

Neurosurgery in Sub-Saharan Africa - Historical Background and Development of Training Programs in East Africa.

Mahmood M Qureshi, MD, FCS-ECSA, FRCSEd,¹ | Aamir W Qureshi, MD FCS, ECSA.²

¹Nairobi Hospital - Kenya

²Nairobi Hospital - Kenya

Correspondence

Mahmood Qureshi, Neurosurgeon, Neurosurgery department, Nairobi Hospital - Kenya

Email: moody_qureshi@yahoo.com

1 | INTRODUCTION

Modern Neurosurgery in Sub-Saharan Africa (SSA) has its roots in the 1960s when Neurosurgeons from Europe set up Units in West Africa and East Africa. While it would be unfair to give credit to some individuals, and inadvertently not naming others, Prof Abdeslam El Khamlichi (1) in his book, "Emerging Neurosurgery in Africa," quoting Professor AdelolaAdeloye (2), provided a valuable account:

A French Neurosurgeon, Dr. Courson, set up the first neurosurgical unit in West Africa in Senegal in 1967. He was joined by two other French neurosurgeons, Dr. Claude Cournil and Dr. Alliez, in 1972 and 1975. They trained the first Senegalese Neurosurgeon, Dr. Mamadou Gueye, who joined as a trainee in 1977. Dr. Gueye was to become the first Senegalese Professor and Chairman of the Neurosurgery Department.

2 | REGIONS BEGINS

In Ivory Coast, the first unit was set up by Dr. Claude Cournil in Abidjan in 1976, having left Dakar. He joined the first Ivorian Neurosurgeon, Dr. Kanga, who set up practice in 1974 in Abidjan.

In Ghana, the first Neurosurgical Unit was set up by Ghanaian Neurosurgeon Dr. Osman Mustaffah in 1969.

In Nigeria, the first units were set up by Nigerian Neurosurgeon Dr. Latunde Odeku started the service in Ibadan in 1962. He was joined by two other pioneer neurosurgeons, Dr. AdelolaAdeloye in 1967 and Dr. Adebayo Ajayi Olumide in 1974. A second department was set up in Lagos by Dr. de Silva and Dr. Nosiru Ojikutu; in 1968, Dr. Samuel C. Ohaegbulam started the third service in Enugu in 1974 (2).

In East Africa, Neurosurgical procedures had been carried out by Dr. Peter Clifford, an ENT surgeon, in 1955 (3).

In Kenya, modern Neurosurgery was introduced by Dr. Renato Ruberti, an Italian Neurosurgeon from Napoli, who set up Private practice in the European hospital in Nairobi in 1967 part-time at the King George V Hospital, which served as the National Hospital. He was joined in 1972 by Dr. Jawahar Dar, from New Delhi. The Indian Dr. Jawahar Dar set up the First Neurosurgery Unit at the King George V hospital, renamed Kenyatta National Hospital while teaching at the University of Nairobi. They were joined by Dr. Gerishom Sande, the first Kenyan Neurosurgeon following his training in Belfast, in 1979 (3).

In Uganda, on advice and recommendation of the renowned British Neurosurgeon, Professor Valentine Logue of the Hospital for Nervous Diseases, Queen Square, London, was invited by the government in 1968 to advise the establishment of neurosurgery at Mulago Hospital, Dr. Ian Bailey moved to Uganda. He was instrumental in establishing the first neurosurgical unit in Uganda at Mulago Hospital in 1969, equipped with 54 beds for the department of neurosurgery and cardiothoracic surgery (4). He was joined by the first Ugandan Neurosurgeon, Dr. Jovan Kiryabirwe, in 1971, who became the first indigenous Ugandan Neurosurgeon and the first African Neurosurgeon in East and Central Africa. He attended medical school at Makerere University School of Medicine in Kampala and subsequently completed postgraduate training at the Royal College of Surgeons in Ireland and Scotland; he also trained at Queens Square with Professor Logue (5).

In Tanzania, the first step towards modern neurosurgery was the establishment of orthopedic and trauma services in 1971 at the

Muhimbili Medical Center (MMC) by Professor Philemon Sarangi (6). At the time, orthopedic surgeons treated most of the cranial and spinal trauma. Over the next few years, several foreign neurosurgeons from Cuba, China, and the Soviet Union spent short stints practicing neurosurgery at MMC. Dr. Reulen, Professor and Chairman of Neurosurgery at University Hospital in Inselspital, Bern, Switzerland, and later in Munich, Germany, provided the impetus for the establishment of a neurosurgery program at MMC teaching in hospital of the University of Dar-es-Salaam and creating a "sandwich" program with training split between national and international centers. He trained Dr. SimpertKinunda, a plastic surgeon who later became the first Tanzanian with any neurosurgical training.

Peter Kadyanji was the first fully trained Tanzanian neurosurgeon, and he joined MMC in 1985 after completing his training in the Soviet Union. Yadon M. Kohi followed in Kadyanji's footsteps, graduating from Makerere University and the Faculty of Medicine at the University of Dar-es-Salaam. He obtained his FRCS in Ireland and Glasgow and later was appointed as the General Director of the National Commission for Science and Technology. Dr. S.M. Mlay was the third neurosurgeon to join MMC in 1989, with a specialty in pediatric neurosurgery. Professor Sarangi was instrumental in the subsequent establishment of Muhimbili Orthopedic Institute (MOI), which was opened in 1993 and later combined with MMC to become Muhimbili National Hospital, the national institute for neurosurgery, orthopedics, and traumatology.

Several neurosurgeons have practiced at MOI since its founding, including Dr. Abednego Kinasha and Dr. Joseph Kahamba, who along with Professor Laurence Museru, the Medical Director of MOI, played a pivotal role in laying the foundation for the training of the current generation of neurosurgeons in Tanzania (5). The core of the specialty expertise in the country is formed by the contemporary, locally trained neurosurgeons who provide neurosurgical training at MOI and neurosurgical care at several healthcare institutions around the country. There are currently 20 neurosurgeons in the country, 18 of whom in public service, one at a Mission hospital in Moshi, one in a private hospital, (the Aga Khan University Hospital) in Dar-es-salaam, and one at the MnaziMmoja/NED Institute in Zanzibar. No dedicated neuroscience nurses or beds are available in the country; however, currently, there are eight neurosurgical intensive care unit beds at MOI, and an additional 14 at the new hospital within the Muhimbili hospital complex in Dar-es-Salaam opened in 2018. There are 5 CT scanners and 3 MRI scanners available across the country, mainly in Dar-es-Salaam, the largest city in Tanzania. In Zimbabwe, Dr. Lawrence Frazer Levy, a British neurosurgeon, started in 1956 (Zimbabwe was called Rhodesia). He set up the Neurosurgery Department at the Central Hospital in Harare (Salisbury), becoming its first Professor and Chairman in 1971. He was joined by a young Scottish neurosurgeon, Dr. Carol Auchtertonie, responsible for starting the second unit at the European Hospital in Harare. The two served patients from Zimbabwe and neighboring Zambia, Malawi, and others for quite a long time (2). From these early beginnings, progress in neurosurgery remained slow, with only a handful of neurosurgeons available in SSA. In 1959, Professor AdelolaAdeloye noted that there were only 20 neurosurgeons across Africa, the majority practicing in South Africa (2). It is against this backdrop that the need to develop neurosurgical care in Sub-Saharan Africa came into focus.

3 | NEXT STEPS

Prior to this 1992, Neurosurgery in the East, Central and, Southern African (ECSA) region was carried out by a handful of neurosurgeons in the National capital cities of Nairobi (Kenya), Kampala (Uganda), Dar-es-salaam (Tanzania), Addis Ababa (Ethiopia), Lusaka (Zambia), Harare (Zimbabwe). Rwanda, Malawi, Mozambique, and the other states in the region had no neurosurgical services to speak of. Progress began to take place after 1992, following the return from training of neurosurgeons trained in Europe who took on the challenge of neurosurgical development. Dr Mahmood Qureshi in Kenya, Dr Abedi Kinasha in Dar-es-salaam, Dr Michael Muhumuza in Kampala, Dr GadlieZenebe in Addis Ababa, Dr KazadiKalangu in Zimbabwe, Dr Benjamin Warf, US trained neurosurgeon working in Mbale (Uganda), began to sow the seeds of future development in the region. They were joined in the coming years by Dr David OluochOlunya in Kenya in 1999, Dr Joel Kiryabirwe in Uganda, Dr LastonChikoya (Zambia), Dr EmmanuelNkusi (Rwanda). Despite initial efforts, significant progress was initially slow, largely because of the lack of a coordinated and unified effort in promoting development. The visit in 1999 by Dr. Paul Young of St Louis, USA, can certainly be regarded as the pivotal moment for truly effective development of neurosurgery in the ECSA region; it was mainly attributed to several well-organized neurosurgical missions conducted by a team that included neurosurgeons, neurological nurses, neuro-anaesthesiologists who worked along side local neurosurgeons in performing complex cranial and spinal surgeries. Through these efforts, the regional training program was realized.

4 | TRAINING PROGRAMS

The Neurosurgical Training program of the East, Central, and Southern African region is known as the "Consortium of Collaborative Neurosurgical Sites of Training of the East, Central and Southern African region (C-CNS-ECSAR), is the Second WFNS Reference Training Centre in Africa. Commenced in 2006, it is an Anglophone training Site, following in the footsteps of the First Francophone Reference Training site in Rabat, Morocco. The C-CNS-ECSAR incorporates neurosurgical training at major hospitals in the East African region of Sub-Saharan Africa. The initiative, led by Dr. Mahmood Qureshi of Kenya, Professor Paul H. Young of the Foundation for International Education in Neurosurgery (FIENS) and Dr. Benjamin Warf, who was working in Mbale, Uganda at the time, followed meetings with neurosurgical leadership from across the region, culminating in a Stakeholders meeting in Nairobi on 29th September 2004. This effort was followed by developing a neurosurgical training Curriculum, known as the Neurosurgical Training Program of the ECSA region (NSTP-ECSA), with input from various regional stakeholders. The hospitals accredited to train included the following:

- Kenyatta National Hospital, Aga Khan University Hospital in Kenya, Coast General Hospital in Mombasa.
- Mulago Medical Complex and CURE Children's Hospital (Uganda).
- Black Lion Hospital and Myun Sung Mission Hospital (Ethiopia).

- Muhimbili Orthopaedic and Neurosurgery Hospital (Tanzania), The Mnazi Mmoja NED Institute in Zanzibar, Tanzania.

The centers have been accredited on the basis; they could provide varying levels of training, with none having the capacity to offer full comprehensive training at this time. The Consortium aims to consolidate the diverse capabilities of the various centers that would enable an internationally accredited level of training. Trainees are enrolled in the program upon completing the Membership of the College of Surgeons (MCS), a two-year program following Internship after graduating from Medical School (5) (Figure 1).

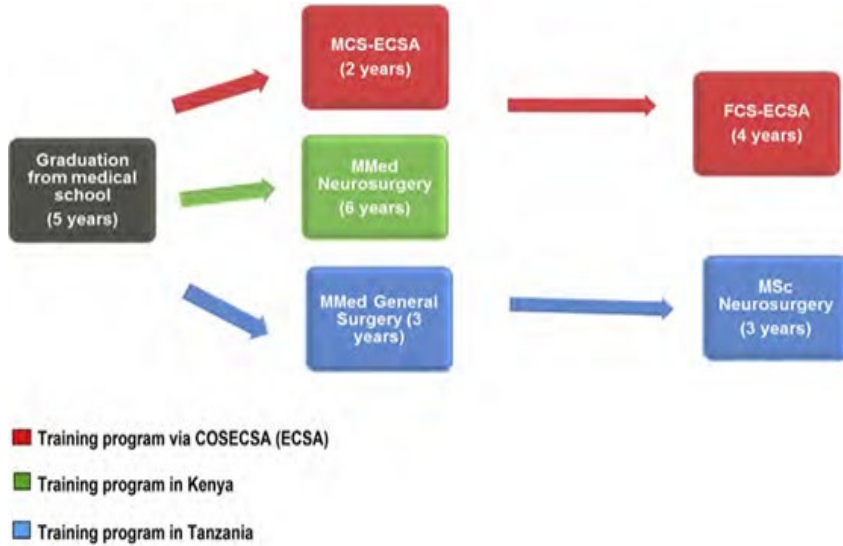


FIGURE 1. Educational pathways to becoming a neurosurgeon offered by different training programs in East Africa. MCS-ECSCA, Member of College of Surgeons; FCS-ECSCA, Fellowship of the College of Surgeons; MMed, Master of medicine; MSc, Master of Science.

Once enrolled into the Fellowship Program (FCS), Neurosurgical Training is commenced at the accredited Sites. Following initial 1-year training in their base center, training takes place for a further three years in centers outside their base center to achieve comprehensive training. The accredited Centers are shown in Table 1.

TABLE 1. COSECSA Accredited Sites

Country in ECSA region	City/ Town	Accredited Centre
Kenya	Nairobi	Kenyatta National Hospital; Aga Khan University Hospital
Kenya	Mombasa	Coast Provincial General hospital
Kenya	Bomet	Tenwek Mission Hospital
Uganda	Kampala	Mulago Medical Complex (Makerere University)
Uganda	Mbarara	Mbarara University Teaching Hospital
Tanzania	Dar-es-Salaam	Muhimbili Orth & Neuro Institute
Tanzania	Zanzibar	Mnazi Mmoja/ Neurosurgical Education & Development (NED) Institute
Ethiopia	Addis Ababa	Black Lion Hosp
Zambia	Lusaka	Lusaka University Teaching Hospital
Malawi	Blantyre	Queen Elizabeth Teaching Hospital
Rwanda	Kigali	King Feisal Hosp

An external rotation is carried out at renowned centers abroad to enhance their experience. Centers in Mumbai, Alicante & Valencia (Spain), Izmir (Turkey), and Bristol (England) have provided such support. Following six years of training (Two years to pass the MCS and Four years for the FCS), the graduates receive the Award of Fellow of the College of East Central and Southern Africa in Neurosurgery (FCS-ECSA, Neuro) at the College Graduation Ceremony (Figure 2).



FIGURE 2. COSECSA Graduation Ceremony, 2018 – Zambia

A further nine candidates are enrolled in the program. (5 Kenyans, 1 Tanzanian, 2 Ugandans, and one trainee from the Democratic Republic of Congo (DRC). The Training program along with several others in Africa were evaluated by Prof Peter Black, Past President of the WFNS, and a report published in World Neurosurgery (6). The assessment included evaluating training quality standards, utilizing universal metrics used by each program during and a completion of training. The scores obtained by each program were outlined by the authors of this publication (7). The purpose of these metrics was to ensure graduates in the various programs had attained the judgment and skills necessary to be safe and effective neurosurgeons upon graduating from the programs.

The positive evaluation, ranking the East African (COSECSA) program comparable in standard to established programs and scoring favorably along with other programs on the African continent, has been an encouraging start to this young program. The program has been boosted by the recognition of C-CNS-ECSAR as a Reference WFNS's Training site. An additional boost has been the support of the WFNS through its foundation. Following the accreditation by the WFNS as a Reference Training Site in 2012, the WFNS Foundation approved an annual stipend of USD 5400 per resident per year and has been increased to USD 6000 per annum, from January 2021, for five residents in the program. Two Kenyan, two Ugandan, and one candidate from the DRC training in Uganda are current recipients of the WFNS Foundation scholarships.

It is gratifying that the regional program has, since its inception in 2006, produced 19 holders of an FCS-ECSA (Neuro). Two additional candidates, Dr. William Copeland, an American Board eligible neurosurgeon, and Dr. Edwin Mogere, a graduate of the South African College of Neurosurgeons, have taken the COSECSA exam, with the intention of obtaining accreditation of their Units as Training sites at Tenwek Mission Hospital and Aga Khan University Hospital, the latter for purpose of re-accreditation. The COSECSA graduates (Table 2) are currently among the leadership of hospitals in the region (figure 3), with others taking on the responsibility of starting new neurosurgical units in cities and towns outside of the capitals in their countries. It is in line with the objective of the Regional C-CNS-ECSAR of providing an opportunity for training to young African candidates within Africa without the need to travel to centers in Europe or the West for their general neurosurgical training. This latter model of training in centers in Europe and the West had resulted in many trained specialists not returning back home to practice and make a contribution to their countries.

TABLE 2. Certificated Neurosurgeons

City	Name
Kenya	John Boore Peter Mwangi Peter K Wanyoike Benjamin O. Okanga Andrew N, Nyaoncha Daniel Njeru Mugendi
Uganda	Drs David Kitya Alexander Muhindo Oscar Obige Blessing Taremwa Juliet Nalwanga
Tanzania	Drs Gerald Mayaya Boniface Kivevele Happiness Rabel AingayaKaale
Ethiopia	Drs AbenezarTirsit TsegazeabLaeke Azarius Kassahun
Mozambique	Dr Sergio Salvador
Residents who have completed their training through the program, and are currently working as certified neurosurgeons, having been approved by their respective National Medical Practitioners Boards, as per the COSECSA Secretariat in Arusha, Tanzania (8)	

Following the development of the Regional Program, several National Programs have also developed during this period. These include

1. The M. Med (Neurosurgery) Program at the University of Nairobi, Kenya,
2. MSc (Neurosurgery) program in Tanzania (Figura 1),
3. M.Med (Neurosurgery) in Uganda,
4. M.Med (Neurosurgery) in Harare, Zimbabwe.
5. Neurosurgery of the University of Addis Ababa, in Ethiopia.

As a result of the Collegiate (COSECSA), neurosurgical initiatives commenced in 2005, neurosurgical training and a resultant increase in specialists' numbers have seen a gratifying advancement of neurosurgical standards and availability in the East, Central, and Southern African region (8).



FIGURE 3. Accredited Hospitals in the ECSA region A. Mbarara University Teaching Hospital, B. MnaziMmoja/NED Institute: launch by former Zanzibar President, H.E. Mohamed Ali Shein, in February 2015, D. Mulago Medical Complex, Makerere University, Kampala, Uganda, D. Kenyatta National Hospital, Nairobi, Kenya, E. Tenwek Hospital, Bomet County, Kenya, F. Surgical Skills Lab at the Addis Ababa University, Ethiopia.

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