Supplementary data – Tables 1 and 2

Table 1. Comparison between results obtained in the study and recommendations in the South African stroke guideline

Recommendations in the national stroke guideline[17]	**Study results**
1. Protocols for the acute and post-acute management of stroke	
• Protocols for referral and transfer of selected stroke patients to a level 2 or 3 hospital	• 19 out of the 28 health professionals reported not having any written protocols to refer to in the wards and emergency units. • The 9 health professionals who reported having protocols were from 4 hospitals: one level 1, one level 2 and the two level 3 hospitals. • Of the 9 health professionals who reported having protocols available, 5 strongly agreed that the protocols (commonly located in the doctor's office, resuscitation area, nurse's station or front desk in the wards) were easily accessible to those who needed to use them. • None of the emergency unit doctors in level 1 and 2 hospitals reported having any protocols for upward referral of patients.
• Evaluation of acute stroke with minimum delay	• 7 out of the 8 emergency unit doctors agreed that strokes were treated as an emergency; however, most (*n*=6) reported that this was dependent on whether the stroke patient presented within the window for reperfusion therapy. If not, they would receive urgent treatment but were not managed as emergencies.
• Use of the National Institutes of Health Stroke Scale (NIHSS)	• 9 out of the 18 doctors agreed that they were familiar with the NIHSS and of those, 8 either disagreed or strongly disagreed that each stroke patient was scored using the NIHSS. • Of the 9, 3 doctors reported only using the NIHSS to grade severity in the acute stroke patients who qualified for intravenous thrombolysis.

2. Availability of recommended diagnostic investigations according to the level of care. Laboratory investigations and bedside tests: blood glucose, full blood count (FBC), urea and electrolytes, erythrocyte sedimentation rate (ESR), C-reactive protein (CRP) and oxygen saturation	• Of the recommended laboratory investigations and bedside tests: o All 8 emergency unit doctors reported always conducting urea and electrolytes, FBC and creatinine tests. o Of the 8 doctors, 7 reported that in addition to the abovementioned tests, they also conducted random blood glucose and oxygen saturation tests on the stroke patients. One of the 8 doctors reported conducting random blood glucose tests only when there was an indication. o None of the emergency unit doctors reported routinely conducting ESR and CRP tests on stroke patients.
• Level 1: No additional diagnostic tests stipulated in guideline	• All five level 1 hospitals had access to chest X-rays and electrocardiograms (ECGs); however, only ECGs were available after office hours at all centres. Chest X-rays were available after office hours at three out of the five level 1 hospitals. • Among the level 1 hospitals, computed tomography (CT) scans were available at one hospital, echocardiograms at two hospitals and duplex Doppler Carotid Sonography (DDCS) at two hospitals; however, none of these investigations were available after office hours.
• Level 2: CT scan, ECG, chest X-ray, echocardiogram	• During office hours, the health professionals at the level 2 hospital had access to all investigations recommended by the guideline, however, only chest X-rays and ECGs were available after office hours.
• Level 3: Magnetic resonance imaging (MRI) scan, CT scan, angiography, ECG, chest X-ray, echocardiogram (trans-thoracic and trans-oesophageal), DDCS	• The two level 3 hospitals met all the recommended diagnostic investigations, and these were accessible 24 hours a day.
3. Swallow test	• Of the 18 nurses and emergency unit doctors, 13 either agreed or strongly agreed that swallow tests were routinely performed on patients before they were allowed to eat or drink. • Speech and language therapists were

	reported as often being responsible for performing swallow tests, followed by doctors and then nurses. • Four of the 18 health professionals reported physiotherapists, occupational therapists and dieticians as being responsible for performing swallow tests at their hospitals. • Even though doctors and nurses were among those who were responsible for performing swallow tests, 56% reported not having been taught how to conduct this test. Of those who reported having been taught, 50% either agreed or strongly agreed that the method used was standardised.
4. Observations (including frequency) conducted by the nurses	• All 10 nurses reported that they conducted the following observations; body temperature, blood pressure, pulse rate and respiratory rate. • For the remaining observations: random blood sugar tests, oxygen saturation, level of consciousness and fluid input and output, 6 of the 10 nurses reported conducting these observations only when indicated by the doctor or when the patient had a specific medical indication. • In the stroke units, the nurses reported that the frequency of observations ranged from ½-hourly to 4-hourly and up to 6 - 8-hourly in the first 24 hours. For those in the general medical wards, the frequency of observations ranged from 2- to 8-hourly. • After 72 hours, 5 out of the 10 nurses reported that the frequency of observations depended on the condition of the patient at that time, existing comorbidities, and the doctor's orders.
5. Involvement of patients and relatives	• All the doctors and nurses in the stroke units and general medical wards at all levels either agreed or strongly agreed that patients and their relatives were involved in management and discharge plans. • Topics that were reported to be discussed included stroke definition, risk factors

	and planned management in hospital and on discharge, medication for secondary prevention, feeding, rehabilitation exercises, patient mobilisation, home safety, lifestyle modification and placement after discharge. • Of the 20 medical doctors and nurses working in the general medical wards and stroke units, 6 reported specifically addressing psychological problems during discussions with patients and relatives. • Of the 10 nurses, only 2 reported having a standardised list of topics to discuss with patients and relatives.

Table 2. Challenges and interventions suggested by the health professionals at level 1, 2 and 3 hospitals

Challenges	Proposed interventions
• Patient delays: most patients presented to the hospitals outside the window for reperfusion therapy	• Community education programmes: educating the public on stroke risk factors, symptoms and the benefits of stroke patients receiving early interventions in hospital.
• Delays in ambulance services despatching vehicles to transport patients	• Increase the number of ambulance vehicles available. • Develop acute stroke protocols for the ambulance services so that all stroke patients within the window for intravenous thrombolysis are quickly identified and transported directly to level 3 hospitals or at least, hospitals with computed tomography (CT) facilities. • Make helicopter ambulance services available to transport acute ischaemic stroke patients suitable for reperfusion therapy in situations where the normal ambulance services cannot dispatch a vehicle in time.
• Inadequate knowledge on acute ischaemic stroke among the health professionals resulting in delays in patients receiving the appropriate treatment once they arrive at the health facility: o Some primary healthcare providers failing to quickly recognise the signs and symptoms of stroke resulting in an acute stroke patient either being delayed or not being referred to higher levels of care o An acute ischaemic stroke patient incorrectly triaged in the emergency unit leading to delays in the patient being examined and properly managed	• Regular stroke education programmes for all health professionals at all levels of care so that stroke care is standardised. • Make protocols available to all health professionals. • Regular triage training programmes for nurses in the emergency unit.
• Shortage of health professionals: o Nursing staff shortages at all	• Increase the number of health professionals at all hospital

hospital levels: In some lower-level hospitals, only one nurse was available to assist the immobile and sometimes overweight stroke patient with their 2-hourly turns, feeding and personal hygiene in addition to their responsibilities for the other patients on the ward. These shortages meant the nurses were not able to spend enough time providing the appropriate nursing care for the stroke patients. ○ Shortage of emergency unit doctors, physiotherapists, speech and language therapists, occupational therapists, dieticians and social workers at level 1 and 2 hospitals	levels. • Establish more comprehensive rehabilitation departments at the level 1 and 2 hospitals, for example, establishing in hospital speech and language therapy and occupational therapy units. • Stroke training programmes for the nurses facilitated by the physiotherapists to train the nurses how to safely mobilise patients without injuring themselves or the patients. • Employ home-based carers trained in stroke care to assist the nurses with the stroke patients on the wards.
• No designated areas in the hospital for stroke patient management	• Establish multidisciplinary stroke units with designated areas at all the level 1 and 2 hospitals with dedicated staff who conduct regular stroke rounds. • To engage the stroke unit doctors at level 3 hospitals so that they are more involved in the care of stroke patients in the general medical wards of their level 3 hospitals.
• Shortage of beds in the wards and in the emergency unit: some stroke patients spent more than 24 hours in the emergency unit before a bed became available in the wards • Shortage of beds at the inpatient rehabilitation facilities: some stroke patients had to wait for long periods in the hospital wards for rehabilitation facility placement	• Increase the number of beds in the level 3 hospital stroke units. • Upskill staff in stroke care at all hospital levels so that they are able to provide improved early care that could result in better patient outcomes, lessening the overall number of patients requiring institutionalised care on discharge.
• Shortage of equipment such as pressure mattresses, wheelchairs and other mobilisation devices	• Increase the availability of equipment such as pressure mattresses, intermittent pneumatic compression devices, wheelchairs and other

• Limited access to diagnostic investigations for the level 1 and 2 hospitals	mobilisation devices at all hospital levels. • Increase access to diagnostic investigations such as CT scans, duplex Doppler carotid sonography and echocardiograms at level 1 and 2 hospitals.

• Psychological problems
  ○ Patients who were in denial and became aggressive towards the nurses
  ○ Relatives who could not cope with the patient at home and brought the patient to the hospital for admission
	• Ongoing counselling for both the patients and their relatives to address some of the psychological problems that can develop.
	• Support for patients and relatives at home through the help of home-based carers trained in stroke care.
	• Better outpatient care:
	  ○ provision of wheelchairs and other mobilisation devices
	  ○ follow-up appointments that are closer together to monitor secondary prevention strategies.