

Review Article

Investing in Pediatric Surgical Research to Advance Universal Health Coverage for Children in Nigeria

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ABSTRACT

About 1.7 billion children and adolescents most of whom are in low- and middle-income countries lack access to safe and affordable surgical and anesthesia care when needed. 43% of Nigeria's population of 199 million are below the age of 15 years. In 2015, Nigeria had a pediatric surgeon workforce deficit of 693 for children <15 years. While threats and constraints to achieving universal health coverage in Nigeria have been highlighted, the role of research is often not included. Over the years, there has been a slow but progressive increase in pediatric surgical workforce and research output, both locally and with international collaborations, and in trainee involvement in research as lead authors. There has unfortunately been a challenge with translation of research findings, outcomes, and recommendations into actions. Despite the various challenges mitigating against pediatric surgery research, efforts must be committed to developing and implementing innovative approaches to address the problems and challenges, as well as implementing quality improvement programs and deploying technology to advance children's care. It is hoped that inclusion of children's surgery in the National Surgical, Obstetrics, Anaesthesia, and Nursing Plan would strengthen pediatric surgical research in Nigeria.

KEYWORDS: *International collaborations, pediatric surgery research, universal health coverage*

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INTRODUCTION

About 5 billion people worldwide lack access to safe and affordable surgical and anesthesia care^[1] [Figure 1].^[2] Of these, 1.7 billion are children and adolescents [Figure 2], and most in low and middle income countries (LMICs).^[3] Around the world, every 5 s, a child under 15 dies and many are from surgical conditions.^[4] Majority of these children are in LMICs including Nigeria. 43% of Nigeria's population of 199 million are below the age of 15 years. In addition, children from the highest mortality countries are up to 60 times more likely to die in the first 5 years of life than those from the lowest mortality countries.^[3]

As at 2017, there were 108 consultant pediatric surgeons and 43 pediatric surgery residents in Nigeria. In 2015, Nigeria had a pediatric surgeon density of 0.11/100,000 people under the age of 15 giving a pediatric surgeon workforce deficit of 693 for children less than 15 years

compared to United States with a density of 2.05/100,000 and pediatric surgeon excess of 640.^[5] Given these scenarios, universal health coverage (UHC) and the health-related targets of the sustainable development goals (SDGs) cannot be achieved without investments in the surgical care of children.

ROLE OF PEDIATRIC SURGICAL RESEARCH IN UNIVERSAL HEALTH COVERAGE AND SUSTAINABLE DEVELOPMENT GOALS

In 2014, the presidential summit on UHC in Nigeria was held under the theme, UHC, a vehicle for sustainable growth and development. There was however no

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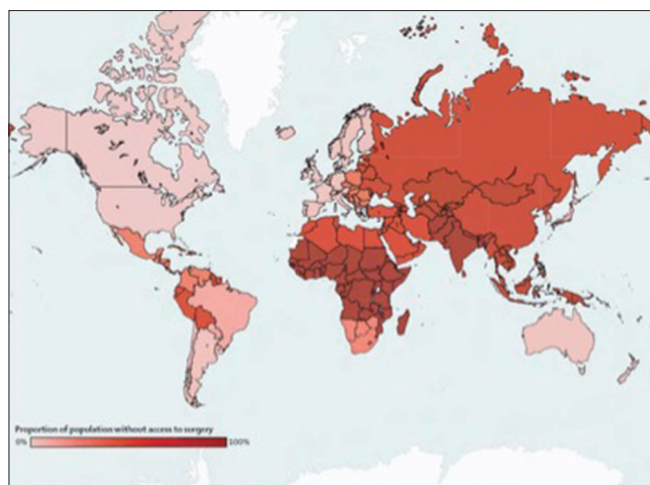


Figure 1: Proportion of the population without access to surgery by country

emphasis or focus on deploying research to achieve the goals and targets. While threats and constraints to achieving UHC in Nigeria have been highlighted, the role of research is often not included.

PEDIATRIC SURGICAL RESEARCH IN NIGERIA

Situational analysis: The Zaria experience

The University and Teaching Hospital in Zaria have been centers for intense pediatric surgery research and training. The foundation for pediatric surgery training was laid by Professor John T. Momoh and the late Professor Paul T. Nmadu with a strong emphasis on excellent clinical practice and high quality research. Subsequent generations of pediatric surgeons have imbibed the culture of research and carried on the baton. This includes, Professors EA Ameh, LB Chirdan, Dr. L. Sabiu, Professor PM Mshelbwala, the late Dr. M. Anumah, Professor C. Lukong, Dr. B. Jabo and more recently, Drs F. Suleiman, TT Sholadoye, S. Kache, M. Ayeni and A. Ibrahim. Other trainees rotating through the center made important contributions to research.

Research here was faced with several challenges, which persist to this day. These include:

Lack of research funding

Nigerian universities have characteristically been underfunded especially with regards to capacity development and research grants.^[6] There are 3 major sources of funding in Nigeria: internal agencies, external agencies, and the government whose contribution is the least.^[7] The internal agencies contributing to the funding of research are few. Local pharmaceutical companies and development partners have made some contribution to research funding. Some government universities have small grants from internally generated revenue. The largest source of funding for research in Nigeria

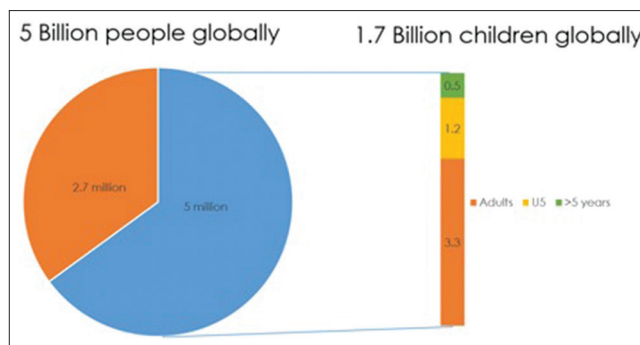


Figure 2: Global lack of access to timely and safe surgical care with financial risk protection (U5 = Under 5 years)

is external agencies such as the Bill and Melinda Gates foundation, USAIDS, and National Institutes of Health. However, surgical research in the country has not benefitted significantly from these. The major source of funding from the government is the Tertiary Education Trust Fund.^[8] This is a scheme established in 2001 to disburse, manage and monitor education tax to government owned tertiary institutions in Nigeria. Some scholars however, argue that the fund has only succeeded in carting away taxpayers' money to fortify and strengthen universities abroad instead of local research capacity development.^[9]

Staff shortages

According to the World Health Organization, a strong health system has a robust finance structure, well-remunerated and trained workforce, sufficient and highly maintained facilities, logistics for medicines, vaccines and technologies, and a reliable and regularly updated health information system.^[10] All these qualities are lacking in Nigeria and the staff shortages in Zaria, continually posed a challenge to pediatric surgery research. There is a perennial lack of research assistants and dedicated secretaries, as well as limited number of consultants and trainees leading to overwork and little time to commit to research.

Lack of research laboratories

Research laboratories are indispensable in the establishment, development, and progress of high-quality impactful surgical research. They help in developing better surgical and nonsurgical treatments, development of cellular and genetic research, tissue engineering, device testing, and development among others.

Lack of research laboratories continually hampers progress in pediatric surgical research.

Situational analysis: Nigeria

Research outputs from various pediatric surgical teams and centers in Nigeria have helped in defining the epidemiology, burden, and short-term outcomes

of pediatric surgical diseases, identifying challenges and devising improvisations and innovations. All these have stemmed from the pioneering work of Professors FA Nwako, MA Bankole, SD Adeyemi, and PT Nmadu [Figure 3]. There has been a progressive increase in pediatric surgical workforce and research both locally and with international collaborations, and in trainee involvement in research as lead authors. Various pediatric surgery texts focused on the specialty practice in the tropics and LMICs, that consider peculiarities and challenges of the region have been written and continue to be published [Table 1]. Chapters in these textbooks have often relied on research findings from Nigeria.

Global pediatric surgery research (Paedsurg Africa)

Interest and advances in research in this region led to conceptualization of Paedsurg Africa which was a multicenter research collaboration of surgeons, anesthetists, and allied health professionals providing neonatal and pediatric surgical care throughout sub-Saharan Africa,^[1] producing the largest prospective cohort of pediatric surgical data in this region. The aim was to compare the outcomes of five common pediatric surgical conditions between sub-Saharan Africa and high-income countries (HICs). The results could serve as a baseline for designing interventions. This project was conceived and led by a HIC trainee. Following this is the Global PaedSurg Research Collaborative, an ongoing project, the world's largest prospective cohort study of

congenital anomalies. Our trainees and younger faculty have the potential to develop and lead high-quality focused research that will impact and change pediatric surgery training and practice. However, mentoring, empowerment, and support are required to achieve this.



Figure 3: Pioneers of pediatric surgical research in Nigeria

Table 1: Surgical textbooks with particular focus on peculiarities of Nigeria and low- and middle-income countries

Book title	Book editors	Chapter title	Chapter authors	Year of publication	Publisher
A textbook of pediatric surgery in the tropics	Festus A. Nwako			1980	Macmillan
Surgical care for children: A guide for primary referral hospitals	Stephen Bickler and Emmanuel Ameh			2011	Macmillan
Pediatric surgery: A comprehensive text for Africa	Emmanuel Ameh, Stephen Bickler, Kokila Lakhoo, Benedict Nwomeh and Dan Poenaru			2011	Global HELP
Atlas of pediatric Surgery in the tropics	Nene Elsie Agugua-Obianyo			2013	Immaculate Publishers Ltd.
Global surgery and anesthesia manual: providing care in resource-limited settings	John G. Meara, Craig D. McClain, David P. Mooney, Selwyn O. Rogers, Jr	Pediatric Surgery	Doruk Ozgediz and Emmanuel A. Ameh	2015	CRC press
Academic Global Surgery	Mamta Swaroop and Sanjay Krishnaswami	Global burden of surgical disease and the role of the academia	Doruk Ozgediz, Keith P. Martin and Emmanuel A. Ameh	2016	Springer international
Global surgery: The essentials	Adrian Park and Raymond Price	Essential Pediatric Surgery	Dan Poenaru, Emmanuel A. Ameh, Arlene Muzira, Doruk Ozgediz	2017	Springer

Other barriers to achieving research involvement by junior faculty and trainees is lack of funding and the design of the training program which places emphasis on service and passing examinations with little time for research.

The gaps

Translating research into actions

In this region, research findings are rarely translated into practice indicating challenges with implementation of research outcomes. A review of abstracts presented at the annual scientific meeting of the Association of Paediatric Surgeons of Nigeria and their final publication rate showed that of abstracts presented at the meetings over a 5-year period, only 34% resulted in publication in peer-reviewed journals.^[12] Only 29.9% of abstracts presented at the Pan-African Pediatric Surgical Association between 2006 and 2010 resulted in full-text publications in 20 peer-reviewed journals.^[13] This represented 28.6% of abstracts from Africa and 33.3% of abstracts from outside Africa. This implies that results of such research work are not placed on a platform that can be accessed both within Nigeria and around the world, by children's surgery providers and others and eventually do not influence clinical practice remaining as academic publications.

Uptake of research to influence practice even in the same institution is low with most surgeons preferring to implement findings from elsewhere or by high income country researchers even if the HIC researchers are trainees. While there is increased research activities and attendant publication output, especially in life and health sciences, currently, most reported researches have not been impactful. Research productivity should not only be based on numbers but also on quality and impact.^[14]

Translational research

Translational research involves the application of discoveries generated during research in the laboratory and in preclinical studies to the development of trials and studies in humans.^[15] It also aims to enhance clinical outcomes and adoption of best practices in the community.^[16] Most impactful translational researches have been based on careful, diligent, and patient laboratory work. The human genome project and stem cell research have significantly impacted current knowledge and treatment of several disease conditions, including congenital anomalies and cancer. Prenatal diagnosis and to fetal surgical treatment are now clinical realities. These advances are based on translational research and laboratory work. The Children's Hospital of Philadelphia's center for pediatric clinical effectiveness, Boston's children hospital, Cincinnati children's and Nationwide Children's hospital are some of the

children's hospitals that have established clinical and translational research offices and programs enhancing the development and execution of highly impactful researches which are specifically designed to improve clinical outcomes. In Nigeria, however, there is little or no laboratory pediatric surgical research and translational research is rare.

Health systems and outcomes research

A 1999 publication revealed that 2% of all deaths are due to preventable medical errors, compounded by a lack of disclosure and secrecy.^[17] A framework and pathway for error disclosure, root cause analysis, and prevention was subsequently created. Another publication, revealed that the U.S. healthcare delivery system does not provide consistent high quality medical care to all people citing that health care harms patients too frequently and routinely fails to deliver its potential benefit.^[18] In 2001, only 55% of Americans had a chance of receiving appropriate healthcare due to fundamental shortcomings in the way care is organized.^[18] This brought quality improvement in healthcare to the fore resulting in development of a platform and roadmap for health systems change and quality improvement. Today, there are several quality improvement programs across the US, some of which have even been exported abroad.

Implementation research

The research efforts of pediatric surgeons in Nigeria with limited support over the decades are commendable. However, the focus has been on doing what has already been concluded such as epidemiological studies, challenges facing pediatric surgery access, and morbidity and mortality. Efforts must now be committed to developing and implementing innovative approaches to address the problems and challenges, as well as implementing quality improvement programs and deploying technology to advance children's surgical care.

Challenges, barriers and limitations

Research capacity

Current research capacity and critical mass of pediatric surgical researchers in Nigeria is limited. Medical graduates almost always commence residency training without any research training or experience. Although the training colleges mandate presentation of a dissertation for the completion of the residency training program, the graduating trainee and new consultants are most often unprepared for research, while medical students, residents, and trainees are rarely involved in research. This may be due to lack of appropriate mentorship, pressure of clinical workload, perceived lack of financial incentive for research, and lack of

interest. A critical analysis of this situation is necessary to properly address this problem and proffer lasting workable solutions.^[19] An enabling environment needs to be created for research to be incorporated as a relevant and critical aspect of training not just as a means of generating a dissertation for the exit examination.

Research funding

While the budget for the United States’ National Institutes of Health (the agency that is responsible for healthcare research funding in that country) for 2018 was \$37 billion^[20] and the proposed budget for 2019 is \$34.8 billion,^[21] Nigeria’s total health budget for 2018 was N356 billion (approximately \$1 billion) which is only 3.9% of the total budget for the country [Figure 4].^[22]

There is presently no dedicated healthcare research budget or funding in Nigeria, and external funding is often difficult to secure. A widely used international indicator to measure the level of investment in research is the Gross Domestic Expenditure on Research and Development, measured as a percentage of the total economic activity in a country or Gross

Domestic Product. While the world average is 1.77%, many African countries lag. In South Africa, it is 0.76%, Egypt 0.4% and Nigeria 0.2%, a value much lower than that of other African countries.^[23] The National Institute of Medical Research in Nigeria, in an attempt to improve grantsmanship and success at winning research grants by Nigerian researchers, recently held a national workshop to strengthen research capacity. The impact of this initiative has yet to be assessed.

National child health research agenda

The National Child Health Policy is currently outdated. Although efforts are being made to revise and update it and children’s surgery should be included in any of its future review, children’s surgery providers are not involved. This needs to be urgently addressed. To facilitate and strengthen children’s surgery research a National Child Health Research Agenda and Priorities need to be developed and implemented.

There is a need to invest in pediatric surgical research for development. A research agenda for global pediatric

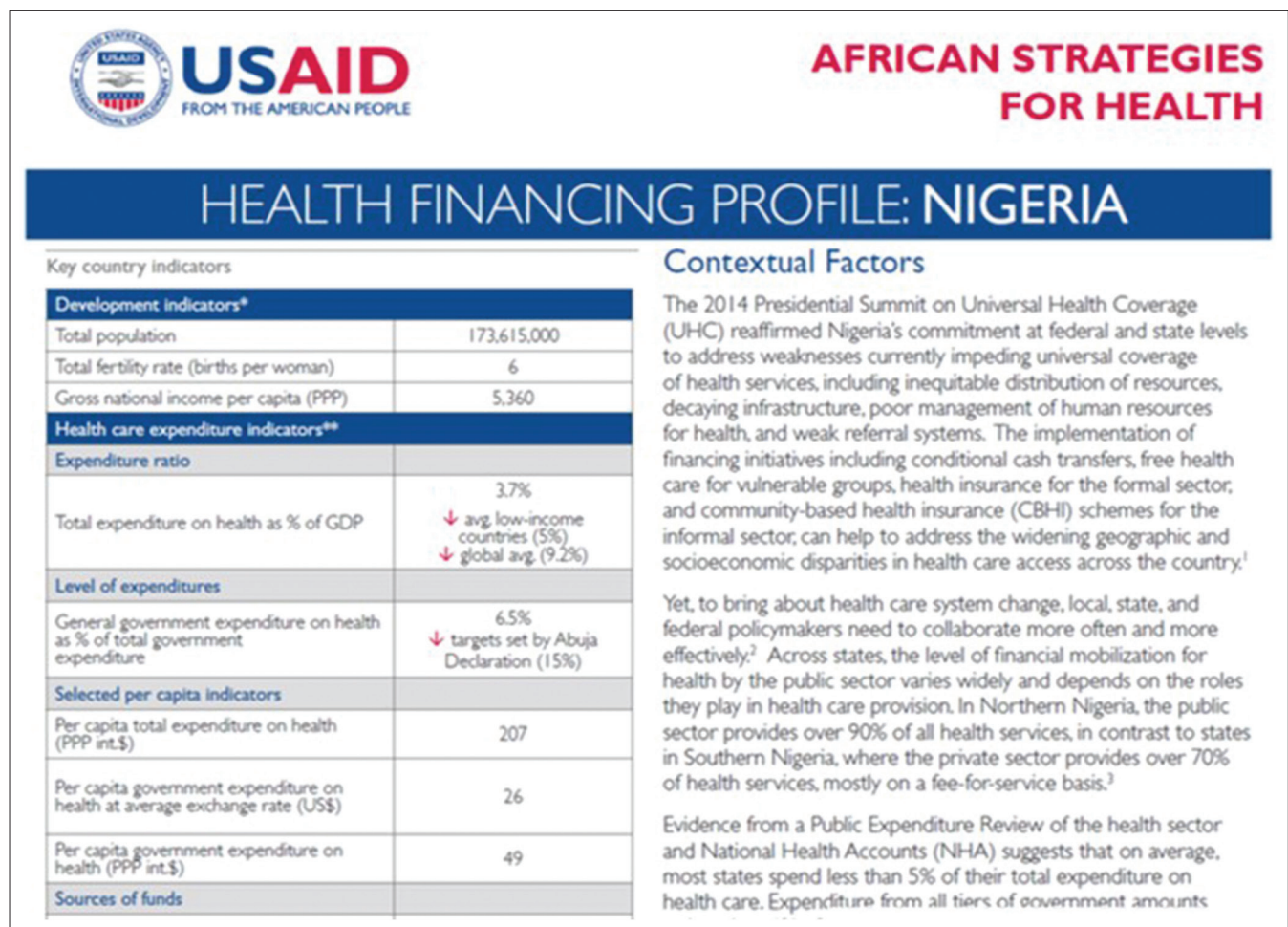


Figure 4: Nigeria healthcare funding profile

surgery has recently been suggested [Table 2].^[24] These suggestions can be prioritized in the Nigeria context to guide children's surgery research in the country.

A revised version of the Nigeria National Strategic Health Development Plan was recently approved by the Federal Executive Council. It however does not lay emphasis on healthcare research with nothing on children's surgical care.

A National Surgical Plan for children is urgently needed and Nigeria is the first to specifically include children's surgery in the recently launched National Surgical, Obstetrics, Anaesthesia, and Nursing Plan. This should help place children's surgery on the national health agenda and enable leveraging of funds for research, grants and growing the capacity for research.

GLOBAL INITIATIVE FOR CHILDREN'S SURGERY

The burden of surgical conditions in LMICs and worldwide lack of access to surgical care, led a consortium of providers, institutions, and allies from around the globe and from a wide range of both LMICs and HICs to form the Global Initiative for Children's Surgery (GICS).^[25] GICS has shown a commitment to addressing children's surgical needs being guided by the needs and insights of local providers in resource-challenged areas around the globe. GICS together with providers and implementers of surgical services for children, health advocacy experts and health policy experts, aims to analyze the current state of surgical care for children in LMICs; develop global, regional, national and local priorities to improve the delivery of surgical care for children in LMICs; and identify and bring together resources to address those global, national and regional priorities. GICS provides a

unique platform for collaboration in research, training, and service in a country like Nigeria. The resources of GICS can be leveraged to create platforms and pathways for implementation of research outcomes, to develop and implement quality improvement programs and enhance advocacy for policymaking.

The recently published GICS Optimal Resources for Children's Surgical Care outlines optimal workforce and equipment resources for children's surgery at each hospital level in the healthcare system.^[26] These guidelines are to serve as the benchmarks for building surgical services through National Surgical, Obstetrics, and Anesthesia Plans and as advocacy tools for increased resources for children's surgery.

CHILDREN'S HOSPITALS URGENTLY NEEDED

There is a dearth of government owned multispecialty children's hospitals in Nigeria. The Kano state government established Sheikh Khalifa Isyaku Rabiou Pediatric Hospital in 2018 as a state of the art multispecialty children's health facility providing international standards of care.^[27] Operational for just over 6 months, a review of the hospital is not yet available.

In high-income countries however, there are well established children hospital that have been operational for decades. These hospitals which are devoted exclusively to the care of children, provide safe and high-quality multispecialty pediatric healthcare.^[28,29] Over the years, they have also fostered medical discoveries and innovations and are involved in cutting edge research in various fields in pediatric healthcare including children's surgical care and research.

ADVOCATING FOR CHILDREN'S SURGICAL CARE

Role of APSON

The Association of Paediatric Surgeons of Nigeria brings together all pediatric surgical trainees and consultants in the country. This association can be a formidable force that will transform the entire terrain of children's surgery in Nigeria. While the aims and objectives of the association are clearly spelt out, deliberate practical steps to achieving these should be clearly outlined with timed targets and periodic reviews of gains made.

Advocacy should be a top priority for APSON. Politicians and policymakers should be made to realize that children's surgical care must not be neglected and that key problems of trauma and injuries, cancer, birth defects, and access to care when needed must be

Table 2: Suggested research agenda and priorities for global pediatric surgery^[24]

Assessment of the global burden of surgical conditions in children in LMICs
Strategies to address the nonavertable burden of surgical conditions in children in LMICs
Strategies to address the avertable burden of surgical conditions in children in LMICs
Models for scaleup of the pediatric surgical workforce
Critical evaluation of partnerships
Tools for measuring and incorporating surgical care as a basic component of health systems
Methods for assessing the human, financial and economic impact of pediatric surgical conditions and surgical care
Aligning pediatric surgical care with other global health and development endeavors
LMICs: Low- and middle-income countries

addressed. APSON may consider having an official advocacy arm.

ROLE OF INTERNATIONAL COLLABORATION

International research collaborations in surgery between HICs and LMICs encourage capacity building and quality improvement and mutually enhance patient care. While the number of global clinical trials is expanding, surgical trials have not undergone the same global expansion.^[30] International collaboration in pediatric surgery will improve generalizability of results and fast recruitment and help clarify management of disorders of low incidence.

The GICS and Global PaedSurg are two of such collaborations. There is need for more collaborations. Some areas of involvement would include consensus work on agreement on definitions for complications, diseases and outcome and core database variables for data collection, international randomized control trials of surgical diseases or interventions, establishment of national and international registries with cross collaborations and international audits, and evidence assessment and distributions. Barriers to international collaborations could be surgeon related (lack of time, academic knowledge or monetary issues and reimbursement), patient related (unwillingness to participate and cultural barriers), methodological (sample size and center selection), social or political (legislative, religious, or ethical regulations).^[30] Various solutions have however been proffered for these. Nearly, all existing international collaborations were conceived and led by researchers in HICs. There is a need for children's surgery researchers in Nigeria to take the lead in initiating and championing these collaborations.

VISION FOR 2030

The year 2030 is the target year for UHC and SDGs and meeting the LCOGs targets. Without deliberate investment in children's surgery and research these goals and targets cannot be reached in Nigeria. The National Surgical Obstetric Anaesthesia and Nursing Plan for Nigeria incorporated a plan for children's surgery. While the government and other stakeholders work toward the implementation of the plan, APSON should as a critical stakeholder take ownership of the children's surgery component to ensure that the goals and targets are realized.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Meara JG, Leather AJ, Hagander L, Alkire BC, Alonso N, Ameh EA, *et al.* Global surgery 2030: Evidence and solutions for achieving health, welfare, and economic development. *Lancet* 2015;386:569-624.
2. Alkire BC, Raykar NP, Shrimel MG, Weiser TG, Bickler SW, Rose JA, *et al.* Global access to surgical care: A modelling study. *Lancet Glob Health* 2015;3:e316-23.
3. Mullapudi B, Grabski D, Ameh E, Ozgediz D, Thangarajah H, Kling K, *et al.* Estimates of number of children and adolescents without access to surgical care. *Bull World Health Organ* 2019;97:254-8.
4. A Child Under 15 Dies Every 5 Seconds Around the World. Available from: <https://www.who.int/news-room/detail/18-09-2018-a-child-under-15-dies-every-5-seconds-around-the-world>. [Last accessed on 2019 Jun 25].
5. Krishnaswami S, Nwomeh BC, Ameh EA. The pediatric surgery workforce in low- and middle-income countries: Problems and priorities. *Semin Pediatr Surg* 2016;25:32-42.
6. Effective Research Funding Could Accelerate Growth. *University World News*. Available from: <https://www.universityworldnews.com/post.php?story=20140206124811736>. [Last accessed on 2019 Jun 25].
7. Olufunke BT. Funding for research in science and technology in Nigeria universities: The gender perspective. *Journal of Emerging Trends in Educational Research and Policy Studies*, 2012;3:34-8.
8. Tertiary Education Trust Fund. Available from: <https://www.tetfund.gov.ng/index.php>. [Last Accessed on 2019 Jun 25].
9. TETFund is Failing Local Universities –Academics. *University World News*. Available from: <https://www.universityworldnews.com/post.php?story=20181029063627363>. [Last accessed on 2019 Jun 25].
10. Adedoye D, David RA, Oloagun AA, Auta A, Adesokan A, Gadanya M, *et al.* Health workforce and governance: The crisis in Nigeria. *Hum Resour Health* 2017;15:32.
11. PaedSurg Africa. *Global PaedSurg*. Available from: <http://globalpaedsurg.com/paedsurg-africa/>. [Last accessed on 2019 Jun 25].
12. Nasir AA, Ameh EA. Fate of abstracts presented at association of paediatric surgeons of Nigeria annual meetings. *Afr J Paediatr Surg* 2012;9:132-6.
13. Nasir AA, Ameh EA, Poenaru D. Completion publication of abstracts presented at the scientific meetings of the pan-African pediatric surgical association. *Afr J Paediatr Surg* 2013;10:246-51.
14. Odeyemi OA, Odeyemi OA, Bamidele FA, Adebisi OA. Increased research productivity in Nigeria: More to be done. *Future Sci OA* 2019;5:FSO360.
15. Translational Research. *Oregon Health and Science University*. Available from: <http://www.ohsu.edu/xd/research/centers-institutes/octri/about/what-we-do/translational-research.cfm>. [Last accessed on 2019 Jun 25].
16. What is Translational Research? UC Davis; 2017. Available from: <https://www.ucdavis.edu/one-health/translational-research> [Last accessed on 2019 Jun 25].
17. Institute of Medicine. *To Err Is Human: Building a Safer Health System*. Washington, DC: The National Academies Press; 2000. Available from: <https://www.nap.edu/catalog/9728/to-err-is-human-building-a-safer-health-system>. [Last accessed on 2019 June 25].
18. Institute of Medicine (US) Committee on Quality of Health Care

- in America. Crossing the Quality Chasm: A New Health System for the 21st Century. Washington (DC): National Academies Press (US); 2001. Available from: <http://www.ncbi.nlm.nih.gov/books/NBK222274/>. [Last accessed on 2019 Jun 25].
19. Atesok KI, Hurwitz SR, Egol KA, Ahn J, Owens BD, Crosby LA, *et al*. Perspective: Integrating research into surgical residency education: Lessons learned from orthopaedic surgery. *Acad Med* 2012;87:592-7.
 20. Our Society. National Institutes of Health; 2014. Available from: <https://www.nih.gov/about-nih/what-we-do/impact-nih-research/our-society>. [Last accessed on 2019 Jul 31].
 21. National Institutes of Health. Testimony on the Fiscal Year 2019 Budget Request before the House Committee. National Institutes of Health; 2018. Available from: <https://www.nih.gov/about-nih/who-we-are/nih-director/testimony-fiscal-year-2019-budget-request-before-house-committee>. [Last accessed on 2019 Jul 31].
 22. USAID. African Strategies for Health. Health Financing Profile: Nigeria. USAID; February, 2016. Available from: http://www.africanstrategies4health.org/uploads/1/3/5/3/13538666/country_profile_-_nigeria_-_us_letter_final.pdf. [Last accessed on 2019 June 25].
 23. Mba D. Nigeria's Universities are Performing Poorly. What Can be Done About it. The Conversation. Available from: <http://theconversation.com/nigerias-universities-are-performing-poorly-what-can-be-done-about-it-112717>. [Last accessed on 2019 Jun 25].
 24. Greenberg SL, Ng-Kamstra JS, Ameh EA, Ozgediz DE, Poenaru D, Bickler SW. An investment in knowledge: Research in global pediatric surgery for the 21st century. *Semin Pediatr Surg* 2016;25:51-60.
 25. What We Are Doing. Global Initiative for Children's Surgery. Available from: <https://www.globalchildrenssurgery.org/what-we-are-doing-global-childrens-health/>. [Last accessed on 2019 Jun 25].
 26. Goodman LF, St-Louis E, Yousef Y, Cheung M, Ure B, Ozgediz D, *et al*. The global initiative for children's surgery: Optimal resources for improving care. *Eur J Pediatr Surg* 2018;28:51-9.
 27. Available from: <http://isyakurabihospital.com/About.html#content7-24>. [Last accessed on 2019 Jun 25].
 28. About Nationwide Children's Hospital. Available from: <https://www.nationwidechildrens.org/about-us>. [Last accessed on 2019 Jul 31].
 29. Philadelphia TCH of. About Children's Hospital of Philadelphia; 2014. Available from: <https://www.chop.edu/about-us>. [Last accessed on 2019 Jul 31].
 30. Søreide K, Alderson D, Bergenfelz A, Beynon J, Connor S, Deckelbaum DL, *et al*. Strategies to improve clinical research in surgery through international collaboration. *Lancet* 2013;382:1140-51.