

Commentary:

The Implications of Global Neurosurgery for Low- and Middle-income Countries: The Case of Cameroon



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ABSTRACT

The unequal distribution of neurosurgical resources and diseases in the world contributes to inequality. Eight in 10 neurosurgical cases needing essential neurosurgical care are found in Low- and Middle-Income Countries (LMICs); however, LMICs lack the neurosurgical resources to address these needs. Besides, where neurosurgical care is available, it is not financially accessible to the majority of patients. Global Neurosurgery is a rapidly growing field that places a priority on improving health outcomes and achieving health equity for all people affected by neurosurgical conditions. To achieve safe, accessible, and affordable neurosurgical care for all, LMIC neurosurgeons should participate in national and international global neurosurgical activities, develop disruptive solutions to local problems and work with local stakeholders to address global neurosurgery problems.

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Highlights

- Global neurosurgery is an increasingly popular field among high-income country neurosurgeons but less so among Low- and Middle-Income Countries (LMICs).
- Using Cameroon as an example, the authors identify the reasons LMIC neurosurgeons must participate in global neurosurgery.
- Cameroon has a limited neurosurgery resource (1 neurosurgeon, 1.16 CT scans, and 0.24 MRIs per 1 million inhabitants) and most are in the two major cities (Yaounde and Douala).

Plain Language Summary

Almost 14 million people suffer from a neurological disease (brain, spine, and nerves) that can be treated with surgery. The majority (>80%) of these people live in developing countries. Unfortunately, most people with these diseases are not treated in time because they live far from hospitals, their hospitals cannot treat them, or they cannot afford health expenses. Global neurosurgery is the field that works to reduce this inequity worldwide. More people are interested in global neurosurgery especially neurosurgeons from Western countries. In this article, the authors explain why and how neurosurgeons and people from developing countries should be involved in global neurosurgery. The authors use Cameroon as an example to show the difficulties (the small number of neurosurgeons and equipment) that cause health inequities. They go on to describe a strategy to identify these problems and find solutions to them. Research will help not only to identify the problems but also to implement the discovered solutions. Education and communication will help spread the global neurosurgery message.

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lobal neurosurgery is “an area for study, research, practice, and advocacy that places a priority on improving health outcomes and achieving health equity for all people worldwide who are affected by neurosurgical conditions or have a need for neurosurgical care” [1].

This definition by Park et al. was derived from that of global surgery by Dare et al. [2]. While the field of global neurosurgery is rapidly growing today, the term “global neurosurgery” and its practice predate its definition by Park et al. Dwight Parkinson first used this term in his 1995 paper on the history of neurosurgery in Manitoba, Canada. According to him, “highlights of global neurosurgery are spliced into the author’s reminiscences to anchor the local history with that of neurosurgery as a whole” [3]. In this historical vignette, Parkinson was opposing global (outside of his geographical area) to local (within his geographical area) practices. Hence, when he used the term “global neurosurgery,” he meant the practice of neurosurgery outside of Manitoba. While some used the term “global neurosurgery” in the same way as Parkinson did [4, 5], others used “global neurosurgery” to mean humanitarian efforts by high-income countries, individuals, and institutions in favor of Low- and Middle-Income Countries (LMICs) [6, 7]. The definition and establishment of global neurosur-

gery as a field in 2016 was a turning point in the history of the field as it consolidated efforts by different actors and expanded the scope of global neurosurgical practice beyond volunteer surgeries and training programs.

Global neurosurgery helps make a case for investment in neurosurgical care and proposes plans that will foster universal neurosurgical access. Research in this field generates data used to design, monitor, evaluate and adjust strategies aimed at improving access to neurosurgical care through actions aimed at the 6 surgical system domains: infrastructure, workforce, service delivery, financing, information management, and governance.

Cameroon has an inadequate number of neurosurgeons and an unequal geographical distribution of its neurosurgical workforce. The workforce density in Cameroon is 0.09 per 100,000 population. Cameroon has an average workforce density in comparison to its neighbors: Central African Republic (0.02), Chad (0.02), Gabon (0.25), Equatorial Guinea (0.41), Nigeria (0.02), and the Republic of Congo (0.10).

The workforce density does not accurately represent the distribution of neurosurgeons in the entire country. Of the 25 neurosurgeons practicing in Cameroon, 19 (76%) are located in the administrative and economic

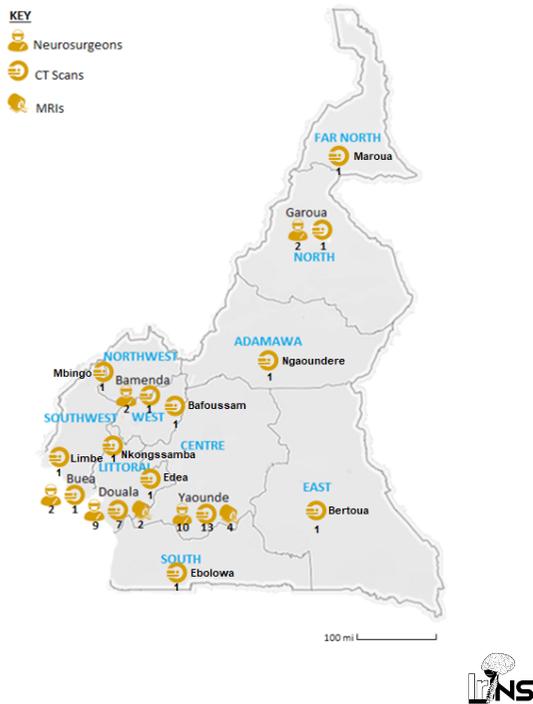


Figure 1. Map of Cameroonian neurosurgical workforce capacity and distribution of neuroimaging centers

The numbers below icons represent the number of the corresponding variable.

capitals -Yaounde and Douala- each of which has more than 3.5 million inhabitants [8, 9]. Unsurprisingly, some regions of Cameroon are without a neurosurgeon including the Far North, Adamawa, West, East, and South. In these underserved areas, general surgeons and general practitioners manage neurosurgically-amenable diseases with very limited available resources. When they are unable to provide satisfactory neurosurgical care for their patients, they refer them to other regions for appropriate management. Unfortunately, the only patients that end up traveling to the regions with acceptable neurosurgical facilities are those that can withstand the gruelling traveling conditions in non-medicalized vehicles and can afford the costs.

Similar to human resources, there is a lack of neuroimaging facilities, and the few that are available are unequally distributed. Twenty of the 29 CT scan centers (69.0%) in Cameroon are located in Yaounde or Douala, and all of the 6 MRI centers (100%) are located in these 2 cities. As a result, patients all around the country have to travel long distances to receive neurosurgical care, and this increases the burden on the neurosurgical centers in Yaounde and Douala, as well. Figure 1 illustrates the neurosurgical workforce and neuroradiological capacity in Cameroon.

Traumatic lesions are the most common neurosurgically disorders in LMICs which can be prevented [10]. Traumatic brain and spine injuries often require urgent neuroimaging and, when necessary, emergent surgical treatment [11, 12]. It is suggested that for expecting a favorable outcome, admission to facilities offering definitive care should be within 4 hours post injury for traumatic brain injuries [13] and 24 hours post injury for traumatic spine injuries [12]. In Cameroon, an estimated 73,000 new cases of traumatic brain and spine injuries occur annually [14], which could be admitted by only 8 public and military level 1 referral neurosurgical centers. The World Federation of Neurosurgical Societies defines level 1 neurosurgical facilities as those that offer primary neurotraumatological care [15]. Due to their locations, the high surgical volume, and financial constraints, these facilities cannot be expected to provide the minimal acceptable standards of neurosurgical care for the country population. About one third (36.4%) of the population have longer travel time to reach a facility (about 4 hours) that can manage non-traumatic neurosurgical diseases, i.e. level 2 or higher facility [16]. Global neurosurgery studies the resources available and challenges faced by neurosurgical care providers in a given environment to address the unmet neurosurgical needs. It does this by suggesting evidence-based policies aimed at improving timely and affordable access to neurosurgical care.

Like Cameroon, many LMICs face similar difficulties. According to Dewan et al., 13.8 million cases need essential neurosurgical care annually, and 80% of these cases are found in LMICs [10]. Paradoxically, the majority of LMICs have less than 1 neurosurgeon per 200,000 population, and up to 33 countries have no neurosurgeon [17]. As a result of this, many have resorted to task-shifting or task-sharing to manage neurosurgical patients in underserved regions [18]. Access to neurosurgical care is equally limited by the lack of financial risk protection in LMICs. In most LMICs, patients pay for their healthcare expenses out of pocket. As a result, 33 million people experience catastrophic health expenditures [19].

Advocacy by global neurosurgeons has led to an increase in global neurosurgical interest. A growing number of neurosurgical journals and institutions have published global neurosurgery editions, and more professional societies are organizing global neurosurgical events [20, 21]. As shown in Figure 2, out of 5000 global neurosurgery indexed articles in PubMed, 44% have been published in the last 4 years [22].

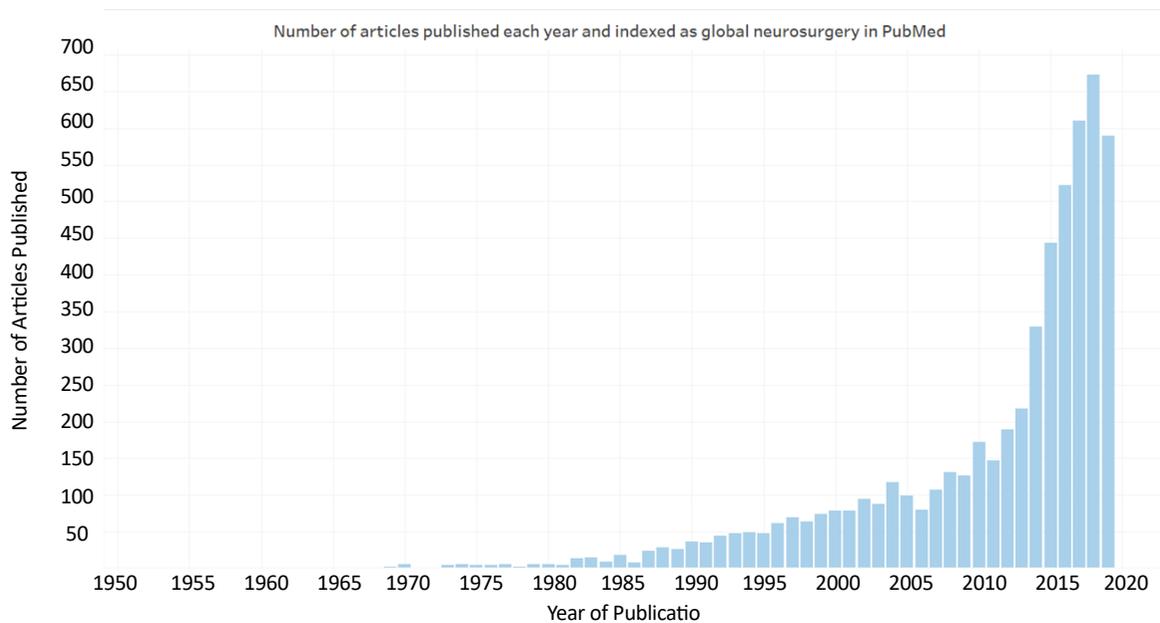


Figure 2. The number of “global neurosurgery” indexed articles in PubMed

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Professional bodies such as the World Federation of Neurosurgical Societies have been instrumental in the development of global neurosurgery. The World Federation of Neurosurgical Societies has recently created an ad hoc committee for global neurosurgery to coordinate the federation’s global neurosurgical efforts.

The task at hand is colossal and will need collaborative efforts and public health strategies aimed at strengthening the entire healthcare system. Neurosurgeons from LMICs have a significant role to play in developing collaborations and solutions for global neurosurgery. To do this, they must develop non-surgical skills and think beyond the operating room and the individual patient. Practically, this means LMIC neurosurgeons should become familiar with global neurosurgery literature and participate in global neurosurgical events. They should collaborate with other global neurosurgeons to propose innovative solutions to problems such as the lack of reliable referral systems, loss to follow-up, deficient transitional care, and inadequate rehabilitation. Developing strategic partnerships with non-neurosurgeon experts of research methodology, surgical innovation, mHealth, artificial intelligence, or data analysis can help neurosurgeons propose disruptive solutions to the problems of global neurosurgery.

LMICs carry most of the burden of neurosurgical diseases and do not have enough resources to meet the local neurosurgical needs [23, 24], yet clinical guidelines are developed in high-income countries where the bur-

den of disease and the resources available differ from those in LMICs. For example, the most prevalent neurosurgical diseases, traumatic brain injury, stroke, and epilepsy, occur mostly in LMICs [10] where there is a lack of resources, and patients face delays in seeking care, reaching care, and receiving care. However, authoritative guidelines for the management of these diseases are developed by non-LMIC societies and are based on non-LMIC [25-27]. Unsurprisingly, the implementation of clinical guidelines in low-resource settings is difficult and, in some cases, impractical. Neurosurgical practice in LMICs should be backed by locally generated scientific evidence. The contribution of LMIC neurosurgeons to the academic discourse can help increase the quality and quantity of global neurosurgery data. Granular data obtained from the resulting studies could lead to the development of contextually appropriate clinical guidelines. Furthermore, locally driven research can lead to better reporting of global surgery indicators and the design of more complex clinical studies in LMICs.

It is equally essential that LMIC global neurosurgeons collaborate with colleagues from both developing and developed countries. International global neurosurgery studies such as the decompressive craniectomy consensus and the comprehensive policy recommendations for traumatic brain and spine injuries [28, 29] have featured researchers from LMICs. In these studies, LMIC researchers contributed to setting the research agenda and made sure these studies answered the questions that were relevant to the problems they and their patients faced. The

collaborations are equally critical for the education of young neurosurgeons and trainees. The COVID-19 pandemic has led to an increase in the number of international webinars and virtual educational events.

Global neurosurgical practice differs from standard neurosurgical practice. While the latter focuses on high-quality management of individual patients, the former seeks to bring the same quality of care to all patients in need of neurosurgical care. By getting more involved in global neurosurgery practice, the LMIC neurosurgeon contributes to universal access to healthcare. The global neurosurgeon should propose contextually appropriate treatments that are equitable, sustainable, and backed by scientific evidence.

Global neurosurgeons are the voices of their patients and defendants of their rights. According to a senior advisor for advocacy at the G4 Alliance, the following actions for efficient global surgery advocacy are proposed [30]:

Join other health groups and understand their agendas. Our body systems are interconnected and interdependent, and in the same way, our initiatives should be interconnected. Traumatic brain and spine injuries, for example, are often concomitant to extracranial injuries. Traumatic brain injury, therefore, is not just a neurosurgical problem. Most of the resources used by neurosurgeons are shared with other healthcare professionals. Hence, global neurosurgeons should collaborate and support other health groups nationally and internationally.

Increase public awareness of global (neuro)surgery. Global neurosurgeons should communicate their research findings with the general public through traditional and social media platforms to raise awareness.

Global neurosurgeons should collaborate with local policymakers, government officials, and stakeholders at high-level meetings to ensure the needs of their patients are better taken into consideration.

Craft the global (neuro)surgery message to focus on the economic impact, change the mentality that (neuro)surgery is expensive, and show the importance of neurosurgery in primary health care.

Neurosurgery needs to evolve if we are going to address the unmet needs in LMICs. Global neurosurgery is transforming neurosurgery into a multifaceted field, where non-neurosurgical skills are just as essential as operative skills, non-neurosurgical collaborators are pivotal, and goals are shared by neurosurgeons, their

collaborators, and the general population. Emphasis is placed on safety, accessibility, affordability, timeliness, and equity of the neurosurgical care provided in resource-limited settings. LMICs are the most affected, and consequently, LMIC neurosurgeons should be at the forefront of this specialty. Every neurosurgeon in resource-limited settings should strive to be a global neurosurgeon, someone that studies, researches, practices, and advocates to improve neurosurgical outcomes and achieve health equity for all neurosurgical patients wherever and whenever.

Ethical Considerations

Compliance with ethical guidelines

There were no ethical considerations to be considered in this research.

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Authors' contributions

Conceptualization and data collection: Ulrick Sidney Kanmounye; Data analysis and interpretation: Nathalie Christelle Ghoms; Writing – original draft, writing – review & editin: Ignatius Esene; Reviewing submitted version of manuscript: Nathalie Christelle Ghoms, Dylan Djiofack, Stéphane Nguemba, Yvan Zolo; Approving the final version of the manuscript: All authors.

Conflict of interest

The author declared no conflict of interest.

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