

Traumatic Brain Injury Management in Nigeria: A Critical Review of Systemic Challenges and Integrated, Context-Specific Solutions

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ABSTRACT

Traumatic brain injury (TBI) is a leading cause of death and disability in Nigeria, driven overwhelmingly by road traffic accidents and affecting the young, economically productive demographic. Yet the health system is poorly equipped to meet this burden. This editorial reviews evidence on challenges spanning the entire continuum of TBI care, from very poor prehospital systems and severe diagnostic bottlenecks to an extreme shortage of neurosurgeons and limited rehabilitation services. It also attempts to integrate practical, evidence-based solutions, some of which are already being piloted within the country. The review will draw on recent Nigerian epidemiological studies, workforce analyses, and nascent national guideline initiatives to propose a coordinated strategy-driven approach. The analysis demonstrates that the necessary tools and local evidence exist; what is absent is the political will and sustained investment to unite fragmented ideas into a coherent national system. This Nigerian case study offers transferable lessons for low-resource settings globally.

Keywords: Traumatic Brain Injury; Nigeria; Health Systems Strengthening; Neurosurgery; Prehospital Emergency Care; Secondary Brain Injury

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INTRODUCTION

Traumatic brain injury (TBI) imposes a disproportionate burden on low- and middle-income countries (LMICs), where more than three-quarters of global trauma deaths occur.^{1,2} Nigeria, with a population exceeding 200 million, exemplifies these problems, characterised by a high incidence of road traffic accidents and a health care system that is fragmented, inequitably distributed, and marked by a shortfall in comprehensive emergency neurosurgical care. This editorial critically examines how systemic barriers can convert a survivable head injury into mortality or a lifetime of severe disability. It clearly elucidates the deficiencies within each domain of the care

pathway for TBI patients and highlights practical recommendations anchored in local, sustainable innovations and emerging evidence. By doing so, it offers a clear pathway for strengthening neurosurgical health systems that is both context-specific and scalable to other resource-limited settings, while acknowledging the implementation and financing challenges that must be overcome.

Epidemiology and Aetiology

A 2024 systematic review and pooled analysis of 45,763 patients across 254 Nigerian studies provides the most comprehensive epidemiological profile to date.² Neurotrauma accounted for the overwhelming majority of

neurosurgical presentations, with TBI alone representing nearly 90% of cases. The mean age was 32.5 years, and the male-to-female ratio was approximately 3:1, reflecting a concentration of injury among the highly productive section of the population. Road traffic accidents were the dominant mechanism, responsible for 68.6% of all TBIs.² This pattern is consistent with global estimates, which identify road traffic injuries as the leading cause of TBI worldwide and a rapidly growing burden in sub-Saharan Africa.^{3,4}

The paediatric burden mirrors this pattern. A systematic review of 2,234 children with TBI found that road traffic accidents (52.2%) and falls from height (32.4%) were the leading causes, with a pooled mortality of 10.2%.⁵ A two-centre prospective study from South-East Nigeria reported road traffic accidents in 69.2% of paediatric head injuries.⁶ Across all age groups, there is a high burden of severe cases at presentation, with altered consciousness documented in nearly half of patients.² While these data are broadly consistent, most originate from tertiary hospitals, potentially overestimating severity and underestimating milder injuries that never reach a formal neurosurgical service. The overwhelming role of road traffic accidents underscores the importance of primary prevention through road safety legislation and enforcement, but it also means that the health system must be configured to receive and manage a large volume of severe head injuries.

The Prehospital Care Gap

In well-functioning trauma systems, the prehospital phase is where the greatest survival gains are made by preventing secondary brain injury from hypoxia, hypotension, and raised intracranial pressure. In Nigeria, this phase is almost entirely absent or exists as pockets of activity in a few urban areas. A 3-year

retrospective review of 23537 trauma patients at a major centre in Lagos, Nigeria, showed that only 2.3% received formal prehospital care.⁷ Basic first aid knowledge, including airway and cervical spine control, is poor among Nigerians (Figure 1), and it is estimated that more than half of all deaths can be prevented by effective prehospital and emergency care delivery.^{8,9} A systematic analysis of the neurosurgical capacity reinforces this, documenting the near-absence of formal prehospital coordination for neurotrauma across the country.¹⁰ Globally, the absence of prehospital systems is recognised as one of the most significant contributors to preventable death after injury in LMICs.^{8,11,12}

The solution does not require an unaffordable fleet of advanced ambulances as seen in industrialised nations. Instead, a national programme to train lay first responders, including commercial drivers, motorcycle and tricycle operators, teachers in primary and secondary schools, and community volunteers, in basic airway management, cervical spine and bleeding control, and safe transportation can significantly reduce preventable deaths. Such programmes have proven effective in other low-resource settings, and the growing body of evidence on task-sharing in neurosurgery supports the principle of extending life-saving competencies to non-specialist cadres.¹³ Simultaneously, the National Emergency Medical Service and Ambulance System (NEMSAS) must be expanded beyond its current limited operations and linked to a single, functioning national emergency number.

Another novel recommendation is mandatory first-aid certification for commercial driving licence renewal, covering commercial bus, motorcycle, and motorbike riders and teaching them safe transportation protocols. In addition, designated hospitals within each region can serve

as the catchment area where the first responder can call before transporting the patient. Although this is a far cry from what is available in developed countries, it will lay the groundwork for further development of Nigeria's prehospital system.

Diagnostic Bottlenecks in Management of Traumatic Brain Injury

Computed tomography is the indispensable tool for triaging TBI, yet its availability in Nigeria is grossly inadequate. The geospatial analysis of neurosurgical infrastructure documented that only a minority of the nation's CT scanners are located in public hospitals, and many of these are non-functional due to maintenance failures and erratic power supply.¹⁰ The financial barrier is equally formidable. Nigeria has the largest population living in multidimensional poverty in Africa, with over 133 million people; that's over 63% of the population lacking access to essential services, including healthcare.¹⁴ Compounding this, the National Health Insurance Authority (NHIA) covers fewer than 10% of Nigerians, and over 70% of total health expenditure is out-of-pocket,¹⁵ meaning that the cost of a CT scan, typically ranging from ₦30,000 to ₦80,000 (approximately US\$20–50), represents a significant expense for the majority of households.¹⁰

The clinical consequences are severe. A systematic review of paediatric TBI in Nigeria reported that at Lagos University Teaching Hospital, a leading tertiary centre, only 57.7% of children with TBI were able to obtain a CT scan, with the inability to pay being the primary barrier.¹⁶ Patients are frequently required to travel over 100 km to access a functioning scanner, and the resultant delays may prove fatal for time-sensitive intracranial haematomas.

Addressing this requires a pragmatic, multi-

pronged strategy involving both private and public partnerships. An immediate national audit of all CT and MRI equipment, documenting location, ownership, functional status, and maintenance needs, must be conducted to create a transparent inventory and inform procurement planning. The second and most impactful intervention would be a government policy directive subsidising the cost of CT for all emergency trauma patients in public and private hospitals, in addition to ensuring that health insurance providers cover the service.

A medium-term target should be the installation of at least one functional CT scanner in each federal and state teaching hospital, federal medical centre, and even general hospital, to expand coverage for underserved rural populations. The broader neurosurgical literature confirms that diagnostic delays due to financial barriers are a leading cause of preventable mortality in LMIC settings, and implementing these strategies will result in early diagnosis and enable appropriate care to be instituted.^{2,10,17} Innovative approaches such as smartphone-based tele-radiology and portable CT technology are emerging as potential solutions in hard-to-reach and underserved areas.¹⁸

The Neurosurgical Workforce Deficit in Nigeria

Nigeria's neurosurgeon-to-population ratio is among the lowest globally. A 2024 geospatial analysis identified approximately 132 neurosurgeons serving 218 million people, a ratio of 1:1.65 million, against the World Health Organisation's recommendation of 1:100,000.¹⁰ This deficit is compounded by severe brain drain. Nigerian neurosurgeons are emigrating at an accelerating rate, citing poor remuneration, lack of equipment, unsafe working conditions, and national insecurity; Nigeria is the largest exporter of health workers in Africa, and specialists are

disproportionately represented.^{19,20}

Services that do exist are profoundly maldistributed. Of 86 neurosurgery-capable health facilities nationwide, only 17.4% are accredited for residency training, dedicated neurosurgery beds account for just 4.0% of total hospital beds, and dedicated neurosurgery operating rooms account for only 15.4% of total operating rooms.¹⁰

The response must centre on expanding specialist training and deliberately restructuring retention incentives. More residency training centres should be established, and a dedicated budgetary allocation should be set aside to increase equipment procurement, infrastructure development, and incentives for trainers within the facilities. Scholarships for postgraduate fellowships in the neurosurgical subspecialty of need should be encouraged, enabling fellows to acquire more skills in centres abroad with advanced neurosurgical programs and to develop competencies that will enable them to commence similar programs in Nigeria on their return.

Retention of specialists is another critical determinant of success. Evidence consistently demonstrates that remuneration is the single most powerful predictor of specialist retention in Africa.^{21,22} A dedicated Neurosurgery specialist allowance, separate from the civil service salary structure, should be established to provide internationally competitive consultant salaries, performance-based bonuses, and non-monetary incentives, including subsidised housing and children's education allowances. Equally important is transforming the working environment: functional operating rooms with reliable power, modern instruments, consistent availability of consumables, and dedicated neurosurgery theatres and intensive care beds in

every teaching hospital are non-negotiable.

Preventing Secondary Brain Injury: The Priority of Basic Physiological Monitoring

While advanced neuromonitoring remains unavailable in many Nigerian public hospitals, the most powerful predictors of death after severe TBI, hypoxia and hypotension, can be detected with simple tools. Landmark studies demonstrate that a single episode of systolic hypotension below 110 mmHg or oxygen saturation below 90% doubles mortality.^{23,24} These modifiable insults occur frequently where basic monitoring is absent.²⁵ In many Nigerian hospitals, automated blood pressure cuffs and pulse oximeters are not applied continuously to TBI patients outside the theatre.

Equipping every emergency department and neurosurgical ward with functioning monitors is immediately achievable. The devices cost US\$50–100 per unit and are locally procurable. The greater challenge is standardisation. A simple nurse-driven TBI Early Warning Score that triggers intervention when SpO₂ falls below 94%, systolic pressure drops below 110 mmHg, or the Glasgow Coma Scale declines by 2 points can be tested. A pilot could be established within six months and, if effective, integrated into national guidelines (NANS, 2022)^{26,27} and scaled to other centres. Correcting hypoxia and hypotension is the single most cost-effective intervention to reduce mortality.

Challenges with Rehabilitation Post TBI

Survival from severe TBI is only the beginning of a long journey to recovery. An estimated 3.2 million people sustain TBI annually across sub-Saharan Africa, a figure projected to reach 14 million by 2050, yet early neuro-rehabilitation guidelines remain undeveloped in most countries in the region.^{28,29} In Nigeria, multidisciplinary rehabilitation services involving

neuropsychology, physiotherapy, occupational therapy, and speech-language pathology are scarce, concentrated in a few urban facilities, and inaccessible to the majority of poor survivors.

The shortage of rehabilitation professionals is significant, leading to a care pathway that invests heavily in acute management while inadequately supporting the post-discharge journey, thereby significantly hampering recovery.²⁸ Globally, fewer than 5% of those needing rehabilitation in LMICs access even basic services.²⁹

The immediate priority is a tiered rehabilitation system leveraging community-based care. At tertiary hospitals, a basic multidisciplinary team comprising at least a physiotherapist, a nurse with neuro-rehabilitation training, and a visiting or telelinked psychologist can be established, while community health extension workers provide home-based follow-up after discharge, using principles of the WHO Rehabilitation Competency Framework (WHO, 2020).³⁰ In addition, post-acute rehabilitation services for TBI should be included in the NHIA benefit package, and coverage should be expanded toward universal health coverage for emergency and rehabilitative care.

From Guidelines to Implementation

The absence of standardised, context-appropriate clinical guidelines has long contributed to variability in TBI care across Nigeria. In response, the Nigerian Academy of Neurological Surgeons (NANS 2022), an umbrella body for Neurosurgeons in Nigeria, developed the Proposed Standard of Practice and Guidelines on the Management of Traumatic Brain Injury, Spinal Cord Injury, and Peripheral Nerve Injury.^{26,27} However, these guidelines remain in draft form; nationwide adoption requires formal endorsement by the Federal Ministry of Health and incorporation

into hospital policies, which has not yet occurred.

The path from guidelines to implementation in Nigeria is achievable through an organised and pragmatic approach. First, the Federal Ministry of Health should formally adopt the NANS guidelines and issue a circular mandating their use in all federal and state teaching hospitals. Second, the guidelines should be embedded in undergraduate and postgraduate medical curricula and reinforced through continuous professional development. Third, adherence must be audited through a functional national neurotrauma registry, enabling tracking of every patient from injury through discharge and follow-up. The value of trauma registries in LMICs is well documented; hospitals with functional registries experience a significantly lower injury burden and improve surveillance and clinical governance.³¹ Establishing such a registry in Nigeria requires phased investment in IT infrastructure, dedicated data clerks, and strategies to minimise loss to follow-up, beginning first at tertiary centres with accredited neurosurgery centres and subsequently involving other private and public health care facilities. To achieve a good outcome, strategies based on active policy implementation, regular audit cycles, and feedback must be in place, with execution steady and sustained, resulting in a change in clinical practice.

Framework for Financing and Implementation

The proposed interventions require sustainable financing. Nigeria already has mechanisms that can be leveraged. The Basic Health Care Provision Fund, which allocates 1% of the Consolidated Revenue Fund to health, can be partially utilised to provide emergency neurosurgical services, including CT scanners and basic monitors. In addition, the National Health Insurance Authority must expand coverage to the

informal sector and include TBI rehabilitation in the minimum benefit package.

Furthermore, road safety funds, generated from fines and vehicle registration fees, can be legislatively redirected to support prehospital care for accident victims. Pooled procurement of hospital equipment can be explored, tied to service contracts by oil companies and telecommunication giants, to reduce costs and provide a sustainable supply chain.

Implementation should be overseen by a national TBI steering committee co-chaired by the Federal Ministry of Health and the Nigerian Academy of Neurological Surgeons, with a mandate to set priorities, track progress, and report publicly. The first concrete steps should be a national equipment audit and lay-first-responder training, which can begin within existing budgets. What is needed is not a new system, but the coordinated activation of existing structures.

Figure 1: Pictures showing a road traffic accident and the evacuation of victims



Figure 1(A-C) shows a road traffic accident (A) Multiple-vehicle crash site with first responders, including Federal Road Safety Corps (FRSC) marshals. (B & C) Victims were transported in the back of the FRSC truck to the hospital without any form of prehospital care or cervical spine immobilisation: Courtesy of Nigerian Top Secret Blog.³²

CONCLUSION

While substantial challenges exist in Nigeria in the management of TBI, these include poor prehospital response, a dearth of acute diagnostic capacity, a scarce neurosurgical workforce, and limited rehabilitation services. This review explored various strategies that can be implemented to improve the trauma health care systems and improve the outcomes of patients with TBI. The imperative is not to construct an entirely new system, but to integrate, fund, and scale existing innovations within a coordinated national framework. Achieving this will demand sustained political commitment, transparent resource allocation,

and institutional accountability, led jointly by the Federal Ministry of Health and the neurosurgical professional community. The evidence is sufficient, the interventions are defined, and the economic and human costs are achievable. What remains is the decision to act.

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