World Neurosurgery: X 18 (2023) 100161

Contents lists available at ScienceDirect

World Neurosurgery: X

journal homepage: www.journals.elsevier.com/world-neurosurgery-x

# Impact of a visiting consultant neurosurgeon: The Nigerian experience

B. Usman [a,b,*], A. Ajulo [c], A.M. Abubakar [c]

[a] Neurosurgery Unit, Surgery Department, University of Maiduguri Teaching Hospital and the University of Maiduguri, Borno State, Nigeria
[b] Visiting Neurosurgeon to the Surgery Department, Federal Medical Centre Yola, Adamawa State, Nigeria
[c] Surgery Department, Federal Medical Centre Yola, Adamawa State, Nigeria

ARTICLE INFO

*Keywords:*
Consultant
Impact
Neurosurgeon
Nigeria
Visiting

ABSTRACT

*Objective:* To study the impact of a visiting consultant neurosurgeon on the management and outcome of neurosurgical patients in a hospital with no resident neurosurgeon.
*Methods:* This is a 5-year retrospective study of neurosurgical conditions and their management outcomes by a visiting consultant neurosurgeon in a Nigerian Tertiary institution from January 2016 to December 2020.
*Results:* Thousand two hundred and four (1,204) patients were reviewed. Patients' ages were between 1 h and to 86-year-olds, with a mean of 23 years and a mode of 32 ± 4 years. Children were 423 (35.1%), with 781(64.9%) adults. Males were 862 (71.6%), and Females were 342 (28.4%), with a Male to Female ratio of 5:2. Congenital problems were 170 (14.1% of 1204): meningocoeles (38, 22.4%), myelomeningocoeles (61, 35.9%), encephalocoeles (24, 14.1%), anencephaly (6, 3.5%), and hydrocephalus (41, 24.1%). Acquired conditions were 1034 (85.9% of 1204): Head injuries (486, 47%), spinal cord injuries (51, 5%), Pyogenic brain Abscess (3, 0.3%), Pott's disease (2, 0.2%), Hydrocephalus (63, 6.1%), brain tumour (5, 0.5%), degenerative spine (421, 40.7%), vascular (3, 0.3%). Surgery was indicated in 348(28.9%) patients. Two hundred and twenty-six (18.8% of 1204) had surgeries, while 978 (81.2% of 1204) had no surgeries. Referred to other facilities were 122 (10.1%). Overall, surgical intervention was 64.9% (226 of 348), with mortality of 13.5% (18 patients) among those who had surgical interventions.
*Conclusions:* In countries with very few medical specialists, particularly neurosurgeons, such a regular visit can impact the care of neurosurgical patients in their environment.

## 1. Introduction

A consultant is a highly qualified and selected specialist Doctor who practices without supervision, gives expert professional advice, and is at the apex of the medical hierarchy.[1]

A visiting consultant is a Medicaid provider with expertise or knowledge in a specific area and is generally recognised by the community as a specialist. This expertise or service is not readily available on a particular island.[2] Included as visiting consultants are specialists requested by other providers to render second opinions or participate in the medical treatment of Medicaid beneficiaries.[2]

Africa, with a total health workforce Density (per 1000 population) of 2.3, is the least among all the continents.[3] From a 2021 Newspaper report, Nigeria currently has 97 neurosurgeons in both the public and private sectors in 27 of the 36 states and the Federal Capital Territory, caring for an estimated teeming population of over 200 million.[4] Therefore, one (1) Nigerian neurosurgeon needs to attend to 100 000 Nigerians – a far cry from the needed number of about 2000 neurosurgeons.[4] This low ratio has made neurosurgical services unavailable to a large population of Nigerians.[5]

A United States study revealed about 66% of neurosurgical transfers because the primary hospital had no neurosurgical coverage with a resultant long mean transfer time of patients, resulting in 10% of patients experiencing a decline in Glasgow Coma Scale (GCS) score during such transfers.[6] In Australia, it has been found that surgeons expect a 2- and 4-h transport time for a neurotrauma patient to a neurosurgical centre.[7] This timed neurosurgical intervention is a significant predictor of mortality and outcomes.[8,9]

Because of the limited access to subspecialty surgical care, the United States Air Force established a Visiting Surgeon Program (VSP) in various remote locations.[10] In the visiting consultant models, the specialists travel away from their primary practice to provide regular services.[11] Therefore, it brings the specialist close to the patients and thence reduces the travelling cost of the patients.[12]

* Corresponding author. Neurosurgery unit, surgery department, university of Maiduguri teaching hospital and the University of Maiduguri, Borno State, Nigeria.
*E-mail address:* babaganau@yahoo.com (B. Usman).

https://doi.org/10.1016/j.wnsx.2023.100161
Received 28 September 2022; Received in revised form 22 January 2023; Accepted 23 January 2023

In the Australian model, regular rural outreach services akin to visiting are undertaken by the surgeons; this has been found to promote growth in their practice, provision of healthcare to disadvantaged people, maintaining a personal connection to a region, provision of complex healthcare in challenging situations, and providing support for rural health staff.[13]

In the Nigerian setup, a "mission" – like arrangement exists in the form of a "Visit" where a medical consultant comes around for a week every month to sort out a "pooled" number of patients and emergencies during that period. Visiting offers the population sustainable, cheap, and good-quality care in a friendly environment.[14]

## 2. Material and methods

We conducted a 5-year retrospective study on the spectrum of neurosurgical conditions and their management outcomes by a visiting consultant neurosurgeon at Federal Medical Centre (FMC) Yola from January 2016 to December 2020. Our hospital is a tertiary health care facility located in Yola, Adamawa state, with no resident Neurosurgeon. However, it is among the few who have the privilege of having a regular visiting neurosurgeon travelling more than 400 km. The hospital is located in northeastern Nigeria, catering to patients from the state and other parts of four (4) neighbouring states, with a total estimated population of more than Fifteen (15) million. It is equipped with essential laboratory services but lacks a Computed Tomography Scanner (CT Scanner), Magnetic Resonance Imaging (MRI) machine, and a C-Arm fluoroscope to carry out an image-guided spine surgery.

The visiting neurosurgeon comes around for five (5) working days a week every month, attending (reviewing) and managing the pooled (electives) and any neurosurgical emergency condition(s) during the periods. The patients are reviewed via the surgical out-patient department (SOPD), accident and emergency (A and E), emergency paediatrics unit (EPU) and the special care baby unit (SCBU). After the visits, the resident General, orthopaedic and paediatric surgeons continue the post-operative care. At discharge, follow-up appointments are adjusted to correspond with the following visit of the neurosurgeon. Outcomes were observed at discharge but most notably at the first follow-up clinic.

Data on the patient's demography (age and sex), diagnosis at presentations (whether the patient was operated on or not), the number of patients operated on, the type of surgical interventions, observed complications, and outcomes were retrieved from the patient's case notes. Data were entered into Microsoft Excel Worksheet 2016 and analysed via descriptive statistics.

## 3. Results

1204 patient case files/folders were retrieved and data were extracted. Patients' ages ranged from 1 h to 86 years, with a mean of 23 years and a mode of 32 ± 4 years. Four hundred and twenty-three (423, 35.1%) were children, while 781(64.9%) were adults. There were 862 males (71.6%) and 342 Females (28.4%), with Male to Female ratio of 5:2.

The spectrum of the clinical diagnoses ranged from congenital to acquired conditions. Some of the clinical findings in patients with congenital conditions are shown below in Fig. 1.

Various types of Congenital diagnoses and the number operated are shown in Table 1 below. The congenital lesions were various Neural Tube Defects (NTD) and congenital Hydrocephalus. Except for anencephaly patients, the NTD patients were counselled for excision and closure. Those with hydrocephalus were offered ventriculoperitoneal shunts (VP shunts).

Eighty-six per cent (1034 of 1204) of the patients had acquired neurosurgical problems ranging from traumatic, inflammatory, neoplastic, degenerative, and vascular conditions.

Trauma to the head and spinal cord involved 537 patients (51.9% of all the acquired conditions), consisting mainly of 486 head injuries (90.5% of 573) with the following severities: severe were 81(16.7%), moderate was 122 (25.1%), and 283 (58.2%) were mild head injuries. Accordingly, they had surgeries comprising evacuation of various haematomas, extraction of foreign bodies, debridement, duraplasty, the elevation of depressed skull fractures, and decompressive craniotomies (DECRA). Some of the findings in the patients with trauma are shown in Fig. 2.

The total number of various categories of acquired conditions that were managed is shown in Table 2 below.

Eight hundred and three (803, 66.7%) were managed as inpatients, while four hundred and one (401, 33.3%) were managed as outpatients.

Two hundred and twenty-six (226, 18.8% of 1204) patients underwent various surgeries, while nine hundred and seventy-eight (81.2% of 1204) were not operated on. One hundred and eleven (111, 63.8%) were operated as elective cases, while sixty-three (36.2%) were operated as emergencies. Overall, the relations between the total number of patients in which surgery was indicated (348) and the number that had various surgeries revealed that 64.9% (226) of the patients had surgical intervention, with post-operative mortalities of 13.5% (18 patients). The management outcomes are shown in Table 3 below.

**Table 1**
Shows the various congenital diagnoses, the total number of patients, and the number of patients operated on.

| Diagnosis | Number of patients | Number operated (%) |
|---|---|---|
| Neural Tube Defects (NTDs) | | |
| Meningocoeles | 38 | 25 (65.8%) |
| Myelomeningocoeles | 61 | 36 (59.0%) |
| Encephalocoeles | 24 | 15 (62.5%) |
| Anencephaly | 06 | Nil |
| Congenital Hydrocephalus | 41 | 16 (39.0%) |
| **Total** | **170** | **92/170 (54.1%)** |

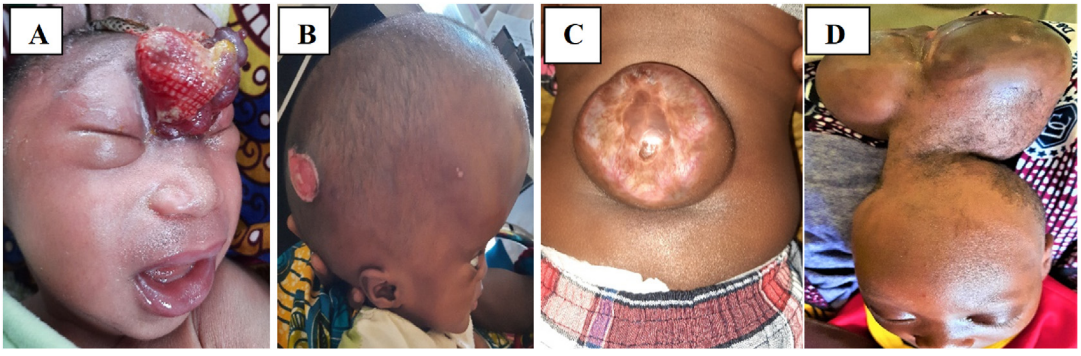


**Fig. 1.** Above showing an ulcerated frontonasal encephalocoele (**A**), congenital hydrocephalus with pressure sore over the right parietal area (**B**), Lumbar myelomeningocoele (**C**), and a giant occipital encephalocoele (**D**).

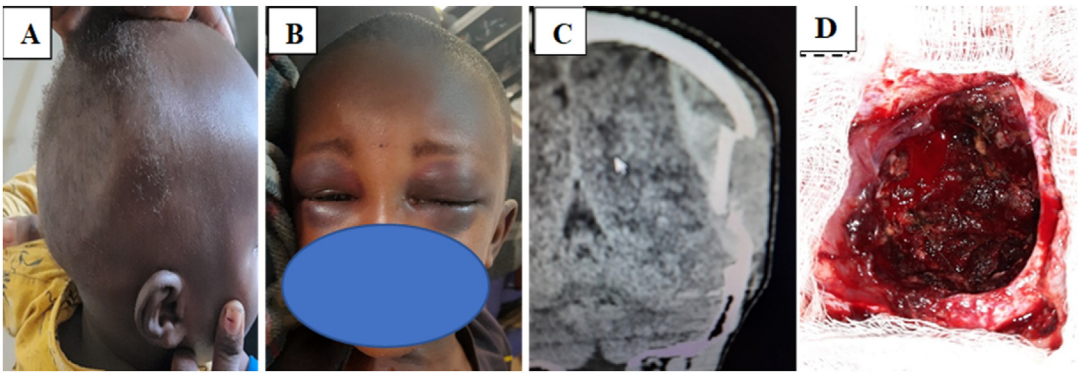


**Fig. 2.** Above showing a right parieto-occipital depressed ("Ping-Pong") fracture(**A**), Bilateral raccoon eye appearance in a head-injured patient(**B**), a coronal reconstruction of a cranial computed tomography showing a left-sided subgaleal haematoma overlying a comminuted, depressed skull fracture and an extradural haematoma(**C**), and a craniotomy revealing a subdural haematoma(**D**).

**Table 2**
shows the acquired conditions that were managed irrespective of surgical intervention and the number that had surgical interventions.

| Category | Diagnoses | Number of patients | Number operated (%) |
|---|---|---|---|
| Trauma | | | |
| | Head injuries (HI) | | |
| | Closed HI | 384 | 71 (18.5%) |
| | Open/penetrating HI | 102 | 32 (31.4%) |
| Spinal cord injuries | | | |
| | Cervical | 15 | Nil |
| | Thoracic | 05 | Nil |
| | Lumbar | 31 | Nil |
| Infection | | | |
| | Pyogenic brain Abscess | 03 | 03(100%) |
| | Pott's disease | 02 | Nil |
| | Hydrocephalus | 63 | 27 (42.8%) |
| Neoplasm | | | |
| | Primary | | |
| | Brain Meningioma | 03 | 01 (33.3%) |
| | Glioblastoma Multiform | 02 | Nil |
| | Secondary | | Nil |
| Degenerative Spine | | | |
| | Cervical | 53 | Nil |
| | Thoracic | 03 | Nil |
| | Lumbosacral | 365 | Nil |
| Vascular | | | |
| | Aneurysm | 01 | Nil |
| | Arteriovenous malformation | 02 | Nil |
| | **Total** | **1034** | **134/1034 (13%)** |

**Table 3**
Shows the patient's management outcomes irrespective of surgical intervention.

| Outcomes | Number of patients | Percentage (%) |
|---|---|---|
| Good | 802 | 66.6% |
| Mild disability | 53 | 4.4% |
| Moderate disability | 20 | 1.7% |
| Severe Disability | 10 | 0.8% |
| Lost to follow-up | 155 | 12.9% |
| Referred to other facilities | 122 | 10.1% |
| Overall mortalities | 42 | 3.5% |
| **Total** | **1204** | **100%** |

## 4. Discussion

Adult patients outnumbered the children, with most of them having trauma-related conditions compared to the children who had mainly congenital lesions, respectively. Rabiu,[15] in a rural Nigerian setup with a resident neurosurgeon, found more adults (73.1%) than ours.

The dominance of male patients in our study is nearly similar to other Nigerian findings of 75.2% and 70% by Rabiu[15] and Morgan,[16] respectively.

We saw fewer congenital lesions compared to acquired disorders. Despite this, Rabiu[15] managed much less (4.8%) congenital disorders in a new rural setting similar to ours, though on a non-visiting basis. Adeleye[17] found more congenital problems in an urban Nigerian setup. The common congenital disorder was Myelomeningocoeles, an NTD seconded by hydrocephalus. This is similar to the findings of Babagana.[18] In contrast, Morgan[16] found hydrocephalus to be numerous. Among the patients with hydrocephalus, acquired causes (post meningitis) outnumbered the congenital; this conforms with the findings of Usman[19] from the same hospital.

Head and spinal cord injuries constituted a large portion of the admissions (>50%), similar to the reports by Adeolu,[20] Agius,[21] and Rabiu.[15] Head injuries dominated the traumatic conditions, mainly mild than moderate, with few (9.1%, 44) severe head injuries. The dominance of mild head injury (HI) had been reported by morgan,[15] Winkler,[22] and Ivers.[23] In contrast to our finding, Winkler[22] found more severe HI than moderate ones. We found Lumbar spine injuries to be numerous, followed by the cervical spine, unlike Morgan,[16] who found more cervical than lumbar injuries.

Our intervention rate of 64.9% among patients who either mostly paid out-of-pocket for medical care, need no referral to other centres, and did not opt for unorthodox care (few ones) with indications for surgery (based on clinical, and imaging findings) is twice that of a new centre[16] in Nigeria with a resident neurosurgeon, though the study periods were not the same. In comparison, it is slightly higher than the 60.7% reported by a Nigerian General surgeon during similar visits undertaken by Mungadi.[14]

Our overall outcomes were mainly good. However, many were lost to follow-up and referred to established neurosurgery centres because our hospital lacked the equipment to carry out complex procedures, especially spinal disorders. Our good outcomes are similar to a finding from a rural Nigerian setting[15] (63.4%). We encountered a few severe disabilities and deaths. Rabiu[15] had reported more severe disabilities (9.1%) and lesser death (9.1%) in a rural setting like ours.

Higher mortalities of 9.2%, 9.7%, and 12.5% were reported from Irrua,[16] a new centre in Nigeria, Mbarara in Uganda,[24] and southern Australia,[25] respectively.

## 5. Conclusions

A visiting surgeon can improve care and offer sustainable, cheap and good qualitative care to patients in their environment. Quite a good number of patients were attended to, and some were operated on by the

visiting neurosurgeon that otherwise should have travelled at least a distance of about 350 km to get the appropriate care. Therefore, in low- and medium-income countries with very few medical specialists, particularly neurosurgeons, such regular visiting arrangements/appointments could have no measurable impact on the care of neurosurgical patients.

## Credit author statement

**Usman B:** Conceptualization, Data curation, original draft and project administration, writing- review and editing. **Ajulo A:** Methodology, Reviewing and editing. **Abubakar A.M:** Reviewing and Editing, Supervision.

## Source of funding

This research did not receive any specific grant from public, commercial, or not-for-profit funding agencies.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Acknowledgements

All other surgeons and resident doctors that participated in managing the patients directly or indirectly.

## References

1. Consultant doctor. *Collins Dictionary of Medicine*, 2005. Robert M. Youngson; 2004, 27 January 2022 https://medical-dictionary.thefreedictionary.com/Consultant+doctor.
2. https://www.lawinsider.com/dictionary/visiting-consultant, 27 January 2022.
3. World Health Organization. *The world health report*. 2006. Health workers: a global profile. Ch.1. pg 5.
4. https://punchng.com/nigeria-needs-at-least-2000-neurosurgeons, 27 January 2022.
5. Taira BR, Kelly McQueen KA, Burkle Jr FM. Burden of surgical disease: does the literature reflect the scope of the international crisis? *World J Surg*. 2009;33:893–898.
6. Byrne RW, Bagan BT, Slavin KV, Curry D, Koski TR, Origitano TC. Neurosurgical emergency transfers to academic centres in Cook County: a prospective multicenter study. *Neurosurgery*. 2008;62:709–716.
7. Bishop CV, Drummond KJ. Rural neurotrauma in Australia: implications for surgical training. *ANZ J Surg*. 2006;76:53–59.
8. Luck T, Treacy PJ, Mathieson M, Sandilands J, Weidlich S, Read D. Emergency neurosurgery in Darwin: still the generalist surgeons' responsibility. *ANZ J Surg*. 2015;85:610–614.
9. Kong VY, Bruce JL, Sartorius B, et al. Civilian cerebral gunshot wounds in rural South African patients are associated with significantly higher mortality rates than in urban patients. *Eur J Trauma Emerg Surg*. 2019;45(1):145–150. https://doi.org/10.1007/s00068-017-0800-z.
10. Fox JP, Latham KP. The air force visiting surgeon program: development, outcomes, and future application [published online ahead of print, 2021 Dec 22]. *Mil Med*. 2021:usab507. https://doi.org/10.1093/milmed/usab507.
11. Gruen RL, Bailie RS, Wang Z, Heard S, O'Rourke IC. Specialist outreach to isolated and disadvantaged communities: a population-based study. *Lancet*. 2006;368(9530):130–138. https://doi.org/10.1016/S0140-6736(06)68812-0.
12. Couper ID, Malete NH, Tumbo JM, Hugo JFM. The role of the visiting Doctor in primary health care clinic. *SA Fam Pract*. 2003;45(6):12.
13. O'Sullivan BG, McGrail MR, Stoelwinder JU. Reasons why specialist doctors undertake rural outreach services: an Australian cross-sectional study. *Hum Resour Health*. 2017;15(1). https://doi.org/10.1186/s12960-016-0174-z.
14. Mungadi IA. Quality surgical care for rural dwellers: the visiting option. *Trop Doct*. 2005;35(3):151–153. https://doi.org/10.1258/0049475054620897.
15. Rabiu TB, Komolafe EO. Neurosurgery in rural Nigeria: a prospective study. *J Neurosci Rural Pract*. 2016;7:485–488.
16. Morgan E, Nwatuzor C. Starting a neurosurgical service in a Southern Nigeria rural community. Prospect, challenges, and future—the Irrua experience. *Egypt J Neurosurg*. 2020;35(1):6. https://doi.org/10.1186/s41984-020-00081-y.
17. Adeleye AO, Olowookere KG. Central nervous system congenital anomalies: a prospective neurosurgical observational study from Nigeria. *Congenital Anom (Kyoto)*. 2009;49:258–261.
18. Babagana U, Ahmadu BU, Wabada S, et al. Profile and management of central nervous system malformations in a tertiary hospital. *KJMS*. 2020;14(1):24–30.
19. Usman B, Wabada S, Oyinloye AO, et al. Demography and management of childhood hydrocephalus in Yola, Adamawa state, Nigeria. *Jewel J Med Sci*. 2020;1(1):81–89.
20. Adeolu AA, Abiona TC, Komolafe EO, Adeolu JO, Adegbehingbe OO. Epidemiology of neurotrauma in Ife-Ijesha zone of Nigeria. *World Neurosurg*. 2013;80:251–254.
21. Agius S, Ansari S, Zrinzo A. Pattern of head injuries in Malta (EU): a small Mediterranean Island. *Br J Neurosurg*. 2012;26:212–215.
22. Winkler AS, Tluway A, Slottje D, Schmutzhard E, Härtl R. East African Neurosurgical Research Collaboration. The pattern of neurosurgical disorders in rural Northern Tanzania: a prospective hospital-based study. *World Neurosurg*. 2010;73:264–269.
23. Ivers LC, Garfein ES, Augustin J, et al. Increasing access to surgical services for the poor in rural Haiti: surgery as a public good for public health. *World J Surg*. 2008;32:537–542.
24. Abdelgadir J, Smith ER, Punchak M, et al. Epidemiology and Characteristics of neurosurgical conditions at Mbarara regional referral hospital. *World Neurosurg*. 2017;102:526–532.
25. Simpson DA, Heyworth JS, McLean AJ, Gilligan JE, North JB. Extradural haemorrhage: strategies for management in remote places. *Injury*. 1988;19:307–312.

## Abbreviations

*A and E:* Accident and Emergency
*CT scanner:* Computed Tomography scanner
*EPU:* Emergency paediatric unit
*FMC:* Federal Medical Centre
*GCS:* Glasgow Coma Scale
*MRI:* Magnetic Resonance Imaging
*NTD:* Neural Tube Defect
*SCBU:* Special Care Baby Unit
*SOPD:* Surgical Out-patient Department
*VP Shunt:* Ventriculoperitoneal Shunt
*VSP:* Visiting Surgeon Program