Stroke care in Africa: a systematic review of the literature

Cover title: Practice for stroke care in Africa

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ABSTRACT

Background: Appropriate systems of stroke care are important to manage the increasing death and disability associated with stroke in Africa. Information on existing stroke services in African countries is limited.

Aim: To describe the status of stroke care in Africa.

Summary of review: We undertook a systematic search of the published literature to identify recent (January 1st, 2006-June 20th, 2017) publications that described stroke care in any African country. Our initial search yielded 838 potential papers, of which 38 publications were eligible representing 14/54 African countries. Across the publications included for our review, the proportion of stroke patients reported to arrive at hospital within three hours from stroke onset varied between 10─43%. The median time interval between stroke onset and hospital admission was 31 hours. Poor awareness of stroke signs and symptoms, shortages of medical transportation, health care personnel, and stroke units, and the high cost of brain imaging, thrombolysis, and outpatient physiotherapy rehabilitation services were reported as major barriers to providing best-practice stroke care in Africa.

Conclusions: This review provides an overview of stroke care in Africa, and highlights the paucity of available data. Stroke care in Africa usually fell below the recommended standards with variations across countries and settings. Combined efforts from policy makers and health care professionals in Africa are needed to improve, and ensure access, to organised stroke care in as many settings as possible. Mechanisms to routinely monitor usual care (i.e. registries or audits) are also needed to inform policy and practice.

Keywords

Stroke, awareness, health care, stroke unit, rehabilitation, secondary prevention, Africa

INTRODUCTION

Stroke is the second most common cause of death (1), and the third most common cause of disability-adjusted life-years (DALYs) lost worldwide (2). In contrast to high income countries (HICs) where stroke mortality rates have declined, the burden of stroke in developing countries has risen in recent years and is expected to accelerate (3). Eighty-six percent of all stroke deaths around the world take place in low and middle-income countries (LMICs) (4). Further, LMICs account for over 87% DALYs lost from stroke, which is about seven times the DALYs lost in HICs (5).

African countries are undergoing an epidemiological transition driven by socio-demographic and lifestyle changes related to unchecked industrialization and a rise in many modifiable vascular disease risk factors. These include smoking, harmful use of alcohol, physical inactivity and unhealthy diets resulting in an increased prevalence of hypertension, diabetes and obesity (6). Consequently, the burden of non-communicable diseases (NCDs) including stroke is growing (6). A recent systematic review (7) of community-based studies revealed an age-standardised annual stroke incidence rate of up to 316 per 100,000 population, and age-standardised prevalence rates of up to 981 per 100,000 in Africa. However, health systems in many African countries are characterised by geographical and financial inaccessibility, rapid turnover of people in key positions, lack of continuity in policy, lack of resources, poor management of available resources and poor implementation (8).

It is recommended that appropriate systems of stroke care be established in Africa and other LMIC regions to control the increasing death and disability associated with stroke (9,10). We need information about the existing resources and current practices for stroke care in Africa. There have been some international reviews and surveys (not offered in languages other than

English) on stroke care, but few studies included Africa. Several have relied on self-reported information which may be biased or had a very narrow focus (10-13). This motivated us to conduct a systematic literature review on systems of stroke care in Africa to inform policy makers and health care professionals about areas for improvement across the whole stroke care pathway.

METHODS

This review was performed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (14).

Search strategy: Studies for this review were identified through searches of Ovid Medline, Embase, Amed, CINAHL, PubMed, and African Journals Online (AJOL) databases. There was no language restriction, but the search was limited to contemporary full-text publications (from January 1st, 2006 to June 20th, 2017). The search strategies for different databases were developed in consultation with a medical literature search specialist and are detailed in the *Online Supplement.* Additional searching was conducted on reference lists of relevant studies to identify publications that could have been omitted in the database searches.

Inclusion criteria: Publications describing stroke care in an African country.

Exclusion criteria: Reviews and clinical trial publications.

Screening and quality assessment: All publications were screened and assessed for eligibility for narrative synthesis by GU in discussion with PL. Publications identified as potentially relevant underwent a full review by two authors (GU and PL) to determine if they met the inclusion criteria. In cases of disagreement, final determination was by discussion and consensus.

Data extraction: Data were extracted using the World Stroke Organisation (WSO) Stroke Services Framework (15) which consists of six phases of the continuum of stroke care: systems for stroke recognition and response, hyperacute stroke care, acute inpatient care, stroke rehabilitation, secondary stroke prevention, and longer-term stroke recovery.

The draft form was pilot tested on five studies for further refinement. The final version allowed extracting data regarding the country, year of publication, study setting, study design, sample size, key element(s) investigated, and the main results.

Thereafter, data from each publication relevant to the current review were systematically extracted by GU. PL crosschecked a sub-sample of 10 studies to ensure accuracy and consistency.

Data analysis: We anticipated that there would be limited and heterogeneous data identified. Therefore, we used a narrative synthesis to summarise the information from the included studies. Information was reported according to the phase of patient journey as conceptualized by the WSO framework (15).

RESULTS

The review profile is shown in Figure 1. We identified 838 references from which 38 publications (16-53) were eligible for our review following de-duplication and screening.

Figure 1: Review profile showing selection of studies
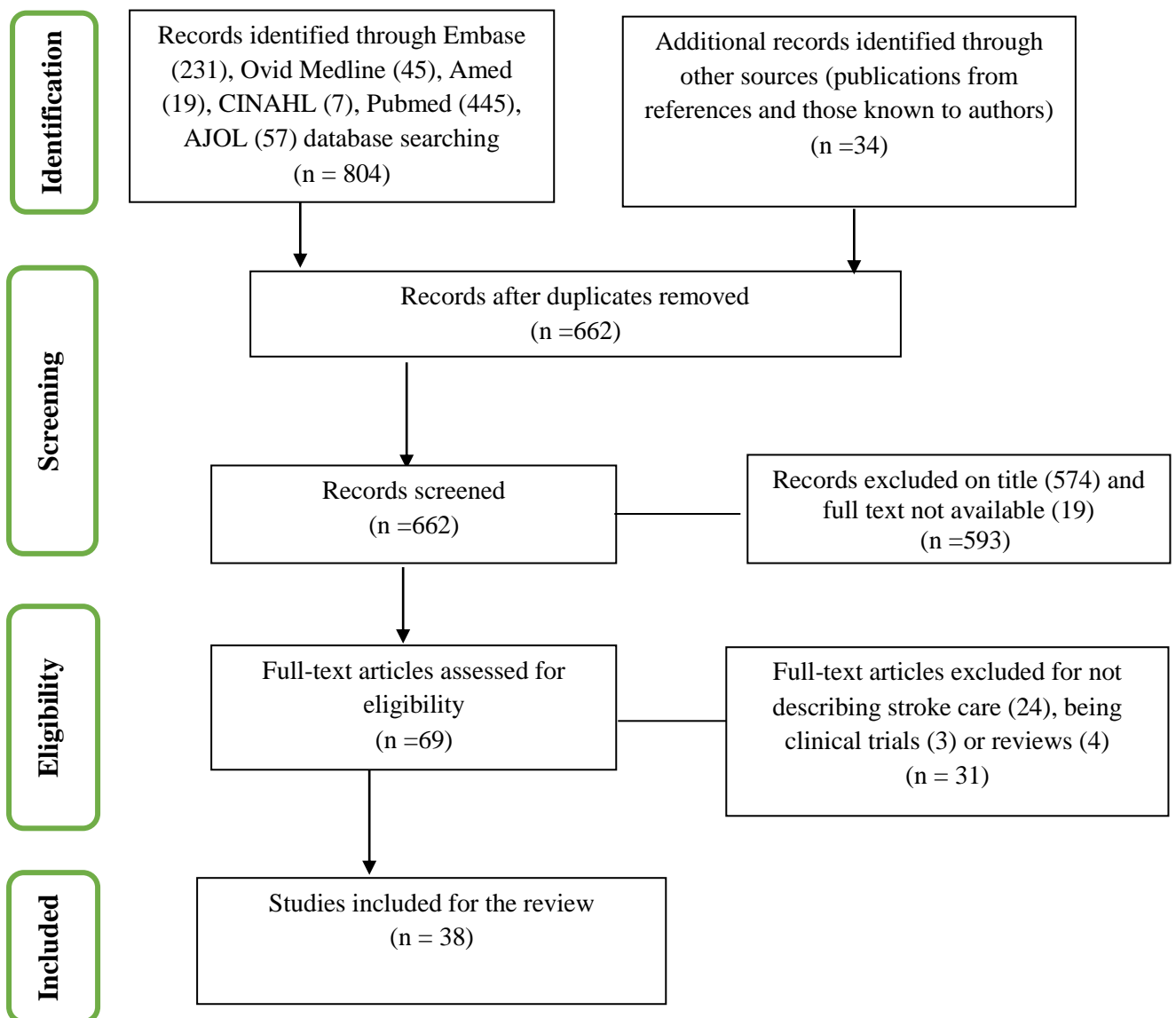
The included publications represent 14/54 African countries from all the main regions (east, west, central, north, and south) (Figure 2).

Figure 2: African map showing countries (in blue) with included publications
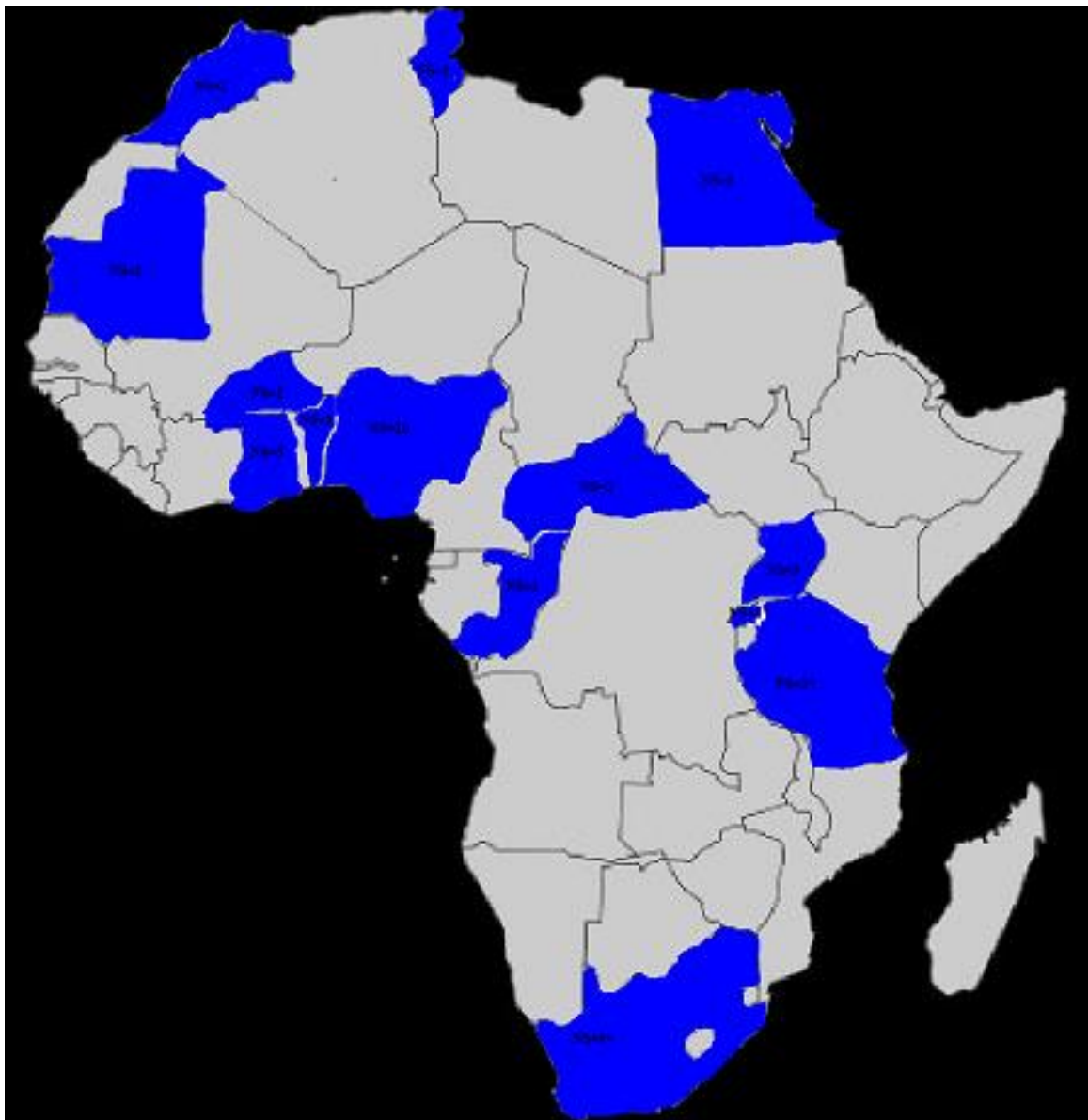
Abbreviations:

NS, number of studies.

 *One study (44) was conducted in three countries including Rwanda, South Africa and Tanzania.

The data ranged from 2008 to 2017, with most (24/38) published between 2013 and 2017.

The publications included single and multi-site studies with varying numbers of respondents

(1 (case study) -15,155 population survey of stroke knowledge). Nigeria and South Africa provided 10 (27.8%) and 9 (25.0%) of the selected publications, respectively. The majority (30/38) of the studies were conducted in urban hospitals or urban communities. Two publications (34,42) were written in French and the remainder were in English.

Table 1 provides a list of the number of publications with information on each stroke care phase from 2008 to 2017.

Table 1: Availability of information reported by stroke care phase from the publications by year

WSO Template	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
Systems for stroke recognition and response	2	2	0	1	3	0	2	3	2	1	**16**
Hyperacute stroke care	1	1	0	0	1	2	1	2	2	1	**11**
Acute inpatient care	2	2	0	0	1	0	0	1	1	0	**7**
Stroke rehabilitation	0	1	0	0	1	2	0	1	0	2	**7**
Secondary stroke prevention	0	1	0	0	0	0	0	0	1	2	**4**
Longer-term stroke recovery	0	1	0	0	0	0	0	0	0	0	**1**

Some publications (26,28,34,39,44) provided information on more than one stroke care phase. Only the first and second phases of stroke care were reported in at least a quarter of the included publications. Secondary stroke prevention and longer-term stroke recovery were rarely reported. The reported core elements related to the stroke care phases are summarized in the *online supplement Table S1.*

Systems for stroke recognition and response

The main core elements related to systems for stroke recognition and response were knowledge of stroke signs and symptoms, perception of adequate response to stroke signs and symptoms, availability and accessibility of stroke care policies and services (16-31).

Regarding the awareness about stroke signs and symptoms, the greatest proportion of participants who knew any of the established stroke signs and symptoms ranged between 18% for paralysis in Uganda (17) and 66% for weakness in Nigeria (22). The most preferred response to stroke signs and symptoms (range: 41%-94%) was bringing the patient to the hospital (20-24), but some participants, between 1-13%, identified seeking spiritual intervention as the first option (19,21-24). In several studies, higher education level was significantly associated with better knowledge (16,19,21,22) of, and better response (19,21) to, stroke signs and symptoms.

Gaps were reported in the availability of stroke care services with variations across countries and settings. The areas in which shortage was commonly reported included medical transportation (27,33,34,36), Computerized Tomography (CT)/Magnetic Resonance Imaging (MRI) scanning machines (26-28,31), stroke units (30,31), thrombolysis (27,31,38), inpatient and long-term rehabilitation services (27), and healthcare personnel in overall number and specialties (26, 28, 31, 38).

The high cost of infrastructure resources where they exist such as CT scanners (26, 27, 37), medications such as thrombolysis (39), and outpatient physiotherapy rehabilitation services (49) were reported as major barriers for stroke care in Africa. In addition, a study from Ghana (29) identified the lack of direct regional or national health policy to support stroke

care, including a lack of a national stroke policy framework and national stroke clinical guidelines.

Hyperacute stroke care

The most common elements related to hyperacute stroke care reported included time from stroke onset to hospital arrival and patient access to CT/MRI brain imaging (28,32-41).

Several publications consistently identified that patients with stroke in Africa were late in arriving to hospital. The highest reported proportion of stroke patients who arrived at hospital within three hours from stroke onset was 43% in Tunisia (34) while the lowest proportion (10%) was reported in Nigeria (32). The reported proportions of stroke patients who received CT brain imaging within three hours of stroke onset varied between 0% (35) and 13% (34), and where operational CT/MRI scan machines existed, the reported proportion of patients who received CT/MRI brain imaging varied between 13% (28) and 36% (36).

Acute inpatient care

The main core elements related to acute inpatient care for stroke patients that were reported included the time from stroke onset to hospital admission, and access to stroke units (26,28,34,39, 42-44)

The interval between time of stroke onset and hospital admission varied between 7.2 hours and 6.8 days (34,42,44), with a median of 1.3 day. Few patients, 1% in Tunisia (34) and 17% in Benin (26), were reported to have been admitted within three hours of stroke onset. Regarding access to stroke units, South Africa was reported to have 21 stroke units (29), and the only other countries reported to have a stroke unit were Ghana (31) and the Central African Republic (39). Two studies (39,43) included in our review reported that stroke unit admission was associated with a decrease in inpatient mortality rate of 17-30%.

Stroke rehabilitation

The proportion of patients reported to receive inpatient physiotherapy rehabilitation was greatest in South Africa (98%) and smallest in Rwanda (40%) (44). A South African publication describing access to outpatient physiotherapy rehabilitation (48) identified low attendance rates (14%) as being associated with lack of finances (95%), patient migration to other areas (36%), and living a long distance from the hospital (38%) (48). In a study from Nigeria (49) the majority (59%) of patients were highly satisfied with outpatient physiotherapy services, however the high cost of these services and lack of continuity of care were sources of dissatisfaction.

Three South African studies (46,47,51) reported information on rehabilitation after discharge from the acute inpatient settings. It appeared that patients treated in a specialized rehabilitation facility received a variety of rehabilitation services from medical doctors, nurses, physiotherapists, social workers, occupational therapists, and speech therapists, although few of them received dietetics (17%) or psychology (11%) services (47). In contrast, services offered in community health centres were mostly limited to physiotherapy and medical rehabilitation services (46).

Secondary stroke prevention

A retrospective observational study (52) involving 418 stroke survivors enrolled into a neurology clinic in Ghana showed that, at one-year post stroke, 92% of subjects were persisting with secondary prevention medications. However, in two publications (28,50) included in our review, evidence of poor compliance with secondary prevention medications was reported. In one study (28) of stroke survivors living in a rural South African community who were prescribed aspirin for secondary prevention, 9/20 (45%) reported taking this

medication at three months post stroke. In a similar study conducted in Uganda (50) which involved 112 participants, only 17% were adhering to anti-hypertensive medications as prescribed. The main reasons for poor drug adherence were lack of knowledge of the chronicity of hypertension (73%) and cost of the drugs (63%). Other factors that were reported to be associated with poor compliance with secondary prevention medications were alcohol abuse (52) and average number of antihypertensive medications prescribed (53).

Longer-term stroke recovery

Regarding longer-term stroke recovery, many challenges were identified in a South African study (28). Three months post stroke, 20 survivors living in a rural community had no access to a rehabilitation facility, and did not get support from government or local authorities, leaving the responsibility to some local non-governmental organizations which also had limited resources to provide stroke survivors support.

DISCUSSION

Overall, very few studies on stroke care have been published about the vast continent of Africa, and only two studies (28,50) included information on secondary stroke prevention or longer-term stroke recovery. From the available data, we identified only a small proportion of patients with stroke that arrived at a hospital within three hours from symptom onset (32,34) and, consequently, less than 20% (26,34) of patients were admitted within three hours of stroke onset. Studies from other non-African LMICs showed a similar delay (54,55). Late presentation to hospital has been reported to be associated with poor awareness of stroke signs and symptoms, late referral from private hospitals, transportation problems, visit to

traditional healers before coming to hospital, and treatment at home (33,36). These were also identified in our review. Delays in presentation to hospital prevent patients from benefiting from emergency interventions such as brain imaging and thrombolysis for ischemic stroke among others. Also, although diagnostic CT or MRI scan imaging is important when antithrombotic treatments are being considered, our review showed that the CT/MRI brain imaging services were rare or too expensive for many patients in Africa (28,36). Our review showed that no patients in a Nigerian hospital (35) and only 13% of stroke patients in Tunisia (34) received a CT scan within three hours of stroke onset. This is a major barrier to meet the recommended standard of thrombolysis for ischemic stroke within four and half hours of stroke onset (15).

Despite the evidence that thrombolysis can improve outcome in ischaemic stroke (56), our review indicates that intravenous thrombolysis remains 'a desirable dream' in many African countries (38,39). This finding was consistent with the results of a survey (12) whereby none of the African centres surveyed in 2012 administered acute revascularization therapy to patients with acute stroke. In another systematic review (57) only 3% of low-income countries were found to use thrombolysis for acute ischemic stroke. The most important barrier of thrombolysis therapy in Africa, as in other low-income countries, is reported to be cost (36,39). This emphasizes the need for governments and health systems of developing countries to develop strategies to enhance accessibility to thrombolysis.

Despite the available evidence for the benefits associated with stroke unit admission, the stroke unit model for stroke care appeared to be rare in Africa. In fact, collectively we identified that there were only 23 stroke units from the available publications we reviewed. Fortunately, there is the intention for the establishment of more stroke units in Africa in the next few years (29,30).

The WSO recommended early adequate rehabilitation to reduce the social and economic costs related to long-term care (15). However, it appeared that only medical and physiotherapy rehabilitation services are common in Africa (31,44,47), and that the physiotherapy services are accessible to a limited number of patients. We need to address the identified barriers for inpatient and outpatient physiotherapy rehabilitation including high cost, geographical inaccessibility and lack of continuity of care.

While aspirin and antihypertensive drugs were found to be associated with lower risk for stroke recurrence (58-59), our review findings indicated poor compliance with secondary prevention anti-hypertensive medications in Uganda (50) and aspirin in South Africa (28) most likely because of cost and lack of knowledge about the risk of stroke recurrence. This issue should be addressed in education sessions for stroke patients and their caregivers.

Other important challenges that were raised were shortage or high cost of medical transportation, brain imaging infrastructure, stroke units, and healthcare personnel (26-28,31, 33,34,36-38). To address this gap, politicians in most African countries need to invest in stroke care by developing and implementing direct health policies for stroke, training and staffing key rehabilitation professionals, making available and accessible the appropriate infrastructure, equipment and medications for quality stroke care, building national insurance systems to reduce the cost for care (60), and establishing partnerships with international experts to improve stroke care in African countries as they appeared to be effective in South Africa (29).

STRENGTHS AND WEAKNESSES

To the best of our knowledge, this is the first review on delivery of stroke care with focus on Africa. It provides a systematic, up-to-date overview of the available data on this topic. We

searched many relevant databases, with no language restriction. Additionally, data from eligible publications were extracted and analysed based on the WSO Stroke services Framework (15) while the review report is based on the PRISMA guidelines. However, our review may well be subject to publication bias as only the electronic databases and references were considered. Furthermore, the investigators of the identified studies were not contacted to confirm data. Among the studies that were considered for our review, nine were retrospective and the shortcomings of this study design needs to be considered while interpreting the results. Furthermore, most of the publications were conducted in cities, and some of them were single studies and generalisability to rural settings or whole countries is limited. Therefore, national or regional prospective observational studies on the provision of stroke care in African countries are needed. The lack of data from many African countries is also a limitation and highlights the urgent need to establish systems of routine and reliable data monitoring across this continent. Finally, there were limited data on important phases of stroke care including secondary prevention and longer-term recovery. More studies about these two phases are required.

CONCLUSION

Overall, the reported provision of stroke care in Africa is below the recommended standards with variations across countries and settings. Combined efforts from policy makers and health care professionals in Africa are needed to ensure greater access to essential infrastructure such as stroke units. More high-quality studies are needed to inform how to establish infrastructure in African settings where there are limited resources and diverse socio-cultural contexts. Mechanisms to routinely monitor usual care (i.e. registries or audits) would be invaluable to inform policy and practice.

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