  Yes  No
17. Does the hospital manage complex strokes that require neurosurgical intervention?  Yes  No
18. Which team usually manages stroke patients at the hospital? *(tick one)*  
 General medical team  
 Stroke geriatric team  
 General geriatric team  
 Stroke neurology team  
 General neurology team  
 General practitioner/visiting medical officers
19. What proportions (%) of acute stroke patients are admitted to the following units or departments in the hospital? *(answer 0 to all that is not applicable)*  
Short stay ward in emergency department |\_|\_|\_| %  
Intensive care unit |\_|\_|\_| %  
Specialised stroke care unit |\_|\_|\_| %  
Neurology ward |\_|\_|\_| %  
Neurosurgical ward |\_|\_|\_| %  
Geriatric ward |\_|\_|\_| %  
Geriatric rehabilitation ward |\_|\_|\_| %  
General medical ward |\_|\_|\_| %  
Other |\_|\_|\_| %

## Emergency Department (ED)

20. Number of beds in ED? |\_|\_|\_|\_|\_| beds
  21. Average number of patients seen in ED per month? |\_|\_|\_|\_|\_| patients
- Generally, what is the number of patients to one staff? *(answer 0 if not applicable)*
22. Number of patients to one nurse |\_|\_|
  23. Number of patients to one health assistant |\_|\_|

24. Select what best describes the ED at the hospital:

- Dedicated ED
- No dedicated ED but a designated "emergency area" in a small hospital

a. If dedicated ED, does it have: *(tick all that apply)*

- an intensive care unit?
- a high dependency or acute medical unit (AMU)?
- a separate resuscitation area?
- a short stay ward?

25. Are there current ED clinical pathway/checklist/protocols for ischaemic stroke patients for:

- Rapid triage and treatment for acute stroke?
- Early transfer to another hospital?

26. Do you have a clinical pathway/checklist for patients with acute intracerebral haemorrhage?  Yes  No

27. What proportion of stroke patients stay in the ED beyond 4 hours?  |  |  |  %

28. Are there medical staff from the stroke service (specialist, fellow or registrar) available in ED?  Yes  No

a. If YES:

- Availability on site 24/7
- Monday to Friday during working hours (8-5), on-call after hours
- Designated phone or telemedicine support only
- Other, please specify: \_\_\_\_\_

b. If NO stroke service available in ED, acute management advice primarily provided by:

- General Physician
- Emergency Medicine Specialist
- General Practitioner or Career Medical Officer
- Other, please specify: \_\_\_\_\_

29. What area in the ED are stroke patients mostly assessed? *(tick one)*

- General area
- Dedicated area for stroke patients
- Dedicated resuscitation area
- Short stay ward
- Other, please specify: \_\_\_\_\_

## Imaging and investigation

Does the hospital have the following investigations for stroke patients:

30. Urgent CT scan on arrival at the hospital?  Yes  No
- If YES, what is the availability?
- 24 hours, 7 days of the week
- Working hours only (8-5)
- Working hours (8-5) and on – call after hours
31. MR Imaging  Yes  No
- If YES, what is the availability?
- a. On-site MRI within 24-48 hours of stroke presentation  Yes  No
- b. Off-site MRI within 24-48 hours of stroke presentation  Yes  No
32. Advanced imaging (CT perfusion or angiography)  Yes  No
- If YES, what is the availability?
- a. CTP on most patients  Yes  No
- b. CTA on most patients  Yes  No
33. Is tele-radiology used at the hospital for rapid imaging interpretation?  Yes  No
34. Carotid Doppler ultrasound?  Yes  No
- If YES, what is the availability?
- a. On-site within 48 hours of presentation?  Yes  No
- b. Off-site within 48 hours of presentation?  Yes  No
35. Is Transcranial Doppler routinely performed on stroke patients in the first 24 hours of admission?  Yes  No
36. Echocardiography (transthoracic and/or transesophageal)?  Yes  No
37. Holter monitor or 24hrs ECG for arrhythmia?  Yes  No
38. Is emergency laboratory testing available at all times?  Yes  No

**Acute treatment for stroke**

39. Do you offer intravenous thrombolysis (rt-PA) for appropriate stroke patients at the hospital?  Yes  No
- a. If YES, when is it available?
- Available 24 hours, 7 days per week
- Monday to Friday during working hours (8-5)
- Limited service
- b. Is there a standardised protocol for administering intravenous rt-PA?  Yes  No
- c. How many patients were thrombolysed in the past 12 months? | \_ | \_ | \_ | patients
- d. What proportions (%) of ischaemic stroke patients receive rt-PA? | \_ | \_ | \_ | %
- e. What is the recommended time window for administering intravenous rtPA in eligible ischemic stroke patients at your hospital?
- 3 hours
- 4.5 hours
- Other, please specify: \_\_\_\_\_
- f. Do you routinely collect door-to-needle (DTN) time?  Yes  No
- g. If YES, what is the current average DTN time for rt-PA? | \_ | \_ | \_ | minutes
- h. Is intravenous thrombolysis performed using tele-medicine?  Yes  No
40. Are endovascular therapies available for stroke patients at the hospital?  Yes  No
- a. If YES, which ones: (tick all that apply)
- Intra-arterial thrombolysis and/or thrombectomy of acute ischaemic stroke
- Endovascular (ie coiling) for the treatment of intracranial aneurysms
- Endovascular treatment (ie stents) for carotid stenosis
41. Is endarterectomy for carotid stenosis available at the hospital?  Yes  No
- a. If NO, is there a transfer agreement with another hospital?  Yes  No
42. Is neurosurgery available onsite?  Yes  No
- a. If NO, is there a transfer agreement with another hospital?  Yes  No

43. What is current practice for positioning patients in the acute (<24 hours) phase of **ischaemic stroke**? (tick one)
- Lying flat: 0-5 degrees (allow head on 1 flat pillow but no elevation of head of bed)
- Sitting up:  $\geq 30$  degrees position
- No standard positioning
- Unsure
- Other, please specify: \_\_\_\_\_
44. What is current practice for positioning patients in the acute (<24 hours) phase of **intracerebral haemorrhage**? (tick one)
- Lying flat: 0-5 degrees position (allow head on flat pillow but no elevation of head of bed)
- Sitting up:  $\geq 30$  degrees position
- No standard positioning
- Unsure
- Other, please specify: \_\_\_\_\_
45. Are there specific clinical situations in which you would alter a patient's position?  Yes  No
- a. If yes, what is the current practice for positioning patients in the clinical situations below? (tick all that apply)
- Lying flat for revascularisation (iv or ia thrombolysis or clot retrieval)
- Sitting up ( $\geq 30^\circ$ ) for large hemispheric infarction
- Sitting up ( $\geq 30^\circ$ ) for mechanically ventilated patients
- Sitting up ( $\geq 30^\circ$ ) for drowsy or comatose patients
- Sitting up ( $\geq 30^\circ$ ) for patients with pneumonia
- Sitting up ( $\geq 30^\circ$ ) for patients with dysphagia when they are not eating or drinking (inter meals period)
- Other, please specify: \_\_\_\_\_

To answer the following questions please refer to any existing policy in any department of the hospital where a stroke patient is likely to be admitted

46. Is there a policy indicating early (<24 hours) mobilisation stroke patients (including sitting up or out of bed)?  Yes  No
47. Is there a policy indicating that stroke patients with a nasogastric tube should be positioned sitting up in bed?  Yes  No

**Stroke care and Stroke Care Unit**

48. Does the hospital have a special pathway, ward or service organisation for the management of patients with acute stroke?  Yes  No

## Hospital organisation questionnaire

49. Is there a dedicated stroke ward/unit? (ie a discrete ward or section of ward caring exclusively for stroke patients)  Yes  No
50. If YES, complete (a) and (b) as it best describes the type of stroke ward/unit that is in the hospital:
- a.  Acute stroke unit (ie accept patients acutely but aims for early discharge (usually within seven days))
- Rehabilitation stroke unit (ie accept patients after a delay, usually 7 or more days, with a focus on rehabilitation)
- Comprehensive stroke units (ie combined acute and rehabilitation, accept patients acutely but also provides early rehabilitation for up to several weeks if necessary)
- b.  'intensive' with continuous monitoring, high staffing levels and life support facilities
- 'semi-intensive' with continuous monitoring, high staffing but no life support facilities
- 'non-intensive' with none of the above.
51. Number of dedicated stroke beds in the hospital? | \_ | \_ | \_ | \_ | \_ | \_ | beds
52. Number of acute stroke patients admitted to the hospital annually? | \_ | \_ | \_ | \_ | \_ | \_ | patients
53. Number of acute stroke patients treated in the stroke care unit annually? | \_ | \_ | \_ | \_ | \_ | \_ | patients
54. Are there guidelines for acute treatment of stroke patients in the stroke care unit?  Yes  No
- Generally, what is the number of patients to one staff? (answer 0 if not applicable)
55. Number of patients to one nurse | \_ | \_ | \_ |
56. Number of patients to one health assistant | \_ | \_ | \_ |
57. Is a doctor stroke specialist available in the stroke care unit? (tick one)
- Availability 24 hours, 7 days per week
- Monday to Friday during working hours (8-5) and on-call after hours
- Monday to Friday during working hours (8-5)
- Limited availability
- Not available
58. Does the stroke unit team provide medical care or advice for patients not in the stroke care ward/unit? (i.e. for outpatients, 'in-reach' or 'mobile' service)  Yes  No

- How many of the following medical officers attend a typical ward round in the stroke ward/unit?
- |  | weekdays  | weekends  |
|--|-----------|-----------|
| 59. Consultants  | _   _   _ | _   _   _ |
| 60. Fellow/advanced trainees (senior training doctors)           | _   _   _ | _   _   _ |
| 61. Registrars (mid-level training doctor)                       | _   _   _ | _   _   _ |
| 62. Junior medical officers (residents/interns) (junior doctors) | _   _   _ | _   _   _ |
63. What is the stroke specialist consultant review process of patients on the ward?
- 1 consultant sees all patients on a daily roster
- 1 consultant sees all patients on a weekly roster
- 1 consultant sees all patients on a 2-4 week roster
- Each consultant regularly sees their own patients
64. After hours, is there any special doctor rostered to be available to attend specifically to stroke patients who require admission to hospital?  Yes  No
- a. If YES, what is their level of expertise: (tick all that apply)
- Consultant
- Fellow/advanced trainee
- Registrar
- Junior medical officers (residents/interns)
65. Are there other health professionals involved in the management of stroke patients at the hospital? (tick all that apply)
- Advanced medical trainee
- Clinical psychology
- Neuropsychology
- Dietician
- General physician
- General practitioner
- Geriatrician
- Neurologist
- Clinical nurse consultant (CNC)
- Clinical nurse specialist (CNS)
- Stroke care coordinator
- Stroke specialist research nurse
- Stroke nurse educator
- Dysphagia specialist nurse
- Nurse practitioner
- Nursing unit manager (NUM)
- Occupational therapist
- Physiotherapist
- Rehabilitation physician
- Social worker
- Speech language pathologist
- Other: \_\_\_\_\_

66. Is there a protocol for referral to the following health professionals? (*tick all that apply*)
- Physiotherapist
  - Speech pathologist
  - Occupational therapist
  - Dietician
  - Psychologist
  - Psychiatrist
  - Social worker
67. Are there multidisciplinary stroke team meetings held at least weekly?  Yes  No
68. Who decide the position of stroke patients in routine care? (*tick one*)
- Stroke physician or stroke registrar
  - Emergency physician
  - Nurses
  - Health assistants
  - Other, please specify:  
\_\_\_\_\_
69. Are assessment scales routinely used for any of the following situations? (*tick all that apply*)
- Consciousness level
  - Motor impairment
  - Visual impairment
  - Sensory impairment
  - Cognitive impairment
  - Executive function
  - Activities of daily living
  - Mood
  - Incontinence
  - Pressure sore risk
  - Nutrition
70. Are there local protocols (including assessment/monitoring) for any of the following situations? (*tick all that apply*)
- Fever control
  - Reducing elevated blood glucose levels
  - Swallow dysfunction
71. When is a swallowing screen performed for stroke patients? (*tick one*)
- within 24 hours for all patients
  - within 24 hours for selected high risk patients
  - before feeding for all patients
  - before feeding for selected high risk patients
  - never performed

72. Is a formal swallowing assessment by a speech pathologist or speech and language therapist performed routinely? (*tick one*)
- on every stroke patient
  - on referral
  - on selected high risk patients
  - never performed

### Discharge plans, rehabilitation and follow-up services

73. Is a discharge summary sent to the General Practitioner?  Yes  No
74. Do all stroke patients receive a routine outpatient clinic follow-up review?  Yes  No
75. Is there an Early Supported Discharge service with home-based rehabilitation and assessment?  Yes  No
76. Is there access to ongoing rehabilitation at the hospital or at another hospital?  Yes  No
77. Is there a home nursing service available for stroke patients?  Yes  No
78. Is there access to palliative care services?  Yes  No

### Continuing education, research and quality improvement

79. Do nursing staff attend continuing education on stroke management?  Yes  No
80. In the last 2 years, has the stroke team been involved in quality improvement activities (e.g. quality assurance, local audit, developing strategies)?
- Yes
  - No
  - Unsure
81. How would you rate (on a scale '1-10') the support received from hospital management on quality improvement in stroke care? (*0 for none and 10 for exceptional support*) | - | - |

**Thank you for you time in completing the questionnaire.**