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Haemorrhagic stroke in the Democratic Republic of the Congo: a neglected neurosurgical emergency care in a health system with critical gaps: a mini review

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Abstract

Haemorrhagic stroke, caused by bleeding in the brain, is one of the most dangerous types of stroke. It kills many people and leaves others with lifelong disabilities. In the Democratic Republic of the Congo (DRC), this problem is serious but often ignored. While most strokes in wealthy countries are caused by blocked blood vessels, in Africa, a much larger number are caused by bleeding.

In the DRC, the problem is that stroke patients often arrive late at hospitals, and most hospitals do not have brain imaging or enough specialised stroke staff to treat them promptly. The country has fewer than 20 neurosurgeons for more than 100 million people, and most of them work in major cities. People living in rural areas usually cannot access proper care. Even when patients arrive at a hospital, surgery and intensive care are often unavailable. Stroke is usually managed as part of general health programmes, but the surgical aspect of haemorrhagic stroke is rarely included. This results in many deaths that could be prevented.

This paper examines haemorrhagic stroke in the DRC from a neurosurgical perspective. We highlight how the lack of specialists, equipment, and clear treatment protocols worsens the situation. Simultaneously, there are opportunities for improvement: training general doctors and nurses in basic neurosurgical care, utilising telemedicine for advice, and developing national policies that include surgery. Collecting better data and establishing global partnerships will also be beneficial. Increasing focus on haemorrhagic stroke can save lives and reduce disabilities in the DRC.

Keywords Democratic Republic of the Congo, Haemorrhagic stroke, Global neurosurgery

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Introduction

Stroke remains one of the leading causes of death and long-term disability worldwide [1]. In 2020, stroke was responsible for approximately 6.6 million deaths globally, with low- and middle-income countries (LMICs) accounting for 86% of these deaths [2]. Although ischaemic stroke constitutes the majority of cases worldwide, haemorrhagic stroke causes a higher proportion of stroke-related deaths and disabilities, especially in LMICs where access to emergency care and neurosurgical treatment is limited [3, 4]. Sub-Saharan Africa (SSA) faces an increasing burden of stroke, driven by rising rates of hypertension, diabetes, and other modifiable risk factors [5, 6]. Unlike high-income countries, haemorrhagic stroke accounts for a significantly larger share of stroke cases in SSA, reaching up to 51% in some reports, and is associated with higher early mortality and poor functional outcomes [3, 6].

In the Democratic Republic of the Congo (DRC), this burden is both severe and insufficiently addressed. Although national-level data are limited, an increasing amount of hospital-based research has begun to reveal the scope of the problem. A recent study in Lubumbashi identified hypertension and atrial fibrillation as leading risk factors for haemorrhagic stroke, highlighting both the preventable nature and seriousness of these events [7]. In eastern DRC, a retrospective study showed that haemorrhagic stroke accounted for a significant portion of hospital admissions, with overall stroke mortality reaching 32.6%, mainly due to delayed presentation and limited access to specialised care [8]. Compounding these clinical challenges is a critically reduced specialised stroke workforce, particularly a severe shortage of neurological, neurosurgical, and critical care infrastructure and expertise. As of 2024, the DRC is served by fewer than 20 neurosurgeons for a population exceeding 100 million, most of whom are concentrated in urban centres such as Kinshasa and Lubumbashi [9, 10]. The majority of the country's population, particularly in rural and peri-urban areas, lacks access to essential services, including brain radiological imaging, invasive intracranial pressure monitoring, timely surgical intervention, and advanced critical care.

Despite the clear clinical imperative, haemorrhagic stroke is rarely approached as a neurosurgical emergency in the DRC's health policy or stroke response frameworks. Stroke care is commonly addressed within non-communicable disease strategies, with little recognition of the surgical interventions, such as haematoma evacuation or external ventricular drainage, required in severe haemorrhagic cases. This policy blind spot results in unnecessary deaths and long-term disability from otherwise manageable conditions. We therefore aim to reframe haemorrhagic stroke in the DRC as a neglected but urgent neurosurgical and health system challenge. By analysing epidemiological trends, resource limitations, and clinical outcomes, we advocate for the integration of neurosurgical care into national stroke strategies and promote health system strengthening through data, training, and policy reform.

Reframing and overview of haemorrhagic stroke in the Democratic Republic of the Congo

Burden and risk factors of haemorrhagic stroke in the DRC

Haemorrhagic stroke constitutes a significant proportion of the overall stroke burden in the DRC, though precise epidemiological data remain limited. Hospital-based studies indicate that haemorrhagic strokes account for nearly a quarter (24%) of all stroke admissions in tertiary care centres, reflecting a considerable clinical challenge within the country [8]. This figure aligns with trends observed across sub-Saharan Africa, where haemorrhagic stroke prevalence exceeds that of high-income countries and is associated with more severe outcomes [3, 5, 6].

Hypertension and atrial fibrillation have consistently been recognised as leading risk factors for haemorrhagic stroke in the DRC [11]. A study carried out in Lubumbashi showed that these conditions were present in most haemorrhagic stroke patients, highlighting the modifiable nature of many stroke risk factors in this setting [7]. This finding is supported by regional analyses, which identify hypertension as the most common risk factor for haemorrhagic stroke across sub-Saharan Africa, affecting over 70% of cases [5, 6].

A critical impediment to effective stroke management in the DRC is the notable scarcity of comprehensive, country-wide epidemiological data. Most available information derives from hospital-based case series, which inherently under-represent the true population burden due to factors such as limited access to healthcare facilities and underreporting. This paucity of data reflects a broader continental challenge; only a fraction of African countries maintain systematic stroke registries or surveillance systems, impeding targeted policy and resource allocation [2, 5, 6].

Furthermore, late presentation to healthcare facilities is a pervasive issue exacerbating stroke morbidity and mortality. Studies in the DRC report median delays of up to 48 h from symptom onset to hospital admission, with only a small minority of patients utilising emergency medical services [8, 12]. Such delays, coupled with the lack of neuroimaging and specialist care, contribute substantially to the high mortality rates observed in the country. Mortality among hospitalised stroke patients in

the DRC has been reported as high as 32.6%, mirroring figures documented in other resource-constrained settings [7, 8, 11].

Severe neurosurgical gap: reduced neurosurgical workforce and advanced care

Neurosurgical capacity in the DRC is critically limited and ill-equipped to address the growing burden of haemorrhagic stroke (Fig. 1). With only 19 full-time local neurosurgeons serving a population of over 100 million, and most based in major cities like Kinshasa and Lubumbashi, access to specialised care is severely restricted, especially in rural areas [9, 10, 13].

Essential diagnostic tools such as CT and MRI are scarce, particularly in public hospitals, making accurate stroke diagnosis difficult. Advanced neurosurgical equipment such as operating microscopes, invasive ICP monitors, and neuro-navigation systems is largely unavailable outside a few private centres [14, 15]. ICU beds and post-operative care resources are similarly insufficient, limiting safe surgical intervention and recovery [16]. In the absence of neuroimaging and ICP monitoring, neurosurgeons often rely solely on clinical signs to make high-risk decisions such as decompressive craniectomy or haematoma evacuation. This diagnostic uncertainty increases the likelihood of complications and poor outcomes [4, 7].

A lack of structured in-country training compounds the neurosurgical workforce shortage. Most Congolese neurosurgeons have received training abroad, and opportunities for local subspecialty development remain limited. Limited mentorship, poor working conditions, and low retention rates further weaken neurosurgical capacity [9, 10, 13, 15].

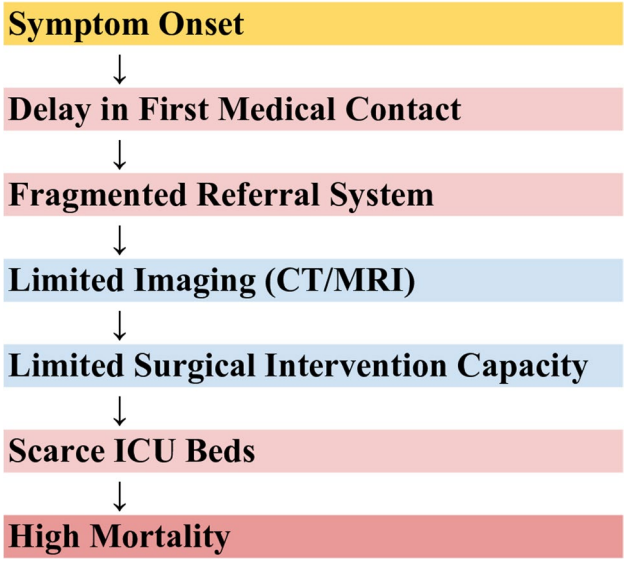

Fig. 1 Stroke care pathway in the DRC with bottlenecks

Health system gaps and structural weaknesses in neurosurgical care

The DRC faces significant systemic barriers that critically hinder the management of haemorrhagic stroke from a neurosurgical perspective. These barriers include delays in referral, financial obstacles, inadequate infrastructure, workforce shortages, and a notable absence of standardised stroke care protocols, all of which collectively affect patient outcomes.

Referral delays and emergency care deficits

Timely neurosurgical intervention, which is essential for favourable outcomes in haemorrhagic stroke, is often precluded by fragmented referral pathways and a lack of organised emergency medical services. Patients frequently experience protracted delays en route to tertiary care centres, often arriving beyond the critical therapeutic window. Regional data from sub-Saharan Africa indicate that only a minority of stroke patients present within three to six hours of symptom onset, markedly limiting the opportunity for effective surgical or medical intervention [5, 6, 17]. Such delays are particularly detrimental in haemorrhagic stroke, where rapid diagnosis and intervention can be lifesaving [7, 8].

Financial barriers to neurosurgical care

In the absence of universal health coverage, the financial burden of stroke care in the DRC predominantly falls upon patients and their families. Diagnostic imaging, neurosurgical procedures, and postoperative critical care impose substantial out-of-pocket costs, often leading to delayed presentation or abandonment of treatment. Comparative data from Senegal reveal that the mean direct cost of stroke hospitalisation ranges between US$825 and US$1,012, a prohibitive sum for most households in the DRC [2, 12]. This economic constraint constitutes a formidable obstacle to timely and adequate neurosurgical management and reflects broader global disparities in access to essential surgical care [16].

Under-equipped infrastructure and poorly allocated resources

Neurosurgical infrastructure in the DRC remains severely under-equipped and inequitably distributed, with sophisticated diagnostic and therapeutic resources concentrated in a limited number of urban tertiary centres. Essential modalities such as computed tomography (CT) scanners, intensive care units, and neurosurgical operating facilities are largely absent from the majority of major towns, rural, and peripheral hospitals. The lack of neuroimaging capacity precludes accurate diagnosis and surgical decision-making, while the scarcity of intensive care resources undermines postoperative management, collectively contributing to elevated morbidity and mortality rates [9, 14, 15].

Fig. 2 Innovative strategies to improve haemorrhagic stroke care in the DRC (Image created in Canva, August 14, 2025)

Workforce shortages and training limitations

The neurosurgical workforce in the DRC is critically deficient, with fewer than 20 neurosurgeons serving a population exceeding 100 million [9, 13]. Moreover, the paucity of structured training programmes and continuing professional development opportunities impedes the expansion of skilled personnel. This shortage extends beyond neurosurgeons to encompass stroke-trained nurses, emergency physicians, and rehabilitation specialists, further restricting comprehensive stroke care delivery [2, 16]. Although task-shifting and non-specialist training have demonstrated efficacy in comparable settings, the absence of formalised protocols and supervision frameworks impairs widespread adoption [25]. This strategy could serve as a temporary solution while scaling up the number of specialised medical personnel in the essential workforce.

Absence of standardised stroke protocols

Perhaps most notably, the DRC lacks nationally endorsed stroke management protocols tailored to its resource constraints. In contrast, adapted models, such as the Motebang Hospital protocol in Lesotho, provide streamlined clinical pathways that enable structured care in the absence of advanced imaging and specialist personnel [2, 12]. The development and implementation of such protocols in the DRC could substantially enhance the consistency and quality of haemorrhagic stroke care [17]. This could be implemented through a consortium of the Congolese Neurosurgical Society (SCNC) and other key stakeholders.

Opportunities for change

The escalating burden of haemorrhagic stroke in the Democratic Republic of the Congo (DRC) calls for a pragmatic, context-specific, and resource-sensitive response (Fig. 2). Solutions must prioritise feasibility within the DRC's fragile sociopolitical and financial environment, while building on proven approaches from comparable low- and middle-income countries.

Task-sharing and scalable training

The severe shortage of neurosurgeons remains one of the greatest challenges in the DRC. Task-sharing, whereby non-specialist healthcare providers (e.g., general practitioners, clinical officers, and nurses) are trained in basic neurosurgical and stroke management skills, has demonstrated success in other African countries. For example, Ethiopia scaled surgical task-shifting programmes within existing training frameworks, resulting in expanded coverage of essential procedures [18].

In the DRC, a specific and measurable goal could be:

- Training at least 100 non-specialist providers in essential haemorrhagic stroke management (acute stabilisation, referral pathways, monitoring) by 2027, with structured curricula and ongoing supervision.

This approach would ensure critical services are delivered closer to patients in rural areas, reducing treatment delays. However, such programmes must be time-bound and phased, acting as an interim solution until the neurosurgical workforce is expanded.

Telemedicine for diagnostic support

Telemedicine can bridge the gap in diagnostic imaging, particularly computed tomography (CT), which is scarce in the DRC. While internet penetration remains low, pilot projects in Rwanda and Uganda demonstrate that mobile-based tele-radiology networks can provide reliable remote consultations even in bandwidth-constrained settings [19].

- Establishing twenty-six regional tele-radiology hubs (Buta, Isiro, Bunia, Kisangani, Kamina, Kabinda, Lusambo, Kindu, Bukavu, Goma, Lisala, Gbadolite, Gemena, Mbandaka, Boende, Inongo, Bandundu, Kenge, Kinshasa, Tshikapa, Kananga, Mbuji-Mayi, Lubumbashi, Kolwezi, Kalemie, Matadi by 2026, enabling remote CT/MRI interpretation and neurosurgical consultation.

This would improve diagnostic accuracy, reduce unnecessary referrals, and enable timely decision-making.

Integration into National Health Policy

Currently, haemorrhagic stroke is insufficiently prioritised within national health frameworks. Policies should formally recognise it as a neurosurgical emergency, with explicit care pathways and resource allocation. Evidence from South Africa's national stroke strategy and Ghana's NCD policy integration shows that embedding stroke care into existing health system frameworks increases coordination and sustainability [20].

A feasible policy target for the DRC would be to:

- Develop a national stroke protocol tailored to resource limitations by 2026, endorsed by the Ministry of Health and professional associations.

Global and regional partnerships

Strengthening neurosurgical capacity requires sustainable collaborations. Partnerships with global neurosurgical societies and African academic institutions (e.g., COSECSA, University of Cape Town neurosurgery exchange programmes) have successfully enhanced training, workforce development, and infrastructure [21, 22].

Specific, measurable goals for the DRC could include:

- Sending 30 neurosurgeons-in-training for regional fellowships by 2028.
- Establishing two national stroke training workshops annually with international faculty.

Such partnerships would also facilitate research collaborations and context-appropriate innovation.

Data systems and registries

Currently, fragmented and hospital-based data impede effective planning. Establishing a national stroke registry would enable systematic data collection, outcome tracking, and resource allocation [23]. For example, Nigeria's stroke registry has provided critical insights into patterns of disease and informed national responses.

For the DRC, a target would be:

- Launching a pilot national stroke registry in five major hospitals by 2026, expanding to 15 hospitals nationwide by 2030.

Conclusion and call to action

Haemorrhagic stroke is an urgent but neglected neurosurgical and public health challenge in the DRC, with disproportionately high morbidity and mortality. Without decisive reform, preventable deaths and disability will continue to rise. Strengthening neurosurgical capacity, expanding workforce training, integrating evidence-based protocols into national policy, and developing innovative strategies such as task-sharing and telemedicine are achievable steps. Importantly, these reforms must be specific, measurable, and time-bound, adapted to the realities of the DRC's fragile health system. Neurosurgeons, policymakers, and global partners must work together to reframe haemorrhagic stroke as both a public health and neurosurgical emergency. By prioritising early diagnosis, coordinated referral pathways, and investment in training and infrastructure, the DRC can reduce mortality and disability, offering patients a better chance at survival and recovery.

Abbreviations

DRC Democratic Republic of the Congo
SSA Sub-Saharan Africa
LMIC(s) Low- and Middle-Income Country (Countries)
CT Computed Tomography
MRI Magnetic Resonance Imaging
ICP Intracranial Pressure
ICU Intensive Care Unit
SCNC Société Congolaise de Neurochirurgie (Congolese Neurosurgical Society)
GBD Global Burden of Disease
COSECSA College of Surgeons of East, Central and Southern Africa
NCD Non-Communicable Disease
ICU Intensive Care Unit

Authors' contributions

FKS participated in the conception and design of the study, literature search, and drafted the manuscript. LKK, KDMK, JN and HML participated in the literature search and review of the manuscript. All authors read and approved the submitted manuscript.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

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Competing interests

The authors declare no competing interests.

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