

Shortfall in stroke care: A study of ischaemic stroke care practices in a South African metropole

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Background. In recent years there have been significant advances in the management of stroke. In particular, reperfusion therapies have been shown to confer significant benefit, with the possibility of reversing ischaemic stroke or reducing disability when administered to suitable patients. However, these therapies also carry significant risk, including death. The South African (SA) and other international guidelines for stroke care provide recommendations to optimise benefit and reduce risk of these novel treatments. Failure to adhere to recommended guidelines can lead to increased preventable morbidity and mortality in such patients.

Objectives. To describe the acute and post-acute ischaemic stroke services offered to patients in level 1, 2 and 3 hospitals in the Cape Metro Health District, determine levels of adherence to the SA stroke guideline, and identify barriers to optimal stroke patient care.

Methods. This study in five level 1, one level 2 and two level 3 public hospitals involved semi-structured interviewer-administered questionnaires and reviews of ischaemic stroke patient discharge summaries, hospital staffing, stroke protocols, diagnostic investigations available and stroke education for patients and their caregivers. The findings were then compared with recommendations in the national guideline.

Results. Twenty-eight participants (18 doctors, 10 nurses) from the general medical wards, stroke units and emergency units of eight hospitals were invited to participate in interviews. Most level 1 and 2 hospitals experienced difficulties transferring patients to higher levels of care. There was also limited access to stroke management protocols, inadequate stroke education among health professionals, pre- and in-hospital delays in patients receiving medical attention, and limited access to diagnostic investigations. As only a total of 12 stroke unit beds were available at the two level 3 hospitals, the majority of ischaemic stroke patients were admitted to the general medical wards of level 1, 2 and 3 hospitals. The level of care at all these facilities was not homogeneous.

Conclusions. The two stroke units at the level 3 hospitals adhered most closely to the recommended SA stroke guideline. Elsewhere, ischaemic stroke care varied widely across general medical wards at all hospital levels. Adherence to the guideline was influenced by factors such as limited access to diagnostic investigations, patient delays in receiving medical attention, and shortages of staff. Monitoring systems for continuous evaluation of the quality of acute and post-acute stroke services are needed. The shortfall in compliance with recommended stroke treatment guidelines could lead to worse outcomes and exposure to litigation.

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Strokes are an important global cause of disability and death in adults, particularly in low- and middle-income countries (LMICs).^[1-3] The past four decades have seen a 42% decrease in the age-adjusted incidence rates of strokes in high-income countries (HICs), whereas LMICs have seen an increase of more than 100% from 52 to 117 per 100 000 person-years during the same period.^[4-6] In South Africa (SA), as in many other LMICs, stroke is an important public health problem. In 2017, cerebrovascular diseases were ranked third in the top 10 leading causes of death (reported as immediately causing or contributing to death) in SA,^[7] and are a major cause of disability in adults.

Interventions that combine prevention strategies and stroke care have been found to reduce stroke incidence and mortality rates.^[8] The management of acute stroke patients in a stroke unit by an organised multidisciplinary team (MDT) has been found to impact positively on outcomes.^[9,10] There is robust evidence to show that the stroke unit model of care has favourable effects on patient outcomes, lowers the risk of death and reduces requirements for institutionalised care.^[11-16] This evidence informed publication of the SA guideline for the management of stroke.^[17] Furthermore, there have been significant recent advances in the management of

stroke. In particular, reperfusion therapies (intravenous thrombolysis and intra-arterial mechanical thrombectomy) have been shown to confer significant benefit, with the possibility of reversing ischaemic stroke or reducing disability when administered to suitable patients. However, these therapies also carry significant risk, including death. The SA and other international guidelines for stroke care provide recommendations to optimise benefit and reduce risk of these novel treatments. However, since the SA guideline was published in 2010, no evaluation has been conducted to assess the degree to which the guideline is being applied in hospitals, if at all.

Objectives

To describe the organisation of the acute and post-acute ischaemic stroke care services offered in level 1, 2 and 3 hospitals in the Cape Metro Health District (CMHD), compare these services with the national guideline, and identify any barriers to optimal stroke patient care. A level 1 hospital (primary level/district) is a facility at which a range of outpatient and inpatient facilities are offered, where patients have conditions that can be managed by a medical officer or a team led by a family doctor; a level 2 hospital (secondary level/provincial) provides care requiring the intervention of specialists as well as general

practitioner services; and a level 3 hospital (tertiary level/academic) is a facility that provides specialist and subspecialist care.^[17]

Methods

Study design

The study design was descriptive, involving semi-structured interviewer-administered questionnaires and reviews of ischaemic stroke patient discharge summaries, hospital staffing, stroke protocols and diagnostic investigations available, as well as stroke education for patients and their caregivers.

Setting

Nine level 1, 2 and 3 public hospitals ($n=6$, 1 and 2, respectively) with inpatient facilities located in the CMHD were included in the study. The two level 3 hospitals manage patients from their catchment area as well as those transferred from their referring level 1 and 2 health facilities for specialised investigations, care and/or treatment such as management of stroke in a young patient or treatment with reperfusion therapies. Level 1 and 2 hospitals are most often located close to or within the communities they serve, and are often the first contact that acute stroke patients have with the health system. Four of the level 1 hospitals in the CMHD refer their patients to one level 3 hospital, and the distance between these facilities ranges from 4 km to 25 km. The second level 3 hospital has one level 2 and two level 1 hospitals that refer patients, and the distance between these facilities ranges from 9 km to 33 km.

Participants

From each of the hospitals, 3 health professionals were randomly selected to participate in an interview. The interview participants were 1 doctor and 1 nurse each from the general medical wards and 1 doctor from the emergency unit. For the level 3 hospitals, in addition to the 3 health professionals previously mentioned, 1 doctor and 1 nurse from each of the stroke units were randomly selected to participate in the interviews. Therefore, for each of the level 1 and 2 hospitals, there was a total of 3 health professionals, and for each of the level 3 hospitals, a total of 5.

Data collection tools

The interviews were conducted through interviewer-administered semi-structured questionnaires (available as a supplementary file, <http://samj.org.za/public/sup/15104-q.pdf>) that had a combination of open-ended, closed-ended and ranking questions (Likert scale).

After the interviews, a review was conducted at each hospital to assess the hospital staffing (staff allocation), availability of stroke protocols, access to diagnostic investigations, and stroke education for patients and caregivers. For the review, a data collection tool was designed specifically for each hospital level, using the minimal requirements for each hospital level (levels 1, 2 and 3) stipulated in the national stroke guideline under these four thematic areas. Each interview participant was asked to ascertain the presence or absence of the minimum requirements for their hospital level under the different thematic areas. The presence of protocols and diagnostic equipment was also verified physically by the interviewer.

A review of patient discharge summaries (first admissions) was conducted at one level 3 hospital, selected because it had the most complete discharge records. Patient data for this one hospital were used because it was one of the two referral hospitals (level 3), and an assumption was made that that patient care at the two hospitals would be similar. Anticipated challenges at the level 1 and 2 hospitals were related to retrieval of the paper-based records from their

records departments, as well as incomplete or inaccurate coding of the diagnosis.

Sample size calculation

A total of 145 discharge summaries for adult ischaemic stroke patients (aged ≥ 18 years) admitted over a 6-month period (1 August 2016 - 31 January 2017) were identified. From these, 96 were randomly selected for the analysis. The sample size of 96 ischaemic stroke patients was based on anticipated prevalence of adherence to guidelines of 50%, a 95% confidence interval and a precision of 10%. The variables included age, gender, admitting ward (general medical ward or stroke unit), comorbidities, laboratory and radiological investigations, whether or not medication for secondary prevention was prescribed, and whether the patient was discharged home or to an institution.

Data analysis

All data collected were then compared with the recommendations in the national guideline pertaining to service delivery, which included most of the minimum requirements stipulated for each level of care (level 1, 2 and 3 hospitals). Data from the level 3 hospital were triangulated using the interviews, reviews and patient discharge summaries.

Results

Data were collected over a 5-month period from February 2017 to June 2017. A total of 28 participants from eight hospitals were recruited for the interviews: 8 doctors and 8 nurses from the general medical wards, 2 doctors and 2 nurses from the stroke units, and 8 doctors from the emergency units. One level 1 hospital was not able to participate in the study, and no doctors and nurses were recruited from this facility.

Service organisation

Most of the doctors from the general medical wards (60%) and emergency units (75%) were medical officers and the remainder were medical registrars. Of the nurses, most were registered nurses (70%) and the rest were either enrolled nursing assistants or enrolled nurses. The median (interquartile range (IQR)) times since qualifying for the ward doctors, ward nurses and emergency unit doctors were 7 (6.3 - 9), 19 (5.3 - 26) and 5.5 (3.7 - 7.5) years, respectively, and the mean (IQR) durations of managing stroke patients were 2.3 (1.3 - 3), 12 (2 - 15) and 0.8 (0.7 - 2.3) years, respectively.

There were two stroke units in the CMHD, located at the two level 3 hospitals, each with only 6 beds; most patients in the level 3 hospitals were therefore admitted into general medical wards. Those at level 1 and 2 hospitals were admitted into either general medical wards or mixed medical and surgical wards.

MDT meetings were reported to be held once a week in the wards of three of the five level 1 hospitals and twice a week in both stroke units of the two level 3 hospitals. The MDT meetings in these five hospitals included medical doctors, nurses, physiotherapists, social workers and dieticians. Occupational therapists and speech and language therapists attended the MDT meetings at four out of the five hospitals (two level 1 hospitals and two stroke units). Psychologists were not reported to be a part of the MDT meetings in all five hospitals; however, they were consulted if needed. A unique category of staff reported as attending the MDT meetings at one level 1 hospital were home-based carers.

At the level 2 hospital and in the general medical wards of the two level 3 hospitals, it was reported that consultant ward rounds were

regularly conducted. Health professionals from other disciplines such as physiotherapy and social work were often consulted. However, no comprehensive MDT meetings were held in the general medical wards of these hospitals. Responses on the MDT meetings and consultant ward rounds were consistent between the doctors and nurses in the general medical wards of the three level 1 hospitals and one level 2 hospital, and the two stroke units of the level 3 hospitals.

Reperfusion therapy with recombinant tissue plasminogen activator (tPA) was available only at the level 3 hospitals. However, some doctors from these hospitals reported that only a small fraction of acute ischaemic stroke patients received tPA, as most arrived outside the window for thrombolysis. Of the 96 discharge summaries reviewed, only 1 patient was recorded as having received tPA. Common reasons stated by the doctors at level 1 and 2 hospitals as to why they did not administer tPA were delays in patients presenting to hospital, limited access to computed tomography (CT) scans, and shortages of staff. Of the 18 general medical ward and emergency unit doctors, 14 set the cut-off for the administration of tPA at ≤ 4.5 hours, 2 set it at > 4.5 hours and 2 set it as a range from 3 to 6 hours.

Of all the doctors from level 1 and 2 hospitals, 83% reported being able to transfer stroke patients to level 3 hospitals if they were suitable candidates for thrombolysis, but not without difficulty, largely owing to delays in arrival of the over-stretched ambulance services. The emergency unit doctors at the level 1 and 2 hospitals reported that the time period between making a clinical diagnosis of an acute stroke and transferring the patient to a level 3 hospital ranged between 20 minutes and 12 hours. This, however, was reported to be dependent on the level 3 hospitals agreeing to take over management of the patient and on how quickly the ambulance was dispatched and arrived at the lower-level hospitals to transfer the patient. The level 3 hospital doctors reported that patients who arrived within the window for intravenous thrombolysis were prioritised, and the majority obtained an interpreted CT scan within 30 minutes of arrival. For patients who arrived at the hospitals outside the window for tPA (level 1, 2 and 3 hospitals), i.e. > 4.5 hours after the onset of ischaemic stroke, the time interval from a clinical diagnosis to obtaining an interpreted CT scan ranged from a few hours up to 2 days.

In the two stroke units, the doctors and nurses had access to protocols, diagnostic investigations and tPA, and had comprehensive MDT meetings. This was in contrast to those in most level 1 and 2 hospitals, who did not have protocols to guide management, continuing medical training programmes in stroke care, or access to some diagnostic investigations. Of all the health professionals, 32.1% reported having written stroke management protocols available in the wards and emergency unit; however, none of the emergency unit doctors reported having protocols for referral and transfer of patients to higher-level centres. Although most health professionals did not have set guidelines for the discussions they held with the

stroke patients and their caregivers, involving them in their care and discharge plans was consistently reported across all levels of care.

Delays in patient presentation and transfer from lower-level hospitals were a common challenge faced by the health professionals throughout all levels of care. Other challenges included limited access to diagnostic investigations, shortages of staff, and inadequate beds in the hospitals and rehabilitation facilities. The shortage of rehabilitation beds resulted in patients staying longer in hospital, occupying beds that could have been used for incoming acute stroke patients.

Clinical data

In the 96 ischaemic stroke patient discharge summaries reviewed, hypertension was the most common risk factor at the level 3 hospital over the 6-month period, followed by diabetes mellitus and then hyperlipidaemia (71.9% ($n=69$), 30.2% ($n=29$) and 11.5% ($n=11$), respectively). Of patients with hypertension and those with diabetes mellitus, 92.8% and 75.9%, respectively, received prescriptions for antihypertensive and antidiabetic medication on discharge. Of those with hyperlipidaemia, 90.9% received prescriptions for lipid-lowering medication on discharge, and of those without a diagnosis of hyperlipidaemia, 87.1% received prescriptions for lipid-lowering medication for secondary prevention. Of the 96 ischaemic stroke patients, 80.2% ($n=77$) received prescriptions for aspirin on discharge.

During the period under review, fewer patients were admitted into the stroke unit ($n=31$) than to the general medical ward, and they were admitted for a longer period (mean (IQR) 16 (8 - 21) days v. 10 (6 - 13) days). However, the risk factor profile was similar in both wards, with hypertension being the most common, followed by diabetes mellitus and then hyperlipidaemia. A more detailed comparison is shown in Table 1.

Stroke education

Of the 28 health professionals who participated in the interviews, most ($n=26$) were aware of stroke units and had some idea of what stroke unit care entailed. Of all 28 health professionals, 16 reported having received some training specifically in stroke care since qualifying. The types of training described included in-service training, training workshops and refresher courses, as well as taking part in broader programmes such as internal medicine and neurology training, courses in acute emergency medicine and Advanced Cardiac Life Support. Of these 16 health professionals, only one reported having completed an examinable stroke course, 15 years previously. Of the 12 health professionals who had not received any training, 6 were nurses.

Of the 20 doctors and nurses working in the general medical wards and stroke units, 12 (60.0%) reported having scheduled educational seminars or tutorials that included stroke management. Of these

Table 1. Demographic and clinical characteristics

Variable	Stroke unit	General medical ward
Patients admitted, <i>n</i>	31	65
Age (years), median (IQR)	50.3 (38.6 - 62.9)	64.3 (57.3 - 72.2)
Duration of admission (days), median (IQR)	16 (8 - 21)	10 (6 - 13)
Gender female, <i>n</i> (%)	15 (48.4)	34 (52.3)
Hypertension, <i>n</i> (%)	17 (54.8)	52 (80.0)
Diabetes mellitus, <i>n</i> (%)	5 (16.1)	24 (36.9)
Hyperlipidaemia, <i>n</i> (%)	4 (12.9)	7 (10.8)

IQR = interquartile range.

12 health professionals, 10 reported having scheduled seminars or tutorials covering all medical conditions including stroke, and the remaining 2 reported twice-weekly stroke rounds or MDT meetings where the management of stroke patients was discussed. The scheduled seminars and tutorials included case presentations, consultant ward rounds, academic meetings, journal clubs and nursing seminars.

A detailed comparison between the recommendations in the SA stroke guideline and the results obtained in this study can be found in Supplementary Table 1 (available online, <http://samj.org.za/public/sup/15104-t.pdf>). All the health professionals from the different hospitals were asked about the challenges they faced in managing stroke patients and about possible interventions that could be implemented to alleviate these problems. Their responses are elaborated in detail in Supplementary Table 2 (available online, <http://samj.org.za/public/sup/15104-t.pdf>).

Discussion

Service organisation

Generally, the two stroke units adhered most closely to the recommended SA stroke guideline.^[17] However, with only 6 stroke unit beds at each of the two level 3 hospitals, a small proportion of stroke patients received optimal care in stroke units. Of the 96 ischaemic stroke patients admitted at the one level 3 hospital over the 6-month period, only 32% received care in a stroke unit. The majority of patients in the CMHD were admitted into the general medical wards or mixed medical and surgical wards of level 1, 2 and 3 hospitals, where there were wide variations in the degree to which the national stroke guideline was followed. This finding is consistent with other studies conducted in other LMICs that found that there were insufficient stroke units available and that the quality of care offered to stroke patients in these areas was not homogeneous.^[2,18,19]

Apart from the stroke units, regular, comprehensive MDT meetings and availability of management protocols were also not consistent in level 1 and 2 hospitals. Making protocols easily available, holding regular MDT meetings and designating areas for stroke patients in the general medical wards at all levels could help to standardise and improve the quality of care.^[17]

Delays in patient presentation and long ambulance waiting times could explain why a large proportion of acute stroke patients miss the window for reperfusion therapy. Patient delay is a challenge reported in studies involving stroke patient management in both HICs and LMICs.^[4,19,20] Other challenges faced by health professionals who participated in this study were similar to those found in other LMICs: shortage of staff and equipment, lack of protocols, limited access to CT scans, and inadequate knowledge on the part of health professionals.^[19]

The demand for rehabilitation facilities is higher than what is currently available, which increases patient hospital stay and blocks beds for new stroke patients. Community rehabilitation centres and home-based carers trained in stroke care could help to provide a continuum of care that would make for easier transition from the hospital to a rehabilitation facility or back to the community.^[21,22] Only one hospital (level 1) in the study involved home-based carers in the inpatient management of stroke patients, which they found to be of benefit to the patients after discharge.

Clinical data

A review of the discharge summaries of patients from a level 3 hospital was undertaken to provide some context regarding the demographics of stroke patients who utilise the existing stroke services.

Similar to previous studies,^[23] the analysis of patient discharge summaries ($n=96$) found hypertension to be a common risk factor for stroke (72%). Of the three comorbidities included in the analysis, hyperlipidaemia was diagnosed least often (12%); however, most of the ischaemic stroke patients (88%) received lipid-lowering medication, which was in line with the national guideline for secondary prevention.^[17] The majority of the stroke patients in the analysis also received prescriptions for other medications for secondary prevention.

Stroke education

Inadequate stroke education among health professionals was listed as a challenge in this study, similar to other studies conducted in LMICs.^[19] The guideline, however, recommends continued training in stroke care for health professionals involved in providing stroke services. In the present study, nurses seemed to have very few learning opportunities for stroke care, yet they tend to spend more time with stroke patients, providing nursing care throughout the admission period. Educational programmes specifically designed for nurses would be beneficial for both nurses and stroke patients. For the smaller hospitals with fewer doctors, having combined meetings where all medical conditions are discussed is probably more efficient, but provision should be made to include stroke management.

Study limitations

Patient discharge summaries from only one hospital were reviewed and, as these were summaries, some information may have been omitted. It would have been ideal to have reviewed more comprehensive medical records from all the hospitals in the CMHD. Anticipated challenges at the level 1 and 2 hospitals were related to retrieval of the paper-based records from their records departments, as well as incomplete or inaccurate coding of the diagnosis. Nevertheless, the primary objective of this study was to evaluate the organisation of stroke services. The purpose of the review of clinical data of patients from the level 3 hospital was to provide some context regarding the demographics of stroke patients who utilise the existing stroke services, and the sample of 96 patients not only reflects patients admitted from the catchment area of the level 3 hospital but also includes patients who were referred up from level 1 and 2 hospitals for further investigation or management.

Every effort was made to collect data from the different health professionals within each hospital in an unbiased way, but there may nevertheless have been some respondent bias. Random selection from all the eligible nurses at a particular hospital was not always possible, as they work in shifts throughout the day and night, and participants were identified from those working the day shifts. However, there is no reason to believe that nurses on the day shift would have substantially different views to those on the night shift.

Recommendations

This study found that the service offered to ischaemic stroke patients, especially in the lower-level hospitals, fell far short of the recommendations in the national guideline, particularly in the era of reperfusion therapy.

The existing stroke units could assist in co-ordinating and standardising stroke care by organising training programmes in the various aspects of stroke management for the hospitals in their catchment areas, aimed at educating the health professionals on stroke care. The stroke unit model of care was found to be effective in reducing mortality in a low-resourced community hospital in the metropole without incurring increased cost to the hospital.^[24]

This model of care, which includes regular MDT combined ward rounds and scheduled training in stroke care, could be more widely adapted at level 1 and 2 hospitals. The Heart and Stroke Foundation of South Africa, the World Stroke Academy and the Angels Initiative all have online web-based resources available covering essential topics in stroke care that can be utilised for on-site training. Relevant information is also available for stroke patients and their caregivers.

In recent years, emphasis in the stroke literature has shifted dramatically towards acute reperfusion therapies with their respective benefits and risks. Training of paramedics who respond to stroke calls is essential, and should include techniques for the rapid diagnosis of stroke such as the FAST test (Facial drooping, Arm weakness, Speech difficulties and Time to call emergency services and to record time of onset of stroke symptoms). Once time of onset (last seen as normal) has been determined, and if a patient is able to be transferred to a hospital within the therapeutic time window, prehospital notification and routing directly to the 'stroke-ready' hospital (i.e. a hospital with capability and standard operating procedures in place for stroke reperfusion), bypassing lower-level hospitals not geared for this type of treatment, is ideal and can substantially reduce prehospital delays for stroke management. Patients for whom this is not achievable can be transferred for ongoing stroke care at level 1 or 2 hospitals as soon as possible.

Many level 2 hospitals with 24-hour CT scan and laboratory facilities would be able to administer intravenous thrombolysis to appropriate patients if medical and nursing staff are suitably informed and trained regarding the indications for, contraindications to and risks of this treatment option. Standard pathways and operating procedures would also need to be put in place at the facility before intravenous thrombolysis could be administered to patients. Telemedicine communication with existing stroke units could facilitate this process. In future, a more comprehensive analysis of the health system may need to be undertaken to understand why service delivery for stroke patients in the lower-level hospitals is suboptimal. Equally important are cost-effectiveness studies that could be used as a guide for implementation of the recommendations in the national stroke guideline. Monitoring systems for continuous evaluation of the quality of acute and post-acute stroke services are also needed.

Conclusions

This study highlights the challenges that health professionals face in managing acute stroke. The two stroke units at the level 3 hospitals adhered most closely to the recommended SA national guideline for stroke care, but there were considerable variations in the extent of adherence in the general medical wards in level 1, 2 and 3 hospitals, where the majority of stroke patients continue to be treated. Limited access to diagnostic investigations, inadequate training in stroke management, prehospital and in-hospital delays in accessing medical attention, staff shortages, and lack of standard operating procedures for acute stroke management all influenced the extent of adherence to the recommendations in the stroke guideline. Interventions are needed to alleviate some of these challenges if the quality of stroke care is to improve.

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Conflicts of interest. None.

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